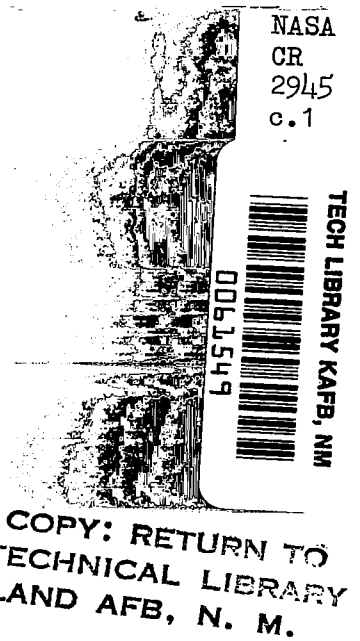

NASA Contractor Report 2945

Users' Instructions for the NASA/MSFC Cloud-Rise Preprocessor Program - Version 6, and the NASA/MSFC Multilayer Diffusion Program - Version 6 (Research Version for Univac 1108 System)

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INTRODUCTION

This document contains users' instructions for a modified version of the NASA/MSFC Multilayer Diffusion Model Computer Program—Version 5. The instructions assume the reader is familiar with the material contained in NASA Contractor Report NASA CR-2631, "NASA/MSFC Multilayer Diffusion Models and Computer Programs—Version 5, by R. K. Dumbauld and J. R. Bjorklund, December 1975. This modified version of the original program consists of a NASA/MSFC Cloud-Rise Preprocessor Program and a NASA/MSFC Multilayer Diffusion Program, both of which will be referred to as Version 6.

The NASA/MSFC Cloud-Rise Preprocessor Program is executed using any desired vertical profile of meteorological data (usually rawinsonde data) for a specific rocket vehicle and pollutant. The Preprocessor Program automatically calculates the rise of the rocket exhaust cloud, the cloud source dimensions at cloud stabilization, and other necessary inputs required by the NASA/MSFC Multilayer Diffusion Program. On option, the Preprocessor Program either punches the input data to cards or writes the data to mass storage and magnetic tape files for subsequent processing by the Multilayer Diffusion Program. The users' instructions for the NASA/MSFC Cloud-Rise Preprocessor Program—Version 6 are given in Section A.

The NASA/MSFC Multilayer Diffusion Program—Version 6 can be executed from input data prepared by the user or from input data prepared by the Preprocessor Program. If the data are from the Preprocessor Program, they can be in card form or on mass storage and tape, and all data cases can be processed in a single execution with a single blank input card. The Multilayer Diffusion Program uses these input data to calculate, on option, patterns of concentration, dosage, time-mean concentration, time of cloud passage, ground-level deposition and surface water pH due to precipitation scavenging and ground-level deposition due to gravitational settling.

The users' instructions for the Multilayer Diffusion Program—Version 6 are given in Section B.

These versions of the Preprocessor and Multilayer Diffusion Programs differ from previous versions of the programs and now incorporate:

- The latest data for the heat content and chemistry of rocket exhaust clouds
- Provision for the automated calculation of surface water pH due to the deposition of HCl from precipitation scavenging
- Provision for the automated calculation of concentration and dosage parameters at any level within the vertical bounds for which meteorological inputs have been specified
- Provision for execution of multiple cases of meteorological data

In addition, some calculation procedures, such as the procedures used to automatically calculate wind direction shear in a layer, have been updated.

SECTION A

USERS' INSTRUCTIONS FOR THE NASA/MSFC CLOUD-RISE PREPROCESSOR COMPUTER PROGRAM—VERSION 6

This computer program is specifically designed for use with the NASA/MSFC Multilayer Diffusion Program—Version 6 and will not function properly with previous versions of the main program. The Preprocessor Program produces a complete set of data decks for input to the NASA/MSFC Multilayer Diffusion Program—Version 6. The program is specifically designed for use with launches of the Space Shuttle, Titan IIIC, Delta-Thor 2914, Delta-Thor 3914 and Minuteman II vehicles. The data decks produced on option by this program include a complete card deck for each of the four pollutants HCl, CO, CO_2 and Al_2O_3 for Models 3 and/or 4 and/or 5 in the NASA/MSFC Multilayer Diffusion Program—Version 6.

The Cloud-Rise Preprocessor Program is written in Fortran IV and requires approximately 17,000 locations of core storage on the Univac 1108 Computer. The program requires card input, print output and optionally punch or mass storage and tape file output. Sections A.1 and A.2 describe the Program input data. Section A.3 describes the Preprocessor Program output data and Section A.3 gives a complete FORTRAN listing of the Preprocessor Program. For convenience, the NASA/MSFC Multilayer Diffusion Program is referred to as the Main Program in the following text.

A.1 PROGRAM INPUT PARAMETERS

The Preprocessor Program requires the input of the following meteorological parameters:

σ_{AR} - Standard deviation of the wind azimuth angle in degrees measured at the first reference height z_1 over a 10-minute time period

ρ	-	Ambient air density in grams per cubic meter measured at z_1
z	-	Height in feet or meters at which the meteorological measurements are taken
θ	-	Wind direction in degrees at z
u	-	Wind speed in knots or meters per second at z
T	-	Ambient air temperature in degrees Celsius at z
P	-	Ambient air pressure in millibars at z
RH	-	Relative humidity in percent at z

The Program also requires control information indicating: (1) vehicle type, (2) whether the computer run is for a normal or abnormal launch, (3) whether z is in feet or meters, (4) whether u is in knots or meters per second, (5) height of the surface mixing layer which must coincide with one of the z inputs above, and (6) the model being used and the pollutants for which data decks will be produced.

A.2 PROGRAM INPUT DATA CARD SEQUENCE

The first card in the input data deck contains general case titling information and is used for a page heading in the Preprocessor print output and is also punched in the output data deck for input to the Multilayer Diffusion Program. The second input card contains control information and σ_{AR} and ρ at the surface.

Data Card 1:

Columns 1 - 72 - (NAMCAS)	General data set titling information. If input as blanks, the program will use the information input into the previous case processed.

Data Card 2:

Column 1 (NSPECL)	-	Number of special data cards containing additional inputs to pass on to the Main Program This data is described under Data Card N + 2 to M (EXTR) below. The maximum value is 5.
Columns 2 - 4 (VEHICL)	-	Punch these characters indicating the vehicle type. If left blank Titan IIIC is assumed. TTN is the Titan IIIC vehicle; STL is the Space Shuttle vehicle; DT2 is the Delta-Thor 2914 vehicle; DT3 is the Delta-Thor 3914 vehicle; MIN is the Minuteman II vehicle.
Columns 5 - 7 (NØRMAL)	-	Punch YES or leave blank if the run is for a normal launch. Punch NØ1 if the run is for an abnormal launch where a single engine burns on the launch pad. Not produced for the Delta-Thor and Minuteman II vehicles. Punch NØ2 if the run is for an abnormal launch where a slow burn on the pad occurs. (Ø is alphabetic)
Column 8 (IFEET)	-	Punch M or leave blank if the heights z are in meters. Punch F if the heights are in feet.
Column 9 (KNOTS)	-	Punch M or leave blank if the wind speed u is in meters per second.
Columns 10-39 (DATE)		Punch the date of the meteorological case or any case identification information (optional).
Columns 40-45* (TPRØP)	-	Punch the initial temperature of the solid propellant in degrees F. If left blank, the average temperature at KSC for the indicated month is used.
Columns 46-51* (SIGAR)	-	Punch σ_{AR}

Data Card 2 (Continued)

Columns 52-58* (RHO)	-	Punch ρ
Columns 59-66* (ZSP)	-	Punch any special calculation height in the same units as z below. These columns are optional and if punch, this height and the surface height (o) are passed to the Main Program for calculations.
Column 67 (ISW(1))	-	Punch a 1 if output (dosage and concentration) for Model 4 is desired; leave blank if not. Punch a 2 if output for Model 5 is desired (precipitation deposition) using the Model 4 source and meteorological structure (HCl only). Punch a 3 if output (dosage and concentration) for Model 4 including depletion due to precipitation scavenging is desired.
Column 68 (ISW(2))	-	Punch a 1 if output (dosage and concentration) for Model 3 is desired; leave blank if not. Punch a 2 if output for Model 5 is desired using the Model 3 source and meteorological structure (HCl only). Punch a 3 if output (dosage and concentration) for Model 3 including depletion due to precipitation scavenging is desired.
Column 69 (ISW(3))	-	Punch a 1 if output for HCl is desired; leave blank if not.
Column 70 (ISW(4))	-	Punch a 1 if output for CO is desired; leave blank if not. (Not produced for Model 5).
Column 71 (ISW(5))	-	Punch a 1 if output for Al_2O_3 is desired; leave blank if not. (Not produced for Model 5).
Column 72 (ISW(6))	-	Punch a 1 if output for CO_2 is desired; leave blank if not. Produced only for the Titan IIIC vehicle. (Not produced for Model 5).
Column 73 (ISW(7))	-	Punch a 1 if cloud the trajectory range and azimuth bearing are to be calculated and cloud rise time is to be printed; leave blank if not.

Data Card 2 (continued)

Column 74 (ISW(8))	-	Punch a 1 if the distribution of the source material in the layers is to have an elliptical shape. Leave blank if the distribution is to be spherical.
Column 75 (ISW(9))	-	Punch a 1 if column 67 or 68 is a 2 for Model 5 and output units in pH (surface water acidity) from the Main Program are desired. Leave blank if Model 5 is to be in milligrams per square meter. (Option ISKIP(9) in Main Program).
Column 76 (ISW(10))	-	If left blank, the program provides for calculations in the Main Program at the surface and at the special height specified in Columns 59-66 (if punched). Punch a 1 if Main Program calculations are to be performed at only the cloud rise height (H) and at the special height specified in Columns 59-66 (if punched). Punch a 2 if main model calculations are to be performed at the surface, the cloud rise height (H) and the special height specified in Columns 59-66 (if punched).
Column 77 (ISW(11))	-	Punch a 1 if column 67 or 68 is a 2 and maximum possible precipitation deposition from Model 5 is desired. Leave blank if Model 5 is not being used or if the precipitation deposition from Model 5 is to be dependent upon the time of the start of precipitation. (Option ISKIP(4) in Main Program).
Column 78 (ISW(12))	-	Punch a 1 if concentration and dosage of precipitation deposition from the Main Program is to be printed for all calculation points. Leave blank if not. (Option ISKIP(1) in Main Program)
Column 79	-	Punch a 1 if maximum centerline concentration and maximum dosage or maximum centerline precipitation deposition are to be printed by the Main Program. Punch a 2 for maximum centerline plots only. Punch a 3 for maximum centerline print and plot. (Option ISKIP(2) in Main Program).

Data Card 2 (continued)

Column 80 (ISW(14)) - Punch a 1 if isopleths of concentration and dosage or precipitation deposition are to be printed by the Main Program. Punch a 2 if isopleth plots are only produced. Punch a 3 if isopleths are to be printed and plotted. (Option ISKIP(3) in Main Program).

Data Card 3: (This data card is read only if column 74 of data card 2 is 1).

Column 1-4* (GAMMAX) - Punch the entrainment parameter for the alongwind dimension of the elliptically shaped cloud. If left blank, the program uses .64 for a normal launch or .5 for an abnormal launch.

Column 5-8* (GAMMAY) - Punch the entrainment parameter for the crosswind dimension of the elliptically shaped cloud. If left blank the program uses .64 for a normal launch or .5 for an abnormal launch.

Column 9-12* (GAMMAZ) - Punch the entrainment parameter for the vertical dimension of the elliptically shaped cloud. If left blank the program uses .64 for a normal launch or .5 for an abnormal launch.

Data Card 4:

Column 1-2 (METUNT) - Punch the Fortran logical unit number right justified from which the input data is to be read. If left blank, the program uses logical unit 5.

Column 5-6 (METDAT(1)) - Punch the month of the meteorological data right justified.

Column 7-8 (METDAT(2)) - Punch the day of the meteorological data right justified.

Column 9-10 (METDAT(3)) - Punch the year of the meteorological data right justified.

Data Card 4 (continued)

Column 13-14 (NSND) - Punch the hour of the meteorological sounding right justified (00-24).

Column 17-18 (IØUNT) - Punch the Fortran logical unit number for the output data right justified. If 7 is punched, the output data is punched to cards. If left blank or 10 is punched, the output data is written to mass storage random access unit 10 as a case inventory. Also, a directory of cases on unit 10 is written sequentially to tape or mass storage unit 12. It is the user's responsibility to assign units 10 and 12. Unit 10 must be a mass storage file of at least 14 positions on the Univac 1108 and unit 12 can be either mass storage or tape. These files can be temporary or permanent files and, if temporary, the Preprocessor and Main Program should be executed sequentially in the same run.

Data Card 5: (This data card is read only if card column 67 or 68 on data card 2 is greater than 1).

Column 1-10* (RAINRT) - Punch the rainfall rate in inches per hour. If left blank, the program uses 0.3 inches per hour.

Column 11-20* (LAMBDA) - Punch the rainfall scavenging coefficient in units of per second. If left blank, the program will calculate the scavenging coefficient using the following equation

$$\text{scavenging coefficient} = 5.2 \times 10^{-4}(R)^{0.567}$$

where R is the rainfall rate in inches per hour

Column 21-30* (TIM1) - Punch the time of the start of rain (seconds) after launch time. If left blank, zero is used. This parameter is not used if maximum possible precipitation deposition is being calculated.

Column 31-40* (ZLIM) - Punch the maximum height in meters through which precipitation can occur. If left blank, the program uses the height selected for the mixing layer height.

Data Card 5 (continued)

Column 41-50* (DURAT) - Punch the duration of the rain in hours. If left blank, the program uses 1 hour. This parameter is not used if maximum possible precipitation is being calculated.

Data Card 6-N: (N must be less than or equal to 26).

Column 1-10* (Z) - Punch the height of the layer boundary or sounding height.

Column 11-20* (WD) - Punch the wind direction in degrees.

Column 21-30* (WS) - Punch the wind speed.

Column 31-40* (T) - Punch the temperature in degrees Celsius.

Column 41-50* (P) - Punch the pressure in millibars.

Column 51-60* (RH) - Punch the relative humidity in percent.

Column 80 (IHM) - Punch an asterisk (*) if the height on this card is the surface mixing layer height. If none of the data cards contains an asterisk, then the last height input is used as the surface mixing layer height.

Data Card N + 1:

Column 1-60: - This card signifies the end of the layer meteorological data on data cards 6-N by leaving columns 1-60 blank.

Data Card N + 1 (continued)

Column 80: - Punch a 1 if this case is to be followed by another data case. Leave blank if this is the last data case for the Preprocessor to process.

Data Card N + 2 - M: (These data cards are not read if column 1 on data card 2 is blank or zero. Otherwise, M is the value in column 1 on data card 2 plus N + 1).

Column 1-80 (EXTR) - Punch data input variables in a namelist format for use in the Main Program that are not used or provided for in the Preprocessor. Any variable that can be input to the Main Program can be included in these data cards. The number of data cards is given in column 1 on data card 2. The program reads these cards and inserts them unaltered at the end of the preprocessor namelist output prior to the $END card. Any variable entered on these cards will override any equivalent variable produced by the preprocessor. The data items input are punched exactly as if they were to be included in an input namelist deck to the Main Program, except $NAM2 and $END cannot appear on these cards. For example, if the user wants to use a special grid system rather than the Main Program default grid system, the following data could be input beginning in column 2. NXS = 10, XX = 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 10000, This input data would change the axis radial distances used in the Main Program calculations for this and subsequent case runs. If this input data is not to be used or if the default axis is to be used in subsequent cases these values must be changed in these cases to the desired values. Setting NXS = O in the next case would result in the default radial axis.

*Each of these fields is read using a format for real numbers. Except for data card 3, the number punched in these fields must include a decimal point (period) unless it is a right justified whole number in the field. If the decimal point is omitted on data card 3, the two low order digits in each field are assumed to be the tenths and hundreths positions of the number.

A.3 PREPROCESSOR PROGRAM OUTPUT

The Preprocessor Program will produce a complete card deck for direct input to the NASA/MSFC Multilayer Diffusion Program—Version 6. The first card of each of the output data decks is a case identification card containing the vehicle type, date of sounding, and pollutant type. The second card contains $NAM2 and the last card of each case deck contains $END. A complete description of this entire deck is given in Section B. The possible data decks output are:

Inputs for:

(1)	HCl	-	Model 4
(2)	CO	-	Model 4
(3)	CO_2	-	Model 4
(4)	Al_2O_3	-	Model 4
(5)	HCl	-	Model 3
(6)	CO	-	Model 3
(7)	CO_2	-	Model 3
(8)	Al_2O_3	-	Model 3
(9)	HCl	-	Model 5 and 4
(10)	MCl	-	Model 5 and 3

A.4 FORTRAN SOURCE LISTING FOR THE NASA/MSFC CLOUD-RISE PREPROCESSOR PROGRAM VERSION 6

This section contains the complete FORTRAN source listing of the NASA/MSFC Cloud-Rise Preprocessor Program— Version 6.

```
1*        **   NASA/MSFC CLOUD-RISE PREPROCESSOR PROGRAM - VERSION 6        **
2*        **                                                                 **
3*
4*            PROGRAM VHICLE, VERSION 6, REVISION 0
5*
6*      C   * PLUME RISE AND SOURCE DISTRIBUTION PREPROCESSOR PROGRAM FOR USE   VHC00100
7*      C   * WITH THE NASA/MSFC MULTILAYER DIFFUSION MODEL - VERSION 5A.       VHC00200
8*      C   *                                                                   VHC00300
9*      C                                                                       VHC00400
10*     C     *-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-VHC00500
11*     C                                                                       VHC00600
12*           COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,PI,GAMMAX,GAMMAY,GAMMAZ,T(21),VHC00700
13*          1P(21),Z(21),UBAR(21),NZS,Q(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,  VHC00800
14*          2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                    VHC00900
15*           COMMON /REST/ ZM,DPDZ,K,A1,B1,PHI1,ZP,TZ,PZ,PHI,IFLG,KS           VHC01000
16*           COMMON /SIG/ SIGXO(20),SIGYO(20),SIGZO(20),H                      VHC01100
17*           COMMON /F/ DATE(6),FRQ(4),WTMOL(3)                                VHC01200
18*           DIMENSION IPOL(4),I1(160),I2(12),I3(61),I4(13),I5(142),ITP(2),JP(2VHC01300
19*          1),ISW(14)                                                         VHC01400
20*           DIMENSION WS(21),I6(44),CC(8)                                     VHC01500
21*           INTEGER YES,VEHICL,TYPE,TYPES,UNITS                               VHC01600
22*           DIMENSION TYPE(8),QC1(8),QT1(8),QC2(8),QT2(8),QC3(8),QT3(8),AA(8),VHC01700
23*          1BB(8),HEATN(8),HEATA(8),FRQ1(4,8),FRQ2(4),TYPES(15),UNITS(4),     VHC01800
24*          2LNCH(11),LNTL(8),HEATM(8)                                         VHC01900
25*           DIMENSION DDI(10,4),CCI(10,4),TTI(10,4)                           VHC02000
26*           DIMENSION DDIP(10)                                                VHC02100
27*           DATA DDIP/12.,10.,8.,6.,4.,2.,4*0./                               VHC02200
28*           DATA TYPE/3HTTN,3HSTL,3HDT2,3HMIN,3HDT3,3*3H   /                  VHC02300
29*           DATA QC1/5.437528E6,1.52671702E7,8.360685E5,4.684476E5,1.057557E6,VHC02400
30*          13*0.0/                                                            VHC02500
31*           DATA QT1/3.2625168E8,1.894794173E9,2.887598E7,2.8106856E7,6.702691VHC02600
32*          1E7,3*0.0/                                                         VHC02700
33*           DATA QC2/2.718764E6,6.882968E6,9.09811E4,4.684476E5,1.482923E5,3*0VHC02800
34*          1.0/                                                               VHC02900
35*           DATA QT2/1.6312584E8,8.56929516E8,3.14229E6,2.8106856E7,9.398616E6VHC03000
36*          1,3*0.0/                                                           VHC03100
37*           DATA QC3/1.359382E6,3.441484E6,2.729434E5,1.171119E5,3.70731E5,3*0VHC03200
38*          1.0/                                                               VHC03300
```

```
39*           DATA QT3/3.2625166E8,1.713859032E9,1.885373E7,2.8106856E7,4.699308VHC03400
40*          1E7,3*0.0/                                                          VHC03500
41*           DATA AA/.429580469,.6522129891,.922156,.469982,1.245756,3*0.0/     VHC03600
42*           DATA BB/.5164223,.4680846,.432703,.463333,.4180947,3*0.0/          VHC03700
43*           DATA CC/5.0,.375,.54,5*0.0/                                        VHC03800
44*           DATA HEATN/2021.1,1479.7,1766.0,2055.9,1449.9,3*0.0/               VHC03900
45*           DATA HEATM/1010.55,1062.35,1000.0,2055.9,1000.0,3*0.0/             VHC04000
46*           DATA HEATA/2*1000.0,690.0,1000.0,411.18,3*0.0/                     VHC04100
47*     C     FRACTIONAL DIST FOR MINUTEMAN II ABNORMAL LAUNCH                   VHC04200
48*           DATA FRQ2/.2042109,.2188377,.0,.2799764/                           VHC04300
49*           DATA FRQ1/.1932,.2665,.0222,.2819,.1782,.2021,.0286,.2524,.1218,   VHC04400
50*          1.2055,.0156,.2214,.1977,.2380,.0318,.2761,.1589,.2783,.0331,.1936,VHC04500
51*          212*0.0/                                                           VHC04600
52*           DATA TYPES/90HTITAN IIIC         SPACE SHUTTLE     DELTA-THOR 2914 VHC04700
53*          1  MINUTEMAN II       DELTA-THOR 3914    /                        VHC04800
54*           DATA UNITS/24H PPM           ML/M**3    /                        VHC04900
55*           DATA LNCH/66H     NORMAL LAUNCHSINGLE ENGINE BURN          SLOW BURVHC05000
56*          1NVEHICLE     /                                                    VHC05100
57*           DATA NAMT/12*1H /                                                  VHC05200
58*           DATA CCI/16.0,8.0,4.0,1.0,0.5,0.1,4*0.0,35.0,10.0,4.0,2.0,1.0,0.1,VHC05300
59*          14*0.0,20.0,10.0,5.0,3.0,1.0,0.5,4*0.0,2.0,1.0,0.4,0.1,0.05,0.01,4*VHC05400
60*          20.0/                                                              VHC05500
61*           DATA DDI/400.0,200.0,100.0,50.0,25.0,5.0,4*0.0,400.0,200.0,100.0,  VHC05600
62*          150.0,25.0,5.0,4*0.0,400.0,200.0,100.0,50.0,25.0,5.0,4*0.0,40.0,   VHC05700
63*          220.0,10.0,5.0,2.5,0.5,4*0.0/                                      VHC05800
64*           DATA TTI/30.0,4.0,8.0,2.0,1.0,0.5,4*0.0,150.0,100.0,60.0,30.0,15.0VHC05900
65*          1,1.0,4*0.0,5.0,2.0,1.0,.5,.1,.05,4*0.0,50.0,100.0,25.0,10.0,5.0,1.VHC06000
66*          20,4*0.0/                                                          VHC06100
67*           DATA JP/12H FEET METERS/,NO/3H NO/,NO1/3HNO1/,NO2/3HNO2/           VHC06200
68*           DATA YES/3HYES/,IPOL/24H HCL   CO    CO2   AL203/,ITP/1HF,1HK/    VHC06300
69*           DATA IAST/1H*/                                                     VHC06400
70*           DATA IBLK/3H   /,IBNK/1H /,NMS/1HM/                                VHC06500
71*           COMMON /OUT/ QF(20,4),WD(21),ISKIP(10),NDI,NCI,NTI,ZRK,JBOT,JTOP,  VHC06600
72*          1IZMOD(21),CI(10),DI(10),TI(10),NPS                                VHC06700
73*           COMMON /PRECIP/ RAINRT,LAMBDA,TIM1,ZLIM,DURAT,JSWS,EXTR(70),NSPECLVHC06800
74*           COMMON/DISPL/ DXX,DX(21),DYY,DY(21),ILXY,TIMC(21)                  VHC06900
75*           COMMON /CASCRD/ NVHCL,METDAT(3),NMODL,NPLNT,NSND,IOUNT,IASV        VHC07000
76*           DIMENSION METDTC(3),AVTEMP(12)                                     VHC07100
```

```
77*            REAL LAMBDA                                                    VHC07200
78*            INTEGER EXTR                                                   VHC07300
79*            DATA IZERO,ISTRTC,IENDC,ISTART/4*0/                            VHC07400
80*            DATA AVTEMP/69.9,67.26,69.57,74.19,78.33,81.81,83.08,83.55,82.45, VHC07500
81*           179.32,73.15,65.62/                                             VHC07600
82*            EQUIVALENCE (IBLK,BLKS)                                        VHC07700
83*            EQUIVALENCE (WS,UBAR),(I1,QC),(I2,ZM),(I3,SIGXO),              VHC07800
84*           1(I4,DATE),(I5,QF),(I6,DXX)                                     VHC07900
85*      C                                                                    VHC08000
86*      C                    *** PROGRAM INPUTS ***                          VHC08100
87*      C-DATA CARD 1                                                        VHC08200
88*      C     NAMCAS - GENERAL DATA SET TITLING INFORMATION (CARD 1 COL 1-72)  VHC08300
89*      C              IF INPUT AS BLANKS THE INFORMATION IN THE LAST CASE INPUVHC08400
90*      C              IS USED                                               VHC08500
91*      C-DATA CARD 2                                                        VHC08600
92*      C     NSPECL - NUMBER OF SPECIAL DATA CARDS CONTAINING ADDITIONAL    VHC08700
93*      C              INPUTS THAT FOLLOW THE LAYER DATA VARIABLES UNDER EXTR  VHC08800
94*      C              BELOW - (MAXIMUM OF 5, DEFAULT=0) (CARD 2 COL 1)       VHC08900
95*      C     VEHICL - THREE CHARACTERS GIVING THE VEHICLE TYPE (CARD 2 COL 2-4)VHC09000
96*      C                TTN IS TITAN IIIC VEHICLE (DEFAULT)                 VHC09100
97*      C                STL IS SPACE SHUTTLE VEHICLE                        VHC09200
98*      C                DT2 IS DELTA-THOR 2914 VEHICLE                      VHC09300
99*      C                MIN IS MINUTEMAN II VEHICLE                         VHC09400
100*     C                DT3 IS DELTA-THOR 3914 VEHICLE                      VHC09500
101*     C     NORMAL - THREE CHARACTERS GIVING THE TYPE OF LAUNCH(CRD 2 COL 5-7)VHC09600
102*     C                YES IS A NORMAL LAUNCH (DEFAULT)                    VHC09700
103*     C                NO1 IS A SINGLE ENGINE BURN ABNORMAL LAUNCH         VHC09800
104*     C                NO2 IS A SLOW BURN ABNORMAL LAUNCH                  VHC09900
105*     C     IFEET - 1 CHARACTER IF Z IS IN FEET PUNCH F, IF Z IS IN METERS  VHC10000
106*     C              PUNCH M, (CARD 2 COL 8) (DEFAULT=M)                   VHC10100
107*     C     KNOTS - 1 CHARACTER IF WS IS IN METERS/SEC PUNCH M, IF WS IS IN VHC10200
108*     C              KNOTS PUNCH K, (CARD 2 COL 9) (DEFAULT=M)             VHC10300
109*     C     DATE - 30 CHARACTERS IDENTIFYING THE METEOROLOGICAL DATA CASE   VHC10400
110*     C            WITHIN THE GENERAL DATA CASE IDENTIFIED IN NAMCAS ABOVE  VHC10500
111*     C            (CARD 2 COL 10-39)                                      VHC10600
112*     C     TPROP - INITIAL TEMPERATURE OF SOLID PROPELLANT (DEG F)        VHC10700
113*     C             (DEFAULT IS AVERAGE TEMP. AT KSC FOR THAT MONTH IF BLANK) VHC10800
114*     C             (CARD 2 COL 40-45, F6.0 FORMAT)                        VHC10900
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115*      C     SIGAR - STANDARD DEVIATION OF THE WIND AZIMUTH ANGLE AT THE        VHC11000
116*      C             SURFACE MEASUREMENT HEIGHT (DEGREES) (CARD 2 COL 46-51)   VHC11100
117*      C             (F6.0 FORMAT)                                             VHC11200
118*      C     RHO - SURFACE AIR DENSITY (G/M**3) (CARD 2 COL 52-58 F7.0 FORMAT) VHC11300
119*      C     ZSP - SPECIAL CALCULATION HEIGHT IN ADDITION TO THE SURFACE       VHC11400
120*      C           HEIGHT IN THE SAME UNITS AS Z BELOW (CARD 2 COL 59-66)      VHC11500
121*      C           (F8.0 FORMAT)                                               VHC11600
122*      C     ISW(1) - IF SET TO 1 CALCULATE PARAMETERS FOR MODEL 4             VHC11700
123*      C              IF SET TO 2 CALCULATE PARAMETERS FOR MODEL 4 AND USE     VHC11800
124*      C              IN CONJUNCTION WITH MODEL 5 - (DATA CARD 5 IS READ WITH  VHC11900
125*      C              THIS OPTION)                                             VHC12000
126*      C              MODEL 5 IS THE PRECIPITATION DEPOSITION MODEL (SEE ISW(9)VHC12100
127*      C              AND ISW(11) AND DATA CARD 5                              VHC12200
128*      C              IF SET TO 3 CALCULATE PARAMETERS FOR MODEL 4 AS IF 1 BUT VHC12300
129*      C              ALSO INPUT CARD UNIT 5 TO CALCULATE CONCENTRATION AND    VHC12400
130*      C              DOSAGE WITH DEPLETION DUE TO PRECIPITATION SCAVENGING    VHC12500
131*      C              IF SET TO 0 MODEL 4 IS NOT PRODUCED (CARD 2 COL 67)      VHC12600
132*      C     ISW(2) - IF SET TO 1 CALCULATE PARAMETERS FOR MODEL 3             VHC12700
133*      C              IF SET TO 2 CALCULATE PARAMETERS FOR MODEL 3 AND USE     VHC12800
134*      C              IN CONJUNCTION WITH MODEL 5 - (DATA CARD 5 IS READ WITH  VHC12900
135*      C              THIS OPTION)                                             VHC13000
136*      C              IF SET TO 3 CALCULATE PARAMETERS FOR MODEL 3 AS IF 1, BUTVHC13100
137*      C              ALSO INPUT CARD UNIT 5 TO CALCULATE CONCENTRATION AND    VHC13200
138*      C              DOSAGE WITH DEPLETION DUE TO PRECIPITATION SCAVENGING    VHC13300
139*      C              IF SET TO 0 MODEL 3 IS NOT PRODUCED (CARD 2 COL 68)      VHC13400
140*      C     ISW(3) - IF SET TO 1 DATA FOR HCL IS PRODUCED                      VHC13500
141*      C              IF SET TO 0 HCL ISNOT PRODUCED (CARD 2 COL 69)           VHC13600
142*      C      ISW(4) - IF SET TO 1 DATA FOR CO IS PRODUCED                      VHC13700
143*      C              IF SET TO 0 CO IS NOT PRODUCED (CARD 2 COL 70)           VHC13800
144*      C     ISW(5) - IF SET TO 1 DATA FOR AL2O3 IS PRODUCED                    VHC13900
145*      C              IF SET TO 0 AL2O3 IS NOT PRODUCED (CARD 2 COL 71)        VHC14000
146*      C     ISW(6) - IF SET TO 1 DATA FOR CO2 IS PRODUCED                      VHC14100
147*      C              IF SET TO 0 CO2 IS NOT PRODUCED (CARD 2 COL 72)          VHC14200
148*      C     ISW(7) - IF SET TO 1 THE CLOUD TRAJECTORY COORDINATES DELX,DELY   VHC14300
149*      C              ARE CALCULATED AND PUNCHED FOR EACH LAYER.  IF SET TO 0  VHC14400
150*      C              CLOUD TRAJECTORY COORDINATES ARE NOT CALCULATED          VHC14500
151*      C              ALSO, LAYER CLOUD RISE TIME IS CALCULATED (CARD 2 COL 73)VHC14600
152*      C     ISW(8) - IF SET TO 1 THE PROGRAM USES AN ELLIPTICAL SHAPE RATHER  VHC14700
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C                THAN A SPHERICAL SHAPE TO DETERMINE THE DISTRIBUTION OF  VHC14800
C                MATERIAL IN THE LAYERS. (CARD 2 COL 74)                  VHC14900
C      ISW(9) - THIS PARAMETER IS USED ONLY IF ISW(1) OR ISW(2) EQUALS 2. VHC15000
C                IF ISW(9) = 0 THE OUTPUT UNITS OF PRECIPITATION          VHC15100
C                DEPOSITION WILL BE MG/M**2. IF ISW(9) = 1 THE UNITS WILL VHC15200
C                BE PH FOR HCL ONLY. (CARD 2 COL 75)                      VHC15300
C      ISW(10)- IF SET TO 0 THE PROGRAM PROVIDES FOR SURFACE CALCULATIONS VHC15400
C                ONLY OR IF ZSP IS INPUT AT THE SURFACE AND ZSP.          VHC15500
C                IF SET TO 1 THE PROGRAM PROVIDES FOR CALCULATIONS AT THE VHC15600
C                CLOUD RISE HEIGHT H AND AT ZSP IF INPUT                  VHC15700
C                IF SET TO 2 THE PROGRAM PROVIDES FOR CALCULATIONS AT THE VHC15800
C                SURFACE, THE CLOUD RISE HEIGHT H AND AT ZSP IF INPUT     VHC15900
C                (CARD 2 COL 76)                                          VHC16000
C      ISW(11)- THIS PARAMETER IS USED ONLY IF ISW(1) OR ISW(2) EQUALS 2, VHC16100
C                IF ISW(11) IS SET = 1, THE MAXIMUM POSSIBLE GROUND-LEVEL VHC16200
C                PRECIPITATION DEPOSITION IS CALCULATED. THE CALCULATIONS VHC16300
C                ARE INDEPENDENT OF THE TIME PRECIPITATION BEGINS.        VHC16400
C                IF ISW(11) IS SET = 0, THE PRECIPITATION DEPOSITION IS   VHC16500
C                DEPENDENT UPON THE TIME OF START OF PRECIPITATION.       VHC16600
C                (CARD 2 COL 77)                                          VHC16700
C      ISW(12) - IF > 0 PRINT ALL GRID CALCULATIONS OF CONCENTRATION,     VHC16800
C                 DOSAGE, DEPOSITION, ETC. FROM MAIN MODEL. (DEFAULT=0)   VHC16900
C                 ( CARD 2 COL 78)                                        VHC17000
C      ISW(13) - IF > 0 CALC. MAXIMUM CENTERLINE VALUES OF CONCENTRATION  VHC17100
C                 DOSAGE, DEPOSITION, ETC. FROM MAIN MODEL.               VHC17200
C                 IF = 1 VALUES ARE PRINTED ONLY                          VHC17300
C                 IF = 2 VALUES ARE PLOTTED ONLY                          VHC17400
C                 IF = 3 VALUES ARE BOTH PRINTED AND PLOTTED              VHC17500
C                 (CARD 2 COL 79)                                         VHC17600
C      ISW(14) - IF > 0 CALC. ISOPLETHS OF CONCENTRATION, DOSAGE,         VHC17700
C                 DEPOSITION, ETC. FROM MAIN MODEL.,                      VHC17800
C                 IF = 1 VALUES ARE PRINTED ONLY.                         VHC17900
C                 IF = 2 VALUES ARE PLOTTED ONLY                          VHC18000
C                 IF = 3 VALUES ARE BOTH PRINTED AND PLOTTED              VHC18100
C                 (CARD 2 COL 80)                                         VHC18200
C                                                                         VHC18300
C-DATA CARD 3 (READ ONLY IF ISW(8) IS NON-ZERO)                           VHC18400
C      THE FOLLOWING PARAMETERS ON CARD 3, GAMMAX,GAMMAY,GAMMAZ ALL USE   VHC18500
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191*      C      AN F4.2 FORMAT. ALSO, THIS CARD IS NOT READ IF ISW(8)=0. ALSO,     VHC18600
192*      C      THE DEFAULT VALUE FOR EACH PARAMETER IS .64 FOR A NORMAL LAUNCH    VHC18700
193*      C      AND .5 FOR AN ABNORMAL LAUNCH. ALSO, THE PRODUCT OF ALL THREE      VHC18800
194*      C      PARAMETERS MUST EQUAL (.64)**3 FOR A NORMAL LAUNCH OR IF ABNORMAL  VHC18900
195*      C      GAMMAX*GAMMAY MUST EQUAL (0.5)**2                                  VHC19000
196*      C      GAMMAX - ENTRAINMENT PARAMETER FOR THE X OR ALONGWIND DIMENSION    VHC19100
197*      C               FOR AN ELLIPTICALLY SHAPED CLOUD (ISW(8)=1 ONLY)          VHC19200
198*      C               (CARD 3 COL 1-4) (USE DEFAULT FOR DELTA-THOR)             VHC19300
199*      C      GAMMAY - ENTRAINMENT PARAMETER FOR THE Y OR CROSSWIND DIMENSION    VHC19400
200*      C               FOR AN ELLIPTICALLY SHAPED CLOUD (ISW(8)=1 ONLY)          VHC19500
201*      C               (CARD 3 COL 5-8) (USE DEFAULT FOR DELTA-THOR)             VHC19600
202*      C      GAMMAZ - ENTRAINMENT PARAMETER FOR THE Z OR VERTICAL DIMENSION     VHC19700
203*      C               FOR AN ELLIPTICALLY SHAPED CLOUD (ISW(8)=1 ONLY)          VHC19800
204*      C               (CARD 3 COL 9-12) (USE DEFAULT FOR DELTA-THOR)            VHC19900
205*      C-DATA CARD 4                                                             VHC20000
206*      C      METUNT - FORTRAN UNIT FROM WHICH TO READ MET. DATA (CARD 4 COL1-2) VHC20100
207*      C               DEFAULT = 5 CARD DATA.                                    VHC20200
208*      C      METDAT(1) - MONTH OF MET. DATA (CARD 4 COL 5-6)                    VHC20300
209*      C      METDAT(2) - DAY OF MET. DATA (CARD 4 COL 7-8)                      VHC20400
210*      C      METDAT(3) - YEAR OF MET. DATA (CARD 4 COL 9-10)                    VHC20500
211*      C      NSND - HOUR OF SOUNDING (0-24) (CARD 4 COL 13-14)                  VHC20600
212*      C      IOUNT - FORTRAN UNIT WHERE PUNCH OUT IS TO BE SENT (CARDS OR TAPE) VHC20700
213*      C              (CARD 4 COL 17-18) (DEFAULT = 10 MASS STORAGE UNIT 10)     VHC20800
214*      C              IF IOUNT = 10 THE PROGRAM REQUIRES MASS STORAGE LOGICAL    VHC20900
215*      C              UNIT 10 AND TAPE OR MASS STORAGE LOGICAL UNIT 12. UNIT     VHC21000
216*      C              12 CONTAINS THE DIRECTORY INFORMATION FOR EACH CASE AND    VHC21100
217*      C              UNIT 10 CONTAINS THE CASE DATA CARD INFORMATION IN A CARD  VHC21200
218*      C              IMAGE FORMAT FOR NAMELIST INPUT.                           VHC21300
219*      C-DATA CARD 5 (READ ONLY IF ISW(1) OR ISW(2) EQUALS 2 OR 3)               VHC21400
220*      C      RAINRT - RAINFALL RATE FOR PRECIPITATION DEPOSITION (MODEL 5)      VHC21500
221*      C               (CARD 5 COL 1-10) IN UNITS OF INCHES PER HOUR.            VHC21600
222*      C               (F10.0 FORMAT). (DEFAULT = 0.3 INCHES/HOUR)               VHC21700
223*      C      LAMBDA - RAINFALL SCAVENGING COEFFICIENT (CARD 5 COL 11-20) IF     VHC21800
224*      C               ZERO OR BLANK LAMBDA IS CALCULATED FROM RAINRT.           VHC21900
225*      C               (F10.0 FORMAT)                                            VHC22000
226*      C      TIM1 - TIME IN SECONDS OF START OF RAIN (CARD 5 COL 21-30). TIM1   VHC22100
227*      C              IS MEASURED FROM LAUNCH TIME AND IS USED ONLY IF ISW(11)   VHC22200
228*      C              ABOVE IS SET TO 0. (F10.0 FORMAT) (DEFAULT = 0.0)          VHC22300
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229*      C      ZLIM - MAXIMUM HEIGHT THROUGH WHICH PRECIPITATION CAN OCCUR.      VHC22400
230*      C             (CARD 5 COL. 31-40 F10.0 FORMAT). (DEFAULT = THE HEIGHT    VHC22500
231*      C             SELECTED FOR THE SURFACE MIXING LAYER HEIGHT HM)           VHC22600
232*      C             (UNITS ARE THE SAME AS Z BELOW)                            VHC22700
233*      C      DURAT - DURATION OF RAIN IN HOURS, USED ONLY IF ISW(11) = 0,      VHC22800
234*      C              (DEFAULT = 1 HR) (CARD 5 COL 41-50 F10.0 FORMAT)          VHC22900
235*      C-DATA CARDS 6-N                                                         VHC23000
236*      C      THE FOLLOWING PARAMETERS EXCEPT IHM ALL USE AN F10.0 FORMAT       VHC23100
237*      C      Z - HEIGHT OF LAYER BOUNDARIES (FEET OR METERS) COL 1-10          VHC23200
238*      C      WD - WIND DIRECTION AT EACH Z (DEGREES) COL 11-20                 VHC23300
239*      C      WS - WIND SPEED AT EACH Z (KNOTS OR METERS/SEC) COL 21-30         VHC23400
240*      C      T  - TEMPERATURE AT EACH Z (DEGREES C) COL 31-40                  VHC23500
241*      C      P  - PRESSURE AT EACH Z (MILLIBARS) COL 41-50                     VHC23600
242*      C      RH - RELATIVE HUMIDITY AT EACH Z (PERCENT) COL 51-60              VHC23700
243*      C      IHM - ASTERISK (*) IN COLUMN 80 IF THE HEIGHT Z ON THIS CARD IS   VHC23800
244*      C      THE SURFACE MIXING LAYER HEIGHT HM.  IF NOT FOUND THE LAST Z INPUTVHC23900
245*      C      IS USED FOR HM.                                                   VHC24000
246*      C      THE DATA CARD THAT SIGNIFIES THE END OF THE LAYER MET DATA IS ALL  VHC24100
247*      C      BLANK EXCEPT FOR COL 80. IF COL 80 IS NON-BLANK THE PROG EXPECTS   VHC24200
248*      C      ANOTHER COMPLETE DATA CASE TO FOLLOW. IF BLANK THE PROG ASSUMES    VHC24300
249*      C      END OF DATA AFTER THE NEXT TWO CARDS.                             VHC24400
250*      C-DATA CARD N+2 TO N+1+NSPECL (THESE NSPECL DATA CARDS ARE READ AFTER    VHC24500
251*      C       THE CARD THAT SIGNIFIES THE END OF THE LAYER MET DATA.           VHC24600
252*      C          (NSPECL CARDS, COL 1-80, 13A6,A2 FORMAT PER CARD)             VHC24700
253*      C      EXTR - ARRAY OF A MAXIMUM OF 400 CHARACTERS. THIS ARRAY IS USED TOVHC24800
254*      C             INPUT DATA VARIABLES FOR USE IN THE MAIN MULTILAYER MODEL  VHC24900
255*      C             THAT ARE NOT USED IN THE PREPROCESSOR. THE PROGRAM READS   VHC25000
256*      C             THIS ARRAY AND INSERTS IT INTO THE PREPROCESSOR PUNCH      VHC25100
257*      C             OUTPUT. ANY VARIABLE ENTERED INTO THIS ARRAY WILL OVERRIDE VHC25200
258*      C             THE EQUIVALENT VALUE PRODUCED BY THE PREPROCESSOR. THE     VHC25300
259*      C             DATA ITEMS INPUT INTO THE ARRAY EXTR ARE PUNCHED EXACTLY   VHC25400
260*      C             AS IF THEY WERE TO BE INCLUDED IN AN INPUT NAMELIST DECK TOVHC25500
261*      C             THE MAIN MODEL EXCEPT THEY CANNOT INCLUDE $NAM2 OR $END.   VHC25600
262*      C             EXAMPLE - IF WE WANT TO USE A SPECIAL GRID SYSTEM RATHER   VHC25700
263*      C             THAN THE MAIN MODEL DEFAULT WE WOULD INPUT THE FOLLOWING   VHC25800
264*      C             DATA BEGINING IN COL 2.                                    VHC25900
265*      C             NXS=10,XX=1000,2000,3000,4000,5000,6000,7000,8000,9000,    VHC26000
266*      C             10000,                                                     VHC26100
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C            THIS DATA WOULD CHANGE THE AXIS RADIAL DISTANCES TO THESE  VHC26200
C            NEW VALUES FOR THIS CASE RUN.  IF SUBSEQUENT CASES ARE NOT VHC26300
C            GOING TO USE THESE VALUES OR IF THE DEFAULT AXIS IS TO BE  VHC26400
C            USED THESE VALUES MUST BE CHANGED TO THE DESIRED VALUES OR VHC26500
C            NXS MUST BE SET TO 0 ON THE NEXT CASE TO GET THE DEFAULT AXVHC26600
C            IF NSPECL IS 0 THIS DATA CARD(S) IS NOT READ               VHC26700
C                                                                       VHC26800
C     INITIALIZE CORE TO ZERO                                           VHC26900
    5 DO 10 I=1,161                                                     VHC27000
      I1(I) = 0                                                         VHC27100
      IF (I .GT. 142) GO TO 10                                          VHC27200
      I5(I) = 0                                                         VHC27300
      IF (I .GT. 61) GO TO 10                                           VHC27400
      I3(I) = 0                                                         VHC27500
      IF (I .GT. 44) GO TO 10                                           VHC27600
      I6(I) = 0                                                         VHC27700
      IF (I .GT. 12) GO TO 10                                           VHC27800
      I2(I) = 0                                                         VHC27900
      IF (I .GT. 13) GO TO 10                                           VHC28000
      I4(I) = 0                                                         VHC28100
   10 CONTINUE                                                          VHC28200
C                                                                       VHC28300
C                  *** PROGRAM CONSTANTS ***                            VHC28400
C     QC1-TOTAL SOURCE OUTPUT RATE IN GRAMS/SEC FOR A NORMAL LAUNCH     VHC28500
C     QT1- TOTAL SOURCE STRENGTH IN GRAMS FOR NORMAL LAUNCH             VHC28600
C     QC2 - TOTAL SOURCE OUTPUT RATE IN GRAMS/SEC FOR AN ABNORMAL LAUNCHVHC28700
C           WITH ONE ENGINE BURNING ON PAD                              VHC28800
C     QT2 - TOTAL SOURCE STRENGTH IN GRAMS FOR AN ABNORMAL LAUNCH WITH  VHC28900
C           ONE ENGINE BURNING ON PAD                                   VHC29000
C     QC3 - TOTAL SOURCE OUTPUT RATE IN GRAMS/SEC FOR AN ABNORMAL LAUNCHVHC29100
C           WHERE ENGINES EXPLODE AND BURN ON GROUND                    VHC29200
C     QT3 - TOTAL SOURCE STRENGTH IN GRAMS FOR AN ABNORMAL LAUNCH WHERE VHC29300
C           THE ENGINES EXPLODE AND BURN ON GROUND                      VHC29400
C     AA AND BB - ROCKET RISE PARAMETERS IN EQUATION TR=AA*Z**BB        VHC29500
C     HEATN - HEAT OUTPUT (CAL/G) NORMAL LAUNCH                         VHC29600
C     HEATM - HEAT OUTPUT (CAL/G) ABNORMAL LAUNCH WITH SINGLE ENGINE    VHC29700
C             BURN                                                      VHC29800
C     HEATA - HEAT OUTPUT (CAL/G) ABNORMAL LAUNCH WITH SLOW BURN ON PAD VHC29900
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305*      C      GAMMAI - ENTRAINMENT PARAMETER FOR NORMAL LAUNCH                    VHC30000
306*             GAMMAI = 0.64                                                       VHC30100
307*      C      GAMMAC - ENTRAINMENT PARAMETER FOR ABNORMAL LAUNCH                  VHC30200
308*             GAMMAC = 0.5                                                        VHC30300
309*             GAMMAX = 0.0                                                        VHC30400
310*             GAMMAY = 0.0                                                        VHC30500
311*             GAMMAZ = 0.0                                                        VHC30600
312*      C      FRQ - FRACTIONAL DISTRIBUTION OF MATERIAL FOR HCL, CO, CO2, AL2O3   VHC30700
313*      C      WTMOL - MOLECULAR WEIGHTS OF HCL, CO, CO2                           VHC30800
314*             WTMOL(1) = 36.46                                                    VHC30900
315*             WTMOL(2) = 28.01                                                    VHC31000
316*             WTMOL(3) = 44.01                                                    VHC31100
317*      C      G - ACCELERATION OF GRAVITY (M/SEC SQUARE)                          VHC31200
318*             G = 9.8                                                             VHC31300
319*      C      CP - SPECIFIC HEAT OF AIR                                           VHC31400
320*             CP = 0.24                                                           VHC31500
321*      C      PI - RADIANS IN 180 DEGREES                                         VHC31600
322*             PI = 3.1415926                                                      VHC31700
323*             NOI = 69                                                            VHC31800
324*             NCI = 69                                                            VHC31900
325*             DO 12 I=1,10                                                        VHC32000
326*          12 ISKIP(I) = 0                                                        VHC32100
327*             NPS = 0                                                             VHC32200
328*      C                                                                          VHC32300
329*      C ** CARD 1                                                                VHC32400
330*             READ 1002, NAMCAS                                                   VHC32500
331*             DO 15 I=1,12                                                        VHC32600
332*             IF (NAMCAS(I) .NE. IBLK) GO TO 17                                   VHC32700
333*          15 CONTINUE                                                            VHC32800
334*             DO 16 I=1,12                                                        VHC32900
335*          16 NAMCAS(I) = NAMT(I)                                                 VHC33000
336*          17 DO 18 I=1,12                                                        VHC33100
337*          18 NAMT(I) = NAMCAS(I)                                                 VHC33200
338*      C                                                                          VHC33300
339*      C ** CARD 2                                                                VHC33400
340*             READ 1000, NSPECL,VEHICL,NORMAL,IFEET,KNOTS,(DATE(I),I=1,5),TPROP,VHC33500
341*            1SIGAR,RHO,ZSP,ISW                                                  VHC33600
342*             IF (ISW(12) .GT. 0) ISKIP(1) = ISW(12)                              VHC33700
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343*            IF (ISW(13) .GT. 0) ISKIP(2) = ISW(13)                          VHC33800
344*            IF (ISW(14) .GT. 0) ISKIP(3) = ISW(14)                          VHC33900
345*      C                                                                     VHC34000
346*      C ** CARD 3 (OPTIONAL)                                                VHC34100
347*            IF (ISW(8) .EQ. 1) READ 1006, GAMMAX,GAMMAY,GAMMAZ              VHC34200
348*      C                                                                     VHC34300
349*      C ** CARD 4                                                           VHC34400
350*            READ 1003, METUNT,(METDAT(I),I=1,3),NSND,IOUNT                  VHC34500
351*            IF (METUNT .EQ. 0) METUNT = 5                                   VHC34600
352*            IF (IOUNT .EQ. 0) IOUNT = 10                                    VHC34700
353*            K = 1                                                           VHC34800
354*      C                                                                     VHC34900
355*      C  IF NAMELIST IS TO BE OUTPUT TO CARDS (UNIT 7), BRANCH              VHC35000
356*            IF (IOUNT .EQ. 7) GO TO 24                                      VHC35100
357*      C                                                                     VHC35200
358*      C  IF THIS ISN'T THE FIRST TIME THROUGH, BRANCH                       VHC35300
359*            IF (ISTART .NE. 0) GO TO 24                                     VHC35400
360*            DEFINE FILE 10(100000,80,L,IASV)                                VHC36000
361*            ISTART = 1                                                      VHC36100
362*      C                                                                     VHC36200
363*      C****                                                                *VHC36300
364*      C  SPECIAL CODE TO INCLUDE WHEN NO MASTER FILE FOR                    VHC36400
365*      C  NAMELIST AND DIRECTORY ARE USED (I.E., NO TAPE COPIED)             VHC36500
366*      C                                                                     VHC36600
367*            WRITE (12,2012) (IZERO,I=1,9)                                   VHC36700
368*      C                                                                     VHC36800
369*            END FILE 12                                                     VHC36900
370*            END FILE 12                                                     VHC37000
371*            REWIND 12                                                       VHC37100
372*      C                                                                     VHC37200
373*      C****                                                                *VHC37300
374*      C  READ THROUGH DIRECTORY FOR THE END OF FILE INDICATOR(IZERO)        VHC37400
375*         19 ISTRT = ISTRTC                                                  VHC37500
376*            IEND = IENDC                                                    VHC37600
377*            READ (12,2012) NVHCLC,(METDTC(J),J=1,3),NSNDC,NMODLC,NPLNTC,    VHC37700
378*           1ISTRTC,IENDC                                                    VHC37800
379*            IF (NVHCLC .NE. IZERO) GO TO 19                                 VHC37900
380*      C  POSITION 12 FOR NEXT ENTRY                                         VHC38000
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381*            BACKSPACE 12                                                    VHC38100
382*      C  POSITION 10 FOR NEXT NAMELIST SET                                  VHC38200
383*            IASV = IEND+1                                                   VHC38300
384*      C                                                                     VHC38400
385*            IERR = 0                                                        VHC38500
386*            IF (METUNT .EQ. 5) GO TO 24                                     VHC38600
387*      C                                                                     VHC38700
388*      CC    CALL METIN(IERR)     - FOR READING FROM MET. TAPE               VHC38800
389*      C                                                                     VHC38900
390*            IF (IERR .EQ. 0) GO TO 22                                       VHC39000
391*      C  ERROR IN READING MET. TAPE                                         VHC39100
392*         24 IF (JSWS .GT. 0.AND.LAMBDA .LE. 0.0) JSWS = 0                   VHC39200
393*            TIM1 = 0.0                                                      VHC39300
394*            LAMBDA = 0.0                                                    VHC39400
395*            RAINRT = 0.0                                                    VHC39500
396*            ZLIM = 0.0                                                      VHC39600
397*            DURAT = 0.0                                                     VHC39700
398*            IF (ISW(1) .LT. 2.AND.ISW(2) .LT. 2) GO TO 20                   VHC39800
399*      C                                                                     VHC39900
400*      C ** CARD 5 (OPTIONAL)                                                VHC40000
401*            READ 1001, RAINRT,LAMBDA,TIM1,ZLIM,DURAT                        VHC40100
402*      C                                                                     VHC40200
403*      C ** CARD 6 THROUGH N+1                                               VHC40300
404*         20 READ 1001, Z(K),WD(K),WS(K),T(K),P(K),RH(K),IHM                 VHC40400
405*            IF (IHM .EQ. IAST) HM = Z(K)                                    VHC40500
406*      C     MAKE SURE THAT K DOES NOT EXCEED ITS RANGE (20 VALUES, PLUS 1 FOR VHC40600
407*      C     WORK SPACE)                                                     VHC40700
408*            IF (K .LT. 21) GO TO 23                                         VHC40800
409*            K = K-1                                                         VHC40900
410*            IF (IHM .EQ. IAST) HM = Z(K)                                    VHC41000
411*            IF (Z(K+1)+WS(K+1)) 21,28,21                                    VHC41100
412*         28 CONTINUE                                                        VHC41200
413*            K = K+1                                                         VHC41300
414*            GO TO 22                                                        VHC41400
415*         23 CONTINUE                                                        VHC41500
416*            IF (Z(K)+WS(K)) 21,22,21                                        VHC41600
417*         21 K = K+1                                                         VHC41700
418*            GO TO 20                                                        VHC41800
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419*        22 N2S = K-1                                                    VHC41900
420*     C                                                                  VHC42000
421*     C  COMPUTE BURN RATE FACTOR DUE TO INITIAL PROPELLANT TEMPERATURE  VHC42100
422*     C                                                                  VHC42200
423*           IMONTH = METDAT(1)                                           VHC42300
424*           RFACT = 1.0                                                  VHC42400
425*           IF (IMONTH .EQ. 0) GO TO 27                                  VHC42500
426*           IF (TPROP-0.0) 26,25,26                                      VHC42600
427*        25 TPROP = AVTEMP(IMONTH)                                       VHC42700
428*        26 RFACT = 0.001*(TPROP-70.0)+1.0                               VHC42800
429*        27 CONTINUE                                                     VHC42900
430*           SIGAP(1) = 0.5*SIGAR                                         VHC43000
431*           IPNPS = 4                                                    VHC43100
432*           IF (ISW(5) .GT. 0)GO TO 30                                   VHC43200
433*           IPNPS = 3                                                    VHC43300
434*           IF (ISW(6) .GT. 0)GO TO 30                                   VHC43400
435*           IPNPS = 2                                                    VHC43500
436*           IF (ISW(4) .GT. 0) GO TO 30                                  VHC43600
437*           IPNPS = 1                                                    VHC43700
438*        30 CONTINUE                                                     VHC43800
439*     C ** CARD N+2 TO N+1+NSPECL                                        VHC43900
440*           IF (NSPECL .LE. 0) GO TO 38                                  VHC44000
441*           J = NSPECL*14                                                VHC44100
442*           READ 1002, (EXTR(I),I=1,J)                                   VHC44200
443*        38 CONTINUE                                                     VHC44300
444*     C     ZRK - HEIGHT AT WHICH SIGAR IS MEASURED (METERS)             VHC44400
445*           ZRK = Z(1)                                                   VHC44500
446*           IF (NORMAL .EQ. IBLK) NORMAL = YES                           VHC44600
447*           IF (VEHICL .EQ. TYPE(1)) GO TO 40                            VHC44700
448*           IF (VEHICL .EQ. TYPE(2)) GO TO 41                            VHC44800
449*           IF (VEHICL .EQ. TYPE(3)) GO TO 42                            VHC44900
450*           IF (VEHICL .EQ. TYPE(4)) GO TO 43                            VHC45000
451*           IF (VEHICL .EQ. TYPE(5)) GO TO 44                            VHC45100
452*           PRINT 2009                                                   VHC45200
453*        40 JV = 1                                                       VHC45300
454*           GO TO 50                                                     VHC45400
455*        41 JV = 2                                                       VHC45500
456*           ISW(6) = 0                                                   VHC45600
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457*            GO TO 50                                                    VHC45700
458*         42 JV = 3                                                      VHC45800
459*            ISW(6) = 0                                                  VHC45900
460*            IF (NORMAL .EQ. NO1) NORMAL = NO2                           VHC46000
461*            GO TO 50                                                    VHC46100
462*         43 JV = 4                                                      VHC46200
463*            ISW(6) = 0                                                  VHC46300
464*            IF (NORMAL .EQ. NO1) NORMAL = NO2                           VHC46400
465*            GO TO 50                                                    VHC46500
466*         44 JV = 5                                                      VHC46600
467*            ISW(6) = 0                                                  VHC46700
468*            IF (NORMAL .EQ. NO1) NORMAL = NO2                           VHC46800
469*         50 IF (JV .NE. 4) GO TO 51                                     VHC46900
470*            IF (NORMAL .NE. YES) GO TO 53                               VHC47000
471*         51 DO 52 I=1,4                                                 VHC47100
472*         52 FRQ(I) = FRQ1(I,JV)                                         VHC47200
473*            GO TO 55                                                    VHC47300
474*         53 DO 54 I=1,4                                                 VHC47400
475*         54 FRQ(I) = FRQ2(I)                                            VHC47500
476*         55 CONTINUE                                                    VHC47600
477*            IF (IFEET .EQ. IBNK) IFEET = NMS                            VHC47700
478*            IF (KNOTS .EQ. IBNK) KNOTS = NMS                            VHC47800
479*            IF (NORMAL .EQ. YES) GO TO 63                               VHC47900
480*            IF (NORMAL .EQ. NO1) GO TO 61                               VHC48000
481*            IF (NORMAL .EQ. NO2) GO TO 60                               VHC48100
482*            PRINT 2006, NORMAL                                          VHC48200
483*            GO TO 500                                                   VHC48300
484*         60 QC = QC3(JV)*RFACT                                          VHC48400
485*            QT = QT3(JV)                                                VHC48500
486*            IJM = 7                                                     VHC48600
487*            HEAT = HEATA(JV)                                            VHC48700
488*            ISKIP(6) = 4                                                VHC48800
489*            GO TO 62                                                    VHC48900
490*         61 QC = QC2(JV)*RFACT                                          VHC49000
491*            QT = QT2(JV)                                                VHC49100
492*            IJM = 4                                                     VHC49200
493*            HEAT = HEATM(JV)                                            VHC49300
494*            ISKIP(6) = 3                                                VHC49400
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495*          62 NORMAL = 0                                                                    VHC49500
496*             IF (GAMMAX .LE. 0.0) GAMMAX = GAMMAC                                          VHC49600
497*             IF (GAMMAY .LE. 0.0) GAMMAY = GAMMAC                                          VHC49700
498*             IF (GAMMAZ .LE. 0.0) GAMMAZ = GAMMAC                                          VHC49800
499*             IF (ABS(GAMMAX*GAMMAY-0.25) .LT. 1.0E-6) GO TO 64                             VHC49900
500*             PRINT 2011                                                                    VHC50000
501*             GO TO 64                                                                      VHC50100
502*          63 QC = QC1(JV)*RFACT                                                            VHC50200
503*             QT = QT1(JV)                                                                  VHC50300
504*             IJM = 1                                                                       VHC50400
505*             IF (GAMMAX .LE. 0.0) GAMMAX = GAMMAI                                          VHC50500
506*             IF (GAMMAY .LE. 0.0) GAMMAY = GAMMAI                                          VHC50600
507*             IF (GAMMAZ .LE. 0.0) GAMMAZ = GAMMAI                                          VHC50700
508*             IF (ABS(GAMMAX*GAMMAY*GAMMAZ-.262144) .GE. 1.0E-6) PRINT 2011                 VHC50800
509*             HEAT = HEATN(JV)                                                              VHC50900
510*             NORMAL = 1                                                                    VHC51000
511*             ISKIP(6) = 2                                                                  VHC51100
512*          64 CONTINUE                                                                      VHC51200
513*             A = AA(JV)                                                                    VHC51300
514*             B = BB(JV)                                                                    VHC51400
515*             C = CC(JV)                                                                    VHC51500
516*             N = 3*JV-2                                                                    VHC51600
517*             M = N+2                                                                       VHC51700
518*             DO 65 I=1,3                                                                   VHC51800
519*             J = IJM+I-1                                                                   VHC51900
520*          65 LNTL(I) = LNCH(J)                                                             VHC52000
521*             J = 3                                                                         VHC52100
522*             DO 66 I=N,M                                                                   VHC52200
523*             J = J+1                                                                       VHC52300
524*          66 LNTL(J) = TYPES(I)                                                            VHC52400
525*             LNTL(7) = LNCH(10)                                                            VHC52500
526*             LNTL(8) = LNCH(11)                                                            VHC52600
527*             IF (HM .GT. 0.0) GO TO 70                                                     VHC52700
528*             HM = Z(NZS)                                                                   VHC52800
529*          70 CONTINUE                                                                      VHC52900
530*             PRINT 2005, (LNTL(J),J=1,8)                                                   VHC53000
531*             CALL CONST(0,NO,YES,IPOL,ITP,IFEET,KNOTS,ISW(8),TPROP)                        VHC53100
532*       C     CONVERT FEET TO METERS IF IFEET = F                                           VHC53200
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533*            IF (ISW(1) .LT. 2.AND.ISW(2) .LT. 2) GO TO 73                    VHC53300
534*            ISW(4) = 0                                                       VHC53400
535*            ISW(5) = 0                                                       VHC53500
536*            ISW(6) = 0                                                       VHC53600
537*            IF (ZLIM .LE. 0.0) ZLIM = HM                                     VHC53700
538*            JSWS = ISW(1)                                                    VHC53800
539*            IF (DURAT .LE. 0.0)DURAT = 1.0                                   VHC53900
540*            IF (RAINRT .LE. 0.0) RAINRT = 0.3                                VHC54000
541*            IF (LAMBDA .LE. 0.0) LAMBDA = 5.2E-4*RAINRT**0.567               VHC54100
542*            IF (ISW(11) .EQ. 1) ISKIP(4) = 1                                 VHC54200
543*         73 CONTINUE                                                         VHC54300
544*            IF (IFEET .NE. ITP(1)) GO TO 76                                  VHC54400
545*            ZLIM = ZLIM*.3048                                                VHC54500
546*            DO 75 K=1,NZS                                                    VHC54600
547*         75 Z(K) = Z(K)*.3048                                                VHC54700
548*            HM = HM*.3048                                                    VHC54800
549*            ZRK = ZRK*.3048                                                  VHC54900
550*            ZSP = ZSP*.3048                                                  VHC55000
551*         76 CONTINUE                                                         VHC55100
552*      C     CONVERT KNOTS TO METERS/SEC IF KNOTS = K                         VHC55200
553*            IF (KNOTS .NE. ITP(2)) GO TO 78                                  VHC55300
554*            DO 77 K=1,NZS                                                    VHC55400
555*         77 WS(K) = WS(K)*.514791                                            VHC55500
556*         78 CONTINUE                                                         VHC55600
557*         80 DO 81 K=1,NZS                                                    VHC55700
558*            IF (Z(K)-1.0 .LT. HM.AND.HM .LT. Z(K)+1.0) GO TO 82              VHC55800
559*         81 CONTINUE                                                         VHC55900
560*            GO TO 400                                                        VHC56000
561*         82 KS = K                                                           VHC56100
562*      C     CONVERT TEMPERATURE FROM DEGREES CELSIUS TO ABSOLUTE             VHC56200
563*            DO 90 K=1,NZS                                                    VHC56300
564*         90 T(K) = T(K)+273.16                                               VHC56400
565*      C     CALCULATE VIRTUAL POTENTIAL TEMPERATURE                          VHC56500
566*            DO 100 K=1,NZS                                                   VHC56600
567*            XT = 1.0-373.16/T(K)                                             VHC56700
568*            XT = 1013.25*EXP(XT*(13.3185+XT*(-1.976+XT*(-.6445-.1299*XT))))  VHC56800
569*            XT = RH(K)*.01*XT                                                VHC56900
570*            XT = 0.622*XT/(P(K)-XT)                                          VHC57000
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571*            XT = T(K)*(1.0+1.61*XT)/(1.0+XT)                        VHC57100
572*          100 TV(K) = CPHI(XT,P(K))                                 VHC57200
573*        C     CALCULATE PLUME RISE                                  VHC57300
574*              IF (NORMAL .EQ. 0) GO TO 120                          VHC57400
575*              CALL PLUME1                                           VHC57500
576*              IF (IFLG .GT. 0) GO TO 410                            VHC57600
577*              IF (JV .NE. 3.AND.JV .NE. 5) GO TO 130                VHC57700
578*              ZMSV = ZM                                             VHC57800
579*              GAMMAX = GAMMAC                                       VHC57900
580*              GAMMAY = GAMMAC                                       VHC58000
581*              GAMMAZ = GAMMAC                                       VHC58100
582*          120 CONTINUE                                              VHC58200
583*              CALL PLUME2                                           VHC58300
584*              IF (IFLG .GT. 0) GO TO 410                            VHC58400
585*              IF (JV .NE. 3.AND.JV .NE. 5) GO TO 130                VHC58500
586*              IF (NORMAL .EQ. 0) GO TO 130                          VHC58600
587*              GAMMAX = 0.5*(GAMMAI+GAMMAC)                          VHC58700
588*              GAMMAY = GAMMAX                                       VHC58800
589*              GAMMAZ = GAMMAX                                       VHC58900
590*              ZM = .5*(ZM+ZMSV)                                     VHC59000
591*              DO 121 I=2,NZS                                        VHC59100
592*              IF (ZM .LT. Z(I)) GO TO 122                           VHC59200
593*          121 CONTINUE                                              VHC59300
594*          122 CALL LEAST(Z,TV,DPDZ,I,0,0.0,0.0)                     VHC59400
595*              IF (DPDZ .LT. 3.322E-4) DPDZ = 3.322E-4               VHC59500
596*          130 CONTINUE                                              VHC59600
597*              IF (ISW(7) .NE. 0) CALL DELTXY                        VHC59700
598*        C     CALCULATE TURBULENCE PARAMETERS                       VHC59800
599*              CALL TURB                                             VHC59900
600*        C     CALCULATE SOURCE DISTRIBUTION FOR MODEL 4             VHC60000
601*              CALL DIST4(ISW(8))                                    VHC60100
602*        C     CALCULATE SOURCE DIMENSIONS FOR MODEL 4               VHC60200
603*              IFLG = 1                                              VHC60300
604*              CALL DIM34                                            VHC60400
605*              JBOT = 1                                              VHC60500
606*              NNZ = NZS-1                                           VHC60600
607*              JTOP = KS-1                                           VHC60700
608*              J = 4                                                 VHC60800
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609*            IF (ISW(1) .EQ. 2) J = 54                                    VHC60900
610*            DO 131 I=JBOT,JTOP                                           VHC61000
611*          131 IZMOD(I) = J                                               VHC61100
612*            IF (JTOP .GE. NNZ) GO TO 134                                 VHC61200
613*            J = JTOP+1                                                   VHC61300
614*            N1 = 0                                                       VHC61400
615*            IF (ISW(10) .EQ. 0.AND.ZSP .LE. Z(JTOP+1)) GO TO 132         VHC61500
616*            IZMOD(J) = 94                                                VHC61600
617*            J = J+1                                                      VHC61700
618*            IF (J .GT. NNZ) GO TO 134                                    VHC61800
619*            N1 = 4                                                       VHC61900
620*          132 DO 133 I=J,NNZ                                             VHC62000
621*          133 IZMOD(I) = N1                                              VHC62100
622*          134 CONTINUE                                                   VHC62200
623*            XX = 1.0E3*22.4*1013.2*T(1)/(273.16*P(1))                    VHC62300
624*            II = 4                                                       VHC62400
625*        C   OUTPUT NAMELIST NAM2 FOR HCL, CO, CO2, AL203 MODEL 4         VHC62500
626*            ISKIP(9) = 0                                                 VHC62600
627*            IF (ISW(1) .EQ. 2.AND.ISW(9) .EQ. 0) ISKIP(9) = 0            VHC62700
628*            IF (ISW(1) .EQ. 2.AND.ISW(9) .EQ. 1) ISKIP(9) = 1            VHC62800
629*            DO 200 I=1,4                                                 VHC62900
630*            DO 151 K=1,NNZ                                               VHC63000
631*          151 QF(K,I) = 0.0                                              VHC63100
632*            ISKIP(5) = 1                                                 VHC63200
633*            NTI = 61                                                     VHC63300
634*            IF (I .EQ. 1) NTI = 62                                       VHC63400
635*            IF (I .EQ. 3) NTI = 69                                       VHC63500
636*            IF (ISW(1) .NE. 2) GO TO 135                                 VHC63600
637*            NTI = 0                                                      VHC63700
638*            NCI = 0                                                      VHC63800
639*          135 CONTINUE                                                   VHC63900
640*            DO 138 J=1,10                                                VHC64000
641*            IF (I .GT. 1.OR.ISW(9) .EQ. 0) GO TO 136                     VHC64100
642*            DI(J) = DDIP(J)                                              VHC64200
643*            GO TO 137                                                    VHC64300
644*          136 DI(J) = DDI(J,I)                                           VHC64400
645*          137 TI(J) = TTI(J,I)                                           VHC64500
646*            CI(J) = CCI(J,I)                                             VHC64600
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      IF (ISW(1) .NE. 2) GO TO 138                                          VHC64700
      C1(J) = 0.0                                                           VHC64800
      TI(J) = 0.0                                                           VHC64900
  138 CONTINUE                                                              VHC65000
C     CALCULATE CONVERSTION FACTOR TO PPM FOR HCL, CO, CO2 AND TO           VHC65100
C     MILLIGRAMS PER CUBIC METER FOR AL203 AND ADJ FOR PERCENT OF MAT.      VHC65200
      IF (ISW(1) .EQ. 2) GO TO 142                                          VHC65300
      IF (I .EQ. 4) GO TO 140                                               VHC65400
      QK = (XX/WTMOL(I))*FRQ(I)                                             VHC65500
      GO TO 150                                                             VHC65600
  140 QK = 1.0E3*FRQ(I)                                                     VHC65700
      GO TO 150                                                             VHC65800
  142 IF (I .GT. 1) GO TO 161                                               VHC65900
      IF (ISW(9) .EQ. 0) GO TO 140                                          VHC66000
      QK = 1.0/(RAINRT*25.4*WTMOL(I)*DURAT)                                 VHC66100
      IF (ISW(11) .EQ. 1) QK = QK*DURAT                                     VHC66200
C     CONVERT Q TO PROPER UNITS AND PERCENTAGE OF POLLUTANT                 VHC66300
  150 DO 160 K=1,NNZ                                                        VHC66400
      XFT = QK*Q(K)                                                         VHC66500
  160 QF(K,I) = XFT                                                         VHC66600
  161 CONTINUE                                                              VHC66700
      IF (ISW(1) .EQ. 0) GO TO 200                                          VHC66800
      IF (ISW(3) .EQ. 0.AND.I .EQ. 1) GO TO 200                             VHC66900
      IF (ISW(4) . EQ. 0 .AND.I .EQ. 2) GO TO 200                           VHC67000
      IF (ISW(5) .EQ. 0.AND.I .EQ. 4) GO TO 200                             VHC67100
      IF (ISW(6) .EQ. 0.AND.I .EQ. 3) GO TO 200                             VHC67200
      PRINT 2005,NAMCAS,(LNTL(J),J=1,8)                                     VHC67300
      PRINT 2007                                                            VHC67400
      K = 1                                                                 VHC67500
      IF (I .EQ. 4) K = 3                                                   VHC67600
      IF (ISW(2) .GT. 0) GO TO 170                                          VHC67700
      IF (IHM .NE. IBNK) GO TO 170                                          VHC67800
      IF (I .EQ. IPNPS) NPS = 1                                             VHC67900
  170 CONTINUE                                                              VHC68000
      NVHCL = JV                                                            VHC68100
      NMODL = 4                                                             VHC68200
      IF (ISW(1) .EQ. 2) NMODL = 54                                         VHC68300
      NPLNT = I                                                             VHC68400
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o85*            WRITE (6,2002) (TYPES(J),J=N,M),IPOL(1),NMODL                    VHC68500
o86*            WRITE (6,2010) METUNT,(METDAT(J),J=1,3),NSND,IOUNT               VHC68600
687*            DATE(6) = BLKS                                                   VHC68700
o88*            PRINT 2001, (DATE(J),J=1,6),(TYPES(J),J=N,M)                     VHC68800
689*            ISTRT = IASV                                                     VHC68900
690*            IF (IOUNT .NE. 7) WRITE(IOUNT'IASV,2001) (DATE(J),J=1,6),(TYPES(J)VHC69000
o91*           1,J=N,M)                                                          VHC69100
692*            IF (IOUNT .EQ. 7) PUNCH 2001, (DATE(J),J=1,6),(TYPES(J),J=N,M)   VHC69200
693*      180 CALL OUTPT(KS,I,4,ISTRT,ISW(10),ZSP)                               VHC69300
694*      200 CONTINUE                                                           VHC69400
695*            IF (ISW(1) .EQ. 0) GO TO 205                                     VHC69500
696*            PRINT 2005, NAMCAS,(LNTL(J),J=1,8)                               VHC69600
697*            CALL CONST(4,NO,YES,IPOL,ITP,IFEET,KNOTS,ISW(8),TPROP)           VHC69700
o98*      205 CONTINUE                                                           VHC69800
o99*      C     OUTPUT NAMELIST NAM2 FOR HCL, CO, CO2, AL203 MODEL 3             VHC69900
700*      C     CALCULATE SOURCE DISTRIBUTION FOR MODEL 3                        VHC70000
701*            CALL DIST3(ISW(8))                                               VHC70100
702*      C     CALCULATE SOURCE DIMENSIONS FOR MODEL 3                          VHC70200
703*            IFLG = 0                                                         VHC70300
704*            CALL DIM34                                                       VHC70400
705*            Z(2) = HM                                                        VHC70500
706*            SIGAP(2) = SIGAP(KS)                                             VHC70600
707*            SIGEP(2) = SIGEP(KS)                                             VHC70700
708*            WD(2) = WD(KS)                                                   VHC70800
709*            UBAR(2) = UBAR(KS)                                               VHC70900
710*            IZMOD(1) = 3                                                     VHC71000
711*            IF (ISW(2) .EQ. 2) IZMOD(1) = 53                                 VHC71100
712*            DX(1) = DX(KS-1)                                                 VHC71200
713*            DY(1) = DY(KS-1)                                                 VHC71300
714*            IF (SIGZO(1) .LE. 0.0) GO TO 420                                 VHC71400
715*            NNZ = 1                                                          VHC71500
716*            NZS = 2                                                          VHC71600
717*            KS = 2                                                           VHC71700
718*            II = 3                                                           VHC71800
719*            ISKIP(9) = 0                                                     VHC71900
720*            IF (ISW(2) .EQ. 2.AND.ISW(9) .EQ. 0) ISKIP(9) = 0                VHC72000
721*            IF (ISW(2) .EQ. 2.AND.ISW(9) .EQ. 1) ISKIP(9) = 1                VHC72100
722*            DO 260 I=1,4                                                     VHC72200
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723*            QF(1,I) = 0.0                                                    VHC72300
724*            ISKIP(5) = I                                                     VHC72400
725*            NTI = 61                                                         VHC72500
726*            IF (I .EQ. 1) NTI = 62                                           VHC72600
727*            IF (I .EQ. 3) NTI = 69                                           VHC72700
728*            IF (ISW(2) .NE. 2) GO TO 207                                     VHC72800
729*            NTI = 0                                                          VHC72900
730*            NCI = 0                                                          VHC73000
731*          207 CONTINUE                                                       VHC73100
732*            DO 210 J=1,10                                                    VHC73200
733*            IF (I .GT. 1.OR.ISW(9) .EQ. 0) GO TO 208                         VHC73300
734*            DI(J) = DDIP(J)                                                  VHC73400
735*            GO TO 209                                                        VHC73500
736*          208 DI(J) = DDI(J,I)                                               VHC73600
737*          209 TI(J) = TTI(J,I)                                               VHC73700
738*            CI(J) = CCI(J,I)                                                 VHC73800
739*            IF (ISW(2) .NE. 2) GO TO 210                                     VHC73900
740*            TI(J) = 0.0                                                      VHC74000
741*            CI(J) = 0.0                                                      VHC74100
742*          210 CONTINUE                                                       VHC74200
743*        C     CALCULATE CONVERSION FACTOR TO PPM FOR HCL, CO, CO2 AND TO     VHC74300
744*        C     MILLIGRAMS PER CUBIC METER FOR AL203 AND ADJ FOR PERCENT OF MAT. VHC74400
745*            IF (ISW(2) .EQ. 2) GO TO 220                                     VHC74500
746*            IF (I .EQ. 4) GO TO 220                                          VHC74600
747*            QF(1,I) = Q(1)*(XX/WTMOL(I))*FRQ(I)                              VHC74700
748*            GO TO 230                                                        VHC74800
749*          220 IF (ISW(2) .EQ. 2.AND.I .GT. 1) GO TO 231                      VHC74900
750*            QF(1,I) = Q(1)*1.0E3*FRQ(1)                                      VHC75000
751*            IF (ISW(2) .NE. 2) GO TO 230                                     VHC75100
752*            IF (ISW(9) .EQ. 0) GO TO 230                                     VHC75200
753*            QF(1,I) = Q(1)/(RAINRT*25.4*WTMOL(I)*DURAT)                      VHC75300
754*            IF (ISW(11) .EQ. 1) QF(1,I) = QF(1,I)*DURAT                      VHC75400
755*          230 CONTINUE                                                       VHC75500
756*          231 CONTINUE                                                       VHC75600
757*            IF (ISW(2) .EQ. 0) GO TO 260                                     VHC75700
758*            IF (ISW(3) .EQ. 0.AND.I .EQ. 1) GO TO 260                        VHC75800
759*            IF (ISW(4) .EQ. 0.AND.I .EQ. 2) GO TO 260                        VHC75900
760*            IF (ISW(5) .EQ. 0.AND.I .EQ. 4) GO TO 260                        VHC76000
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761*            IF (ISW(6) .EQ. 0.AND.I .EQ. 3) GO TO 260                                    VHC76100
762*            PRINT 2005,NAMCAS,(LNTL(J),J=1,8)                                            VHC76200
763*            PRINT 2007                                                                   VHC76300
764*            K = 1                                                                        VHC76400
765*            IF (I .EQ. 4) K = 3                                                          VHC76500
766*            IF (IHM .NE. IBNK) GO TO 240                                                 VHC76600
767*            IF (I .EQ. IPNPS) NPS = 1                                                    VHC76700
768*          240 CONTINUE                                                                   VHC76800
769*            NVHCL = JV                                                                   VHC76900
770*            NMODL = 3                                                                    VHC77000
771*            IF (ISW(2) .EQ. 2) NMODL = 53                                                VHC77100
772*            JSWS = ISW(2)                                                                VHC77200
773*            NPLNT = I                                                                    VHC77300
774*            WRITE (6,2002) (TYPES(J),J=N,M),IPOL(I),NMODL                                VHC77400
775*            WRITE (6,2010) METUNT,(METDAT(J),J=1,3),NSND,IOUNT                           VHC77500
776*            DATE(6) = BLKS                                                               VHC77600
777*            PRINT 2001, (DATE(J),J=1,6),(TYPES(J),J=N,M)                                 VHC77700
778*            ISTRT = IASV                                                                 VHC77800
779*            IF (IOUNT .NE. 7) WRITE (IOUNT'IASV,2001) (DATE(J),J=1,6),(TYPES(JVHC77900
780*           1),J=N,M)                                                                     VHC78000
781*            IF (IOUNT .EQ. 7) PUNCH 2001, (DATE(J),J=1,6),(TYPES(J),J=N,M)               VHC78100
782*          250 CALL OUTPT(KS,I,3,ISTRT,ISW(10),ZSP)                                       VHC78200
783*          260 CONTINUE                                                                   VHC78300
784*            IF (ISW(2) .EQ. 0) GO TO 500                                                 VHC78400
785*            PRINT 2005, NAMCAS,(LNTL(J),J=1,8)                                           VHC78500
786*            CALL CONST(3,NO,YES,IPOL,ITP,IFEET,KNOTS,ISW(8),TPROP)                       VHC78600
787*            GO TO 500                                                                    VHC78700
788*          400 PRINT 2003                                                                 VHC78800
789*            GO TO 500                                                                    VHC78900
790*          410 II = 2                                                                     VHC79000
791*            IF (IFEET .NE. ITP(1)) GO TO 411                                             VHC79100
792*            II = 1                                                                       VHC79200
793*            ZM = ZM/.3048                                                                VHC79300
794*          411 PRINT 2004, ZM,JP(II)                                                      VHC79400
795*            GO TO 500                                                                    VHC79500
796*          420 PRINT 2008                                                                 VHC79600
797*          500 IF (IHM .NE. IBNK) GO TO 5                                                 VHC79700
798*        C  ADD IZERO ON UNIT 12 TO INDICATE LAST RECORD                                  VHC79800
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799*          IF (IOUNT .EQ. 7) STOP                                                    VHC79900
800*          WRITE (12,2012) (IZERO,J=1,9)                                             VHC80000
801*          ENDFILE 12                                                                VHC80100
802*          ENDFILE 12                                                                VHC80200
803*          REWIND 12                                                                 VHC80300
804*          WRITE (6,2013)                                                            VHC80400
805*       510 CONTINUE                                                                 VHC80500
806*          READ (12,1002,END=520) NAMCAS                                             VHC80600
807*          WRITE (6,2014) NAMCAS                                                     VHC80700
808*          GO TO 510                                                                 VHC80800
809*       520 CONTINUE                                                                 VHC80900
810*          REWIND 12                                                                 VHC81000
811*          STOP                                                                      VHC81100
812*      1000 FORMAT (I1,2A3,2A1,5A6,2F6.0,F7.0,F8.0,14I1)                             VHC81200
813*      1001 FORMAT (6F10.0,19X,A1)                                                   VHC81300
814*      1002 FORMAT (13A6,A2)                                                         VHC81400
815*      1003 FORMAT (I2,2X,3I2,2X,I2,2X,I2)                                           VHC81500
816*      1006 FORMAT (3F4.2)                                                           VHC81600
817*      2001 FORMAT (6H $NAM2/11H TESTNO=60H,9A6,7H      ,)                          VHC81700
818*      2002 FORMAT (1H,3A6,10X,A6,10X,6HMODEL=,I2)                                   VHC81800
819*      2003 FORMAT (84H0 **ERROR** HM MUST BE EQUAL TO ONE OF THE LAYER BOUNDAVHC81900
820*          1RIES Z AND IN THE SAME UNITS./)                                          VHC82000
821*      2004 FORMAT  (70H0 **ERROR** NOT ENOUGH LAYERS, TOP OF LAST LAYER MUST VHC82100
822*          1BE GREATER THAN ,1PE12.5,1X,A6,19H, INPUT MORE LAYERS/)                  VHC82200
823*      2005 FORMAT (1H1,21X,8H*-*-*-* ,12A6,8H *-*-*-*/29X,8H*-*-*-* ,3A6,1X,5VHC82300
824*          1A6,8H *-*-*-*/)                                                          VHC82400
825*      2006 FORMAT (58H ***ERROR*** COLUMNS 1-3 ARE INCORRECTLY PUNCHED ON CARVHC82500
826*          1D 1)                                                                     VHC82600
827*      2007 FORMAT (28X,75H*-* NAMELIST NAM2 FOR INPUT TO THE NASA/MSFC MULTILVHC82700
828*          1AYER MODEL VERSION 5 *-*//)                                          VHC82800
829*      2008 FORMAT (102H1*-* CLOUD RISE IS WELL ABOVE HM. MODEL 3 PARAMETERS AVHC82900
830*          1RE NOT CALCULATED. USE MODEL 4 FOR THIS CASE *-*)                        VHC83000
831*      2009 FORMAT (54H *WARNING* VEHICLE TYPE NOT SPECIFIED, TITAN IIIC USED)VHC83100
832*      2010 FORMAT (1H ,7HMETUNT=,I2,5X,7HMETDAT=,I2,1H/,I2,1H/,I2,5X,17HHOUR VHC83200
833*          1OF SOUNDING=,I2,5X,28HIOUNT(NAMELIST OUTPUT UNIT)=,I2//)             VHC83300
834*      2011 FORMAT(126H0 ***WARNING*** PRODUCT OF GAMMA'S IS NOT CORRECT, SEE VHC83400
835*          1NOTE ACCOMPANYING DEFINITION OF GAMMA'S FOR ELLIPTICALLY SHAPED SOVHC83500
836*          2URCES/)                                                                  VHC83600
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837*      2012 FORMAT (I1,3I2,I2,I3,I1,2I6)                                VHC83700
838*      2013 FORMAT (1H1,26HDUMP OF NAMELIST DIRECTORY)                  VHC83800
839*      2014 FORMAT (1H ,12A6)                                           VHC83900
840*           END                                                         VHC84000
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 1*            SUBROUTINE CONST, VERSION 6,  REVISION 0
 2*
 3*            SUBROUTINE CONST(JFLG,NO,YES,IPOL,ITP,IFEET,KNOTS,ISW8,TPROP)      CST00100
 4*            COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,PI,GAMMAX,GAMMAY,GAMMAZ,T(21),CST00200
 5*           1P(21),Z(21),UBAR(21),NZS,Q(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,  CST00300
 6*           2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                    CST00400
 7*            COMMON /REST/ ZM,DPDZ,K,A1,B1,PHI1,ZP,TZ,PZ,PHI,IFLG,KS           CST00500
 8*            COMMON /SIG/ SIGXO(20),SIGYO(20),SIGZO(20),H                      CST00600
 9*            COMMON /F/ DATE(6),FRQ(4),WTMOL(3)                                CST00700
10*            COMMON /OUT/ QF(20,4),WD(21),ISKIP(10),NDI,NCI,NTI,ZRK,JBOT,JTOP, CST00800
11*           1IZMOD(21),CI(10),DI(10),TI(10),NPS                                CST00900
12*            COMMON/DISPL/DXX,DX(21),DYY,DY(21),ILXY,TIMC(21)                  CST01000
13*            COMMON /PRECIP/ RAINRT,LAMBDA,TIM1,ZLIM,DURAT,JSWS,EXTR(70),NSPECLCST01100
14*            INTEGER EXTR                                                      CST01200
15*            REAL LAMBDA                                                       CST01300
16*            DIMENSION IFQ(4)                                                  CST01400
17*            DATA IFQ/24H FEET METERSKNOTS MET/S /                             CST01500
18*            DATA IBLK,IPH/1H ,3H PH/                                          CST01600
19*            DIMENSION IPOL(4)                                                 CST01700
20*            DIMENSION ITP(2)                                                  CST01800
21*            INTEGER YES                                                       CST01900
22*            IF (JFLG .GT. 0) GO TO 20                                         CST02000
23*            PRINT 2000, QC,QT,A,B,HEAT,CP                                     CST02100
24*       2000 FORMAT (1H0,41X,     47H*-* INITIALIZED DATA USED FOR ABOVE VEHICLCST02200
25*           1E *-*//20X,69HQC - RATE OF OUTPUT OF EXHAUST MATERIAL FROM VEHICLECST02300
26*           2 IN GRAMS/SEC IS ,1PE15.8/                                       CST02400
27*           320X,58HQT - TOTAL AMOUNT OF VEHICLE EXHAUST MATERIAL IN GRAMS IS ,CST02500
28*           4E15.8/                                                           CST02600
29*           520X,64HA AND B - VEHICLE RISE PARAMETERS IN THE EQUATION TR=A*Z**BCST02700
30*           6 ARE ,0PF8.6,5H AND ,F8.6/                                       CST02800
31*           720X,45HHEAT - TOTAL HEAT OUTPUT IN CALORIES/GRAM IS ,F10.4/      CST02900
32*           820X,29HCP - SPECIFIC HEAT OF AIR IS ,F5.3)                       CST03000
33*            PRINT 2008, GAMMAX,GAMMAY,GAMMAZ                                 CST03100
34*       2008 FORMAT (20X,36HGAMMAX - X ENTRAINMENT PARAMETER IS ,F7.4/        CST03200
35*           120X,36HGAMMAY - Y ENTRAINMENT PARAMETER IS ,F7.4/                 CST03300
36*           220X,36HGAMMAZ - Z ENTRAINMENT PARAMETER IS ,F7.4)                 CST03400
37*            PRINT 2001, IPOL,FRQ,WTMOL                                       CST03500
38*       2001 FORMAT (20X,23HPOLUTANT MATERIALS ARE ,4(A6,1H,)/                 CST03600
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39*          120X,50HFRACTIONAL DISTRIBUTION OF THE ABOVE MATERIALS IS ,4(F5.3, CST03700
40*          21H,)/                                                          CST03800
41*          320X,43HMOLECULAR WEIGHT OF THE ABOVE MATERIALS IS ,3(F7.3,1H,)  ) CST03900
42*           J1 = NO                                                        CST04000
43*           IF (NORMAL .EQ. 1) J1 = YES                                    CST04100
44*           J2 = NO                                                        CST04200
45*           IF (IFEET .EQ. ITP(1)) J2 = YES                                CST04300
46*           J3 = NO                                                        CST04400
47*           IF (KNOTS .EQ. ITP(2)) J3 = YES                                CST04500
48*           N1 = IFQ(2)                                                    CST04600
49*           IF (J2 .EQ. YES) N1 = IFQ(1)                                   CST04700
50*           N2 = IFQ(4)                                                    CST04800
51*           IF (J3 .EQ. YES) N2 = IFQ(3)                                   CST04900
52*           PRINT 2002, (DATE(I),I=1,5),J1,J2,J3,TPROP,SIGAR,RHO,HM        CST05000
53*       2002 FORMAT (1H0,52X,26H*-X PROGRAM INPUT DATA *-*//25X,11HDATA CARD 1/CST05100
54*          129X,8HTITLE - ,5A6/29X,28HNORMAL - IS LAUNCH NORMAL ? ,A3/     CST05200
55*          229X,54HIFEET - ARE LAYER BOUNDARY HEIGHTS Z, AND HM IN FEET? ,A3/ CST05300
56*          329X,39HKNOTS - IS THE WIND SPEED WS IN KNOTS? ,A3/             CST05400
57*          829X,77HTPROP - THE INITIAL TEMPERATURE OF THE PROPELLANT IN DEGREECST05500
58*          9S FAHRENHEIT IS   ,F6.1/                                       CST05600
59*          429X,67HSIGAR - STANDARD DEVIATION OF THE AZIMUTH WIND ANGLE IN DEGCST05700
60*          5REES IS ,F7.3/                                                 CST05800
61*          629X,42HRHO - AIR DENSITY IN GRAMS/CUBIC METER IS ,F9.3/        CST05900
62*          729X,39HHM -  DEPTH OF SURFACE MIXING LAYER IS ,F9.3)           CST06000
63*           IF (ISW8 .EQ. 0) PRINT 2009                                    CST06100
64*       2009 FORMAT (29X,25HSOURCE SHAPE IS SPHERICAL)                     CST06200
65*           IF (ISW8 .EQ. 1) PRINT 2010                                    CST06300
66*       2010 FORMAT (29X,26HSOURCE SHAPE IS ELLIPTICAL)                    CST06400
67*           PRINT 2011, NZS                                                CST06500
68*       2011 FORMAT (25X,20HDATA CARD 1 THROUGH ,I2/33X,67HLAYER BOUNDARY   WINCST06600
69*          1D DIRECTION  WIND SPEED  TEMPERATURE   PRESSURE)               CST06700
70*           PRINT 2003, N1,N2                                              CST06800
71*       2003 FORMAT (39X,1HZ,1X,1H(,A6,1H),4X,9HWD  (DEG),5X,2HWS,1X,1H(,A5,1H)CST06900
72*          1,2X,9HT (DEG C),6X,6HP (MB),3X,12HRH (PERCENT))                CST07000
73*           DO 10 I=1,NZS                                                  CST07100
74*         10 PRINT 2004, Z(I),WD(I),UBAR(I),T(I),P(I),RH(I)                CST07200
75*       2004 FORMAT (34X,F9.3,9X,F9.4,4X,F9.4,5X,F9.3,3X,F9.3,5X,F7.3)     CST07300
76*           GO TO 40                                                       CST07400
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 77*          20 CONTINUE                                                                CST07500
 78*             NNZ = NZS-1                                                             CST07600
 79*             ZZL = 0.0                                                               CST07700
 80*             N7 = JFLG                                                               CST07800
 81*             IF (JSWS .GT. 1) N7 = N7+50                                             CST07900
 82*             PRINT 2005, N7,H,ZM,TAUK,DPDZ,JBOT,JTOP,ZZL                             CST08000
 83*        2005 FORMAT (1H0,39X,36H*-* CALCULATED PARAMETERS FOR MODEL ,I2,4H *-*/CST08100
 84*            1/13X,39HH - ADJUSTED CLOUD HEIGHT IN METERS IS ,F9.3/                  CST08200
 85*            213X,36HZM - REAL CLOUD HEIGHT IN METERS IS ,F9.3/                      CST08300
 86*            313X,45HTAUK - TIME TO CLOUD STABILIZATION IN SEC IS ,F9.3/             CST08400
 87*            413X,73HDPDZ - VERTICAL GRADIENT OF AMBIENT POTENTIAL TEMP IN DEGRECST08500
 88*            5ES K/METER IS ,F12.6/                                                  CST08600
 89*            613X,44HJBOT - BOTTOM LAYER FOR USE WITH MODEL 4 IS ,I2/                CST08700
 90*            713X,41HJTOP - TOP LAYER FOR USE WITH MODEL 4 IS ,I2/                   CST08800
 91*            813X,58HZ - BOUNDARY HEIGHT AT THE BOTTOM OF LAYER 1 IN METERS IS ,CST08900
 92*            9F8.3)                                                                  CST09000
 93*             IF (JSWS .LE. 1) GO TO 25                                              CST09100
 94*             J1 = YES                                                               CST09200
 95*             J2 = IBLK                                                              CST09300
 96*             IF (ISKIP(9) .EQ. 0) GO TO 24                                          CST09400
 97*             J1 = NO                                                                CST09500
 98*             J2 = IPH                                                               CST09600
 99*          24 PRINT 2012, RAINRT,LAMBDA,TIM1,ZLIM,DURAT,J1,J2                        CST09700
100*        2012 FORMAT (13X,34HRAINRT - RAIN RATE IN IN./HOUR IS ,E12.6/               CST09800
101*            113X,51HLAMBDA - COEFFICIENT OF PRECIPITATION SCAVENGING IS,E12.6/ CST09900
102*            213X,42HTIM1 - TIME OF START OF PRECIP. IN SEC IS ,F8.2/                CST10000
103*            313X,46HZLIM - MAXIMUM HEIGHT OF PRECIP. IN METERS IS ,F7.2/            CST10100
104*            413X,39HDURAT - DURATION OF PRECIP. IN HOURS IS,F7.4/                   CST10200
105*            513X,57HARE PRECIPITATION DEPOSITION OUTPUT UNITS TO BE MG/M**2 -,2CST10300
106*            6A3)                                                                    CST10400
107*          25 CONTINUE                                                               CST10500
108*             PRINT 2006, ZRK,SIGAP(1),SIGEP(1),IPOL                                 CST10600
109*        2006 FORMAT (13X,83HSIGAP - STANDARD DEVIATION OF THE WIND AZIMUTH ANGLCST10700
110*            1E AT THE MEASUREMENT HEIGHT ZRK=,F6.2,11H METERS IS ,F8.3/              CST10800
111*            213X,65HSIGEP - STANDARD DEVIATION OF THE WIND ELEVATION ANGLE AT ZCST10900
112*            3RK IS ,F8.3/19H LAYER PARAMETERS -/10H LAYER   Z,17X,21H- SOURCE SCST11000
113*            4TRENGTH Q -,21X,59HSIGAP SIGEP  SIGXO   SIGYO   SIGZO    DELX   DECST11100
114*            5LY  CLD-RISE/12H  NO. (LAYER,56X,2(6H (DEG)),4(8H (METER)),14H  (DCST11200
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115*          6E9)   TIME/8X,4HTOP),5X,A6,2(8X,A6),7X,A6,58X,5H(SEC)/)                CST11300
116*           DO 30 K=1,NNZ                                                          CST11400
117*        30 PRINT 2007, K,Z(K+1),(QF(K,I),I=1,4),SIGAP(K+1),SIGEP(K+1),SIGXO(KCST11500
118*          1),SIGYO(K),SIGZO(K),DX(K),DY(K),TIMC(K)                              CST11600
119*      2007 FORMAT (1X,I3,F8.1,1P4E14.7,0P2F6.2,3F8.3,F8.2,F7.2,F9.2)            CST11700
120*        40 CONTINUE                                                             CST11800
121*           RETURN                                                               CST11900
122*           END                                                                  CST12000
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1*          SUBROUTINE OUTPT, VERSION 6,  REVISION 0
2*
3*          SUBROUTINE OUTPT(NZ,I,IK,ISTRT,ISW10,ZSP)                                  OPT00100
4*          COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,PI,GAMMAX,GAMMAY,GAMMAZ,T(21),OPT00200
5*         1P(21),Z(21),UBAR(21),NZS,Q(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,  OPT00300
6*         2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                     OPT00400
7*          COMMON /SIG/ SIGXO(20),SIGYO(20),SIGZO(20),H                       OPT00500
8*          COMMON /PRECIP/ RAINRT,LAMBDA,TIM1,ZLIM,DURAT,JSWS,EXTR(70),NSPECLOPT00600
9*          INTEGER EXTR                                                       OPT00700
10*         REAL LAMBDA                                                        OPT00800
11*         COMMON /OUT/ QF(20,4),WD(21),ISKIP(10),NDI,NCI,NTI,ZRK,JBOT,JTOP,  OPT00900
12*        1IZMOD(21),CI(10),DI(10),TI(10),NPS                                 OPT01000
13*         COMMON/DISPL/ DXX,DX(21),DYY,DY(21),ILXY,TIMC(21)                  OPT01100
14*         COMMON /CASCRD/ NVHCL,METDAT(3),NMODL,NPLNT,NSND,IOUNT,IASV        OPT01200
15*         DIMENSION QL(20),IQ(20),JQ(20),KQ(20)                              OPT01300
16*         DIMENSION JE(15)                                                   OPT01400
17*         DIMENSION ZZL(3)                                                   OPT01500
18*         DATA JE/90H     Z     Q UBARK SIGAK SIGEK SIGXO SIGYO SIGZOTHETAK OPT01600
19*        1   DI    CI  DELX  DELY    TI TEMPK/                              OPT01700
20*         NZM = NZ                                                           OPT01800
21*         IF (IK .EQ. 4.AND.ZSP .GT. Z(NZ)) NZ = NZS                         OPT01900
22*         IF (IK .EQ. 4.AND.ISW10 .GT. 0) NZ = NZS                           OPT02000
23*         IF (NZ .GT. 16) NZ = 16                                            OPT02100
24*         NNZ = NZ-1                                                         OPT02200
25*         NDII = NDI/10                                                      OPT02300
26*         NCII = NCI/10                                                      OPT02400
27*         NTII = NTI/10                                                      OPT02500
28*         NPTS = 0                                                           OPT02600
29*         LSW1 = NSPECL*14                                                   OPT02700
30*         ZZL(1) = 0.0                                                       OPT02800
31*         ZZL(2) = 0.0                                                       OPT02900
32*         ZZL(3) = 0.0                                                       OPT03000
33*         IF (ISW10 .EQ. 1) GO TO 5                                          OPT03100
34*         NPTS = NPTS+1                                                      OPT03200
35*         ZZL(NPTS) = 0.0                                                    OPT03300
36*       5 IF (ZSP .LE. 0.0) GO TO 6                                          OPT03400
37*         NPTS = NPTS+1                                                      OPT03500
38*         ZZL(NPTS) = ZSP                                                    OPT03600
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39*         6 IF (ISW10 .EQ. 0) GO TO 7                                                    OPT03700
40*           NPTS = NPTS+1                                                                OPT03800
41*           ZZL(NPTS) = H                                                                OPT03900
42*         7 IF (NPTS .EQ. 1) GO TO 8                                                     OPT04000
43*           IF (ZZL(NPTS) .GE. ZZL(NPTS-1)) GO TO 8                                      OPT04100
44*           ZT = ZZL(NPTS)                                                               OPT04200
45*           ZZL(NPTS) = ZZL(NPTS-1)                                                      OPT04300
46*           ZZL(NPTS-1) = ZT                                                             OPT04400
47*         8 CONTINUE                                                                     OPT04500
48*           ZF = 0.0                                                                     OPT04600
49*           TIMAV = 600.0                                                                OPT04700
50*           IF (I .EQ. 2) TIMAV = 360.0                                                  OPT04800
51*           PRINT 1999, NAMCAS                                                           OPT04900
52*      1999 FORMAT (1X,10HNAMCAS=68H,11A6,A2,1H,)                                        OPT05000
53*           PRINT 2008, NVHCL,(METDAT(K),K=1,3),NSND,NMODL,NPLNT                         OPT05100
54*      2008 FORMAT (7H NVHCL=,I1,8H,METDAT=,3(I2,1H,),5HNSND=,I2,7H,NMODL=,I2,OPT05200
55*          17H,NPLNT=,I1,1H,)                                                            OPT05300
56*           PRINT 2000, ISKIP,NPS,NZ,NDI,NCI,NTI,ZRK,TAUK,(IZMOD(K),K=1,NNZ)             OPT05400
57*           PRINT 2001, JE(1),ZF,(Z(K),K=2,NZ)                                           OPT05500
58*           PRINT 2002,    JE(2),(QF(K,I),K=1,NNZ)                                       OPT05600
59*           PRINT 2001,    JE(3),(UBAR(K),K=1,NZ)                                        OPT05700
60*           PRINT 2001,    JE(4),(SIGAP(K),K=1,NZ)                                       OPT05800
61*           PRINT 2001,    JE(5),(SIGEP(K),K=1,NZ)                                       OPT05900
62*           PRINT 2001,    JE(6),(SIGXO(K),K=1,NNZ)                                      OPT06000
63*           PRINT 2001,    JE(7),(SIGYO(K),K=1,NNZ)                                      OPT06100
64*           PRINT 2001,    JE(8),(SIGZO(K),K=1,NNZ)                                      OPT06200
65*           PRINT 2001,    JE(9),(WD(K),K=1,NZ)                                          OPT06300
66*           PRINT 2006, TIMAV                                                            OPT06400
67*           PRINT 2001,    JE(10),(DI(K),K=1,NDII)                                       OPT06500
68*           IF (NCII .GT. 0) PRINT 2001, JE(11),(CI(K),K=1,NCII)                         OPT06600
69*           IF (NTII .GT. 0) PRINT 2001, JE(14),(TI(K),K=1,NTII)                         OPT06700
70*           PRINT 2001, JE(12),(DX(K),K=1,NNZ)                                           OPT06800
71*           PRINT 2001, JE(13),(DY(K),K=1,NNZ)                                           OPT06900
72*           PRINT 2001, JE(15),(TV(K),K=1,NZ)                                            OPT07000
73*           PRINT 2011, NPTS,(ZZL(K),K=1,NPTS)                                           OPT07100
74*      2011 FORMAT (1X,5HNPTS=,I2,5H,ZZL=,3(F8.3,1H,))                                   OPT07200
75*           PRINT 2005, H                                                                OPT07300
76*           IF (JSWS .NE. 0) PRINT 2010, LAMBDA,TIM1,ZLIM                                OPT07400
```

```
 77*      2010 FORMAT (1X,7HbLAMDA=,E12.6,6H,TIM1=,F9.3,6H,ZLIM=,F8.3,1H,)          OPT07500
 78*           IF (LSW1 .GT. 0) PRINT 2012, (EXTR(K),K=1,LSW1)                     OPT07600
 79*      2012 FORMAT (13A6,A2)                                                    OPT07700
 80*           PRINT 2003                                                          OPT07800
 81*      2000 FORMAT (7H ISKIP=,10(I1,1H,),4HNPS=,I2,5H,NZS=,I2,5H,ND1=,I2,5H,NCOPT07900
 82*          1I=,I2,5H,NT1=,I2,5H,ZRK=,F5.1,1H,/6H TAUK=,F8.3,7H,IZMOD=,15(I2,1HOPT08000
 83*          2,))                                                                OPT08100
 84*      2001 FORMAT (1X,A6,1H=,7(F9.3,1H,)/(1X,7(F9.3,1H,)))                     OPT08200
 85*      2002 FORMAT (1X,A6,1H=,1P4(E14.7,1H,)/1X,5(E14.7,1H,)/(1X,5(E14.7,1H,))OPT08300
 86*          1)                                                                  OPT08400
 87*      2003 FORMAT (5H $END)                                                    OPT08500
 88*      2004 FORMAT (1X,A6,1H=,4(F11.8,1HE,3A1,1H,)/1X,4(F11.8,1HE,3A1,1H,)/    OPT08600
 89*          11X,4(F11.8,1HE,3A1,1H,))                                           OPT08700
 90*      2005 FORMAT (3H H=,F9.3,1H,)                                             OPT08800
 91*      2006 FORMAT (7H TIMAV=,F6.1,1H,)                                         OPT08900
 92*           IF (IOUNT .NE. 7) GO TO 30                                          OPT09000
 93*           PUNCH 1999, NAMCAS                                                  OPT09100
 94*           PUNCH 2008, NVHCL,(METDAT(K),K=1,3),NSND,NMODL,NPLNT                OPT09200
 95*           PUNCH 2000, ISKIP,NPS,NZ,ND1,NC1,NT1,ZRK,TAUK,(IZMOD(K),K=1,NNZ)    OPT09300
 96*           PUNCH 2001, JE(1),ZF,(Z(K),K=2,NZ)                                  OPT09400
 97*           DO 20 K=1,NNZ                                                       OPT09500
 98*           QL(K) = QF(K,I)                                                     OPT09600
 99*        20 CALL CONV(QL(K),IQ(K),JQ(K),KQ(K))                                  OPT09700
100*           PUNCH 2004, JE(2),(QL(K),KQ(K),IQ(K),JQ(K),K=1,NNZ)                 OPT09800
101*           PUNCH 2001, JE(3),(UBAR(K),K=1,NZ)                                  OPT09900
102*           PUNCH 2001, JE(4),(SIGAP(K),K=1,NZ)                                 OPT10000
103*           PUNCH 2001, JE(5),(SIGEP(K),K=1,NZ)                                 OPT10100
104*           PUNCH 2001, JE(6),(SIGXO(K),K=1,NNZ)                                OPT10200
105*           PUNCH 2001, JE(7),(SIGYO(K),K=1,NNZ)                                OPT10300
106*           PUNCH 2001, JE(8),(SIGZO(K),K=1,NNZ)                                OPT10400
107*           PUNCH 2001, JE(9),(WD(K),K=1,NZ)                                    OPT10500
108*           PUNCH 2006, TIMAV                                                   OPT10600
109*           PUNCH 2001, JE(10),(DI(K),K=1,NDII)                                 OPT10700
110*           IF (NCII .GT. 0) PUNCH 2001, JE(11),(CI(K),K=1,NCII)                OPT10800
111*           IF (NTII .GT. 0) PUNCH 2001, JE(14),(TI(K),K=1,NTII)                OPT10900
112*           PUNCH 2001, JE(12),(DX(K),K=1,NNZ)                                  OPT11000
113*           PUNCH 2001, JE(13),(DY(K),K=1,NNZ)                                  OPT11100
114*           PUNCH 2001, JE(15),(TV(K),K=1,NZ)                                   OPT11200
```

```
115*            PUNCH 2011, NPTS,(ZZL(K),K=1,NPTS)                                  OPT11300
116*            PUNCH 2005, H                                                       OPT11400
117*            IF (JSWS .NE. 0) PUNCH 2010, LAMBDA,TIM1,ZLIM                       OPT11500
118*            PUNCH 2007, TAUK                                                    OPT11600
119*       2007 FORMAT (1X,6HTAUOK=,F8.3,1H,)                                       OPT11700
120*            IF (LSW1 .GT. 0) PUNCH 2012, (EXTR(K),K=1,LSW1)                     OPT11800
121*            PUNCH 2003                                                          OPT11900
122*            GO TO 50                                                            OPT12000
123*         30 WRITE (IOUNT'IASV,1999) NAMCAS                                      OPT12100
124*            WRITE (IOUNT'IASV,2008) NVHCL,(METDAT(K),K=1,3),NSND,NMODL,NPLNT    OPT12200
125*            WRITE (IOUNT'IASV,2000) ISKIP,NPS,NZ,NDI,NCI,NTI,ZRK,TAUK,(IZMOD(KOPT12300
126*           1),K=1,NNZ)                                                          OPT12400
127*            WRITE (IOUNT'IASV,2001) JE(1),ZF,(Z(K),K=2,NZ)                      OPT12500
128*            DO 40 K=1,NNZ                                                       OPT12600
129*            QL(K) = QF(K,I)                                                     OPT12700
130*         40 CALL CONV(QL(K),IQ(K),JQ(K),KQ(K))                                  OPT12800
131*            WRITE (IOUNT'IASV,2004) JE(2),(QL(K),KQ(K),IQ(K),JQ(K),K=1,NNZ)     OPT12900
132*            WRITE (IOUNT'IASV,2001) JE(3),(UBAR(K),K=1,NZ)                      OPT13000
133*            WRITE (IOUNT'IASV,2001) JE(4),(SIGAP(K),K=1,NZ)                     OPT13100
134*            WRITE (IOUNT'IASV,2001) JE(5),(SIGEP(K),K=1,NZ)                     OPT13200
135*            WRITE (IOUNT'IASV,2001) JE(6),(SIGXO(K),K=1,NNZ)                    OPT13300
136*            WRITE (IOUNT'IASV,2001) JE(7),(SIGYO(K),K=1,NNZ)                    OPT13400
137*            WRITE (IOUNT'IASV,2001) JE(8),(SIGZO(K),K=1,NNZ)                    OPT13500
138*            WRITE (IOUNT'IASV,2001) JE(9),(WD(K),K=1,NZ)                        OPT13600
139*            WRITE (IOUNT'IASV,2006) TIMAV                                       OPT13700
140*            WRITE (IOUNT'IASV,2001) JE(10),(DI(K),K=1,NDII)                     OPT13800
141*            IF (NCII .GT. 0) WRITE (IOUNT'IASV,2001) JE(11),(CI(K),K=1,NCII)    OPT13900
142*            IF (NTII .GT. 0) WRITE (IOUNT'IASV,2001) JE(14),(TI(K),K=1,NTII)    OPT14000
143*            WRITE (IOUNT'IASV,2001) JE(12),(DX(K),K=1,NNZ)                      OPT14100
144*            WRITE (IOUNT'IASV,2001) JE(13),(DY(K),K=1,NNZ)                      OPT14200
145*            WRITE (IOUNT'IASV,2001) JE(15),(TV(K),K=1,NZ)                       OPT14300
146*            WRITE (IOUNT'IASV,2011) NPTS,(ZZL(K),K=1,NPTS)                      OPT14400
147*            WRITE (IOUNT'IASV,2005) H                                           OPT14500
148*            IF (JSWS .NE. 0) WRITE (IOUNT'IASV,2010) LAMBDA,TIM1,ZLIM           OPT14600
149*            WRITE (IOUNT'IASV,2007) TAUK                                        OPT14700
150*            IF (LSW1 .GT. 0) WRITE (IOUNT'IASV,2012) (EXTR(K),K=1,LSW1)         OPT14800
151*            WRITE (IOUNT'IASV,2003)                                             OPT14900
152*            IEND = IASV-1                                                       OPT15000
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153*            WRITE (12,2009) NVHCL,(METDAT(K),K=1,3),NSND,NMODL,NPLNT,ISTRT,    OPT15100
154*           1IEND                                                               OPT15200
155*         2009 FORMAT (I3,3I2,I2,I3,I1,2I6)                                     OPT15300
156*           50 CONTINUE                                                         OPT15400
157*              NZ = NZM                                                         OPT15500
158*              RETURN                                                           OPT15600
159*              END                                                              OPT15700
```

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1*            SUBROUTINE TURB, VERSION 6,  REVISION 0
2*
3*            SUBROUTINE TURB                                                    TRB00100
4*            COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,PI,GAMMAX,GAMMAY,GAMMAZ,T(21),TRB00200
5*           1P(21),Z(21),UBAR(21),NZS,G(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,  TRB00300
6*           2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                    TRB00400
7*            COMMON /REST/ ZM,DPDZ,K,A1,B1,PHI1,ZP,TZ,PZ,PHI,IFLG,KS            TRB00500
8*            PHI1 = G*DPDZ/T(1)                                                 TRB00600
9*            TAUK = PI/SQRT(PHI1)                                               TRB00700
10*           IF (TAUK .GT. 600.0) TAUK = 600.0                                  TRB00800
11*           K = 0                                                              TRB00900
12*        10 K = K+1                                                            TRB01000
13*           IF (K .GT. NZS) GO TO 40                                           TRB01100
14*           IF (Z(K) .GT. HM) GO TO 35                                         TRB01200
15*           SIGAP(K) = SIGAP(1)                                                TRB01300
16*           SIGEP(K) = SIGAP(1)                                                TRB01400
17*           GO TO 10                                                           TRB01500
18*        35 SIGAP(K) = 1.0                                                     TRB01600
19*           SIGEP(K) = 1.0                                                     TRB01700
20*           GO TO 10                                                           TRB01800
21*        40 CONTINUE                                                           TRB01900
22*           RETURN                                                             TRB02000
23*           END                                                                TRB02100
```

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      SUBROUTINE DELTXY, VERSION  6, REVISION 0

      SUBROUTINE DELTXY                                                      DXY00100
      COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,PI,GAMMAX,GAMMAY,GAMMAZ,T(21),     DXY00200
     1P(21),Z(21),UBAR(21),NZS,Q(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,       DXY00300
     2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                         DXY00400
      COMMON /REST/ ZM,DPDZ,K,A1,B1,PHI1,ZP,TZ,PZ,PHI,IFLG,KS                DXY00500
      COMMON /OUT/ QF(20,4),WD(21),ISKIP(10),NYS,NDI,NCI,NBK,NPTS,ZRK,       DXY00600
     1JBOT,JTOP,IZMOD,CI(10),DI(10),ZZL(2)                                   DXY00700
      COMMON/DISPL/ DXX,DX(21),DYY,DY(21),ILXY,TIMC(21)                      DXY00800
      IP = 4                                                                 DXY00900
      XL = GAMMAZ                                                            DXY01000
      IF (NORMAL .EQ. 1) GO TO 5                                             DXY01100
      IP = 3                                                                 DXY01200
      XL = 1.0                                                               DXY01300
    5 UF = 0.0                                                               DXY01400
      ZF = 0.0                                                               DXY01500
      A1 = RHO*CP*PI*GAMMAX*GAMMAY*XL/(3.0*QC*HEAT)                          DXY01600
      IF (NORMAL .EQ. 1) A1 = A1/A                                           DXY01700
      B1 = G/T(1)                                                            DXY01800
      S = 1.0/SQRT(G*DPDZ/T(1))                                              DXY01900
      PPI = PI*5.5555555E-3                                                  DXY02000
      TSTR = PI*S                                                            DXY02100
      PPII = 1.0/PPI                                                         DXY02200
      DXX = 0.0                                                              DXY02300
      DYY = 0.0                                                              DXY02400
      I = 0                                                                  DXY02500
      TI = 0.0                                                               DXY02600
   10 I = I+1                                                                DXY02700
      IF (I .GE. NZS) GO TO 30                                               DXY02800
      CALL LEAST(Z,TV,DPDZS,I+1,0,0,0,0,0)                                   DXY02900
      IF (DPDZS .LT. 3.322E-4) DPDZS = 3.322E-4                              DXY03000
      BK = A1*DPDZS                                                          DXY03100
      IF (NORMAL .EQ. 0) GO TO 12                                            DXY03200
      BK = BK/(Z(I+1)**B+C/A)                                                DXY03300
      GO TO 15                                                               DXY03400
   12 CONTINUE                                                               DXY03500
      UFS= UF+(Z(I+1)-Z(I))*.5*(UBAR(I+1)+UBAR(I))                           DXY03600
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      ZFS= ZF+(Z(I+1)-Z(I))                                                    DXY03700
      BK = BK*UFS/ZFS                                                          DXY03800
   15 CONTINUE                                                                 DXY03900
      ZD = BK*Z(I+1)**IP                                                       DXY04000
      IF (ZD .GT. 2.0) GO TO 20                                                DXY04100
      THETAK = (WD(I+1)+WD(I))*0.5                                             DXY04200
      IF (ABS(WD(I+1)-WD(I)) .GT. 180.0) THETAK = THETAK-180.0                 DXY04300
      BB = 1.0-ZD                                                              DXY04400
      IF (BB .GT. 1.0) BB = 1.0                                                DXY04500
      IF (BB .LT.-1.0) BB = -1.0                                               DXY04600
      S = 1.0/SQRT(B1*DPDZS)                                                   DXY04700
      TK = S*ARCOS(BB)-TT                                                      DXY04800
      TT = TK+TT                                                               DXY04900
      IF (TT .LE. TSTR) GO TO 17                                               DXY05000
      TT = TT-TK                                                               DXY05100
      GO TO 20                                                                 DXY05200
   17 CONTINUE                                                                 DXY05300
      UF = UFS                                                                 DXY05400
      ZF = ZFS                                                                 DXY05500
      IF (NORMAL .EQ. 0) GO TO 18                                              DXY05600
      RK = 0.5*(UBAR(I+1)+UBAR(I))*TK                                          DXY05700
      GO TO 19                                                                 DXY05800
   18 RK = UF*TK/ZF                                                            DXY05900
   19 CONTINUE                                                                 DXY06000
      BB = THETAK*PPI                                                          DXY06100
      DY(I) = DY(I-1)-RK*COS(BB)                                               DXY06200
      DX(I) = DX(I-1)-RK*SIN(BB)                                               DXY06300
      TIMC(I) = TT                                                             DXY06400
      ILXY = I                                                                 DXY06500
      GO TO 10                                                                 DXY06600
   20 RK = ((ZM-Z(I))/(Z(I+1)-Z(I))*0.5*(UBAR(I+1)-UBAR(I))+UBAR(I))           DXY06700
      IF (NORMAL .EQ. 1) GO TO 25                                              DXY06800
      RK = RK*(ZM-Z(I))+UF                                                     DXY06900
      ZF = ZF+(ZM-Z(I))                                                        DXY07000
      RK = RK/ZF                                                               DXY07100
   25 RK = RK*(TSTR-TT)                                                        DXY07200
      BB = WD(I+1)-WD(I)                                                       DXY07300
      IF (BB .GT. 180.0) BB = BB-360.0                                         DXY07400
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77*            IF (BB .LT. -180.0) BB = BB+360.0                                    DXY07500
78*            BB = AMOD(BB,360.0)                                                  DXY07600
79*            THETAM = BB/(Z(I+1)-Z(I))*(ZM-Z(I))+WD(I)                            DXY07700
80*            THETAK = 0.5*(THETAM+WD(I))                                          DXY07800
81*            IF (ABS(THETAM-WD(I)) .GT. 180.0) THETAK = THETAK-180.0              DXY07900
82*            BB = THETAK*PPI                                                      DXY08000
83*            DX(I) = DX(I-1)-RK*SIN(BB)                                           DXY08100
84*            DY(I) = DY(I-1)-RK*COS(BB)                                           DXY08200
85*            TIMC(I) = TSTR                                                       DXY08300
86*            ILXY = I                                                             DXY08400
87*         28 I = I+1                                                              DXY08500
88*            IF (I .GE. NZS) GO TO 30                                             DXY08600
89*            RK = TSTR*0.5*(UBAR(I+1)+UBAR(I))                                    DXY08700
90*            ZF = 0.5*(WD(I+1)+WD(I))                                             DXY08800
91*            IF (ABS(WD(I+1)-WD(I)) .GT. 180.0) ZF = ZF-180.0                     DXY08900
92*            BB = ZF*PPI                                                          DXY09000
93*            DX(I) = -RK*SIN(BB)                                                  DXY09100
94*            DY(I) = -RK*COS(BB)                                                  DXY09200
95*            TIMC(I) = TSTR                                                       DXY09300
96*            GO TO 28                                                             DXY09400
97*         30 CONTINUE                                                             DXY09500
98*            I = NZS-1                                                            DXY09600
99*            DO 80 J =1,1                                                         DXY09700
100*           IF (DX(J)) 50,40,50                                                  DXY09800
101*        40 IF (DY(J)) 50,80,50                                                  DXY09900
102*        50 BB = 270.0-ATAN2(DY(J),DX(J))*PPII                                   DXY10000
103*           IF (BB .GT. 360.0) BB = BB-360.0                                     DXY10100
104*           IF (BB .GT. 180.0) GO TO 60                                          DXY10200
105*           BB = BB+180.0                                                        DXY10300
106*           GO TO 70                                                             DXY10400
107*        60 BB = BB-180.0                                                        DXY10500
108*        70 DX(J) = SQRT(DX(J)*DX(J)+DY(J)*DY(J))+0.5*(UBAR(J+1)+UBAR(J))*       DXY10600
109*          1(TSTR-TIMC(J))                                                       DXY10700
110*           DY(J) = BB                                                           DXY10800
111*        80 CONTINUE                                                             DXY10900
112*           RETURN                                                               DXY11000
113*           END                                                                  DXY11100
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1*            SUBROUTINE DIST4, VERSION 5, REVISION 0
2*
3*            SUBROUTINE DIST4(ISW8)                                                    DS400100
4*            COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,PI,GAMMAX,GAMMAY,GAMMAZ,T(21),        DS400200
5*           1P(21),Z(21),UBAR(21),NZS,Q(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,          DS400300
6*           2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                            DS400400
7*            COMMON /REST/ ZM,DPDZ,K,A1,B1,PHI1,ZP,TZ,PZ,PHI,IFLG,KS                   DS400500
8*            DOUBLE PRECISION D0,D1,D2,D3,D4,D5,D6                                     DS400600
9*            DATA D1,D2,D3,D4,D5,D6/4.9867347D-2,2.11410061D-2,3.2776263D-3,           DS400700
10*          13.80036D-5,4.88906D-5,5.383D-6/                                           DS400800
11*           IF (NORMAL .EQ. 0) GO TO 5                                                DS400900
12*           QQ = QC*(A*ZM**B+C)                                                       DS401000
13*           GO TO 6                                                                   DS401100
14*         5 QQ = QT                                                                   DS401200
15*         6 IF (ISW8 .EQ. 1) GO TO 8                                                  DS401300
16*           SQ2I = 1.0/(GAMMAZ*ZM*.465116279)                                         DS401400
17*           PHI = 0.0                                                                 DS401500
18*           GO TO 9                                                                   DS401600
19*         8 SQ2I = 0.75/(GAMMAZ*ZM)                                                   DS401700
20*           PHI = 1.0/(3.0*(GAMMAZ*ZM)**2)                                            DS401800
21*           ZTC = ZM*(1.0+GAMMAZ)                                                     DS401900
22*           ZBC = ZM*(1.0-GAMMAZ)                                                     DS402000
23*         9 K = 1                                                                     DS402100
24*        10 K = K+1                                                                   DS402200
25*           IF (ISW8 .EQ. 1) GO TO 61                                                 DS402300
26*           IFLG = 0                                                                  DS402400
27*           ZP = (Z(K)-ZM)*SQ2I                                                       DS402500
28*           IF (ZP) 20,15,30                                                          DS402600
29*        15 CONTINUE                                                                  DS402700
30*           PZ = 0.5                                                                  DS402800
31*           GO TO 60                                                                  DS402900
32*        20 CONTINUE                                                                  DS403000
33*           ZP = -ZP                                                                  DS403100
34*           IFLG = 1                                                                  DS403200
35*        30 D0 = 1.0-0.5*(1.0+ZP*(D1+ZP*(D2+ZP*(D3+ZP*(D4+ZP*(D5+ZP*D6))))))**      DS403300
36*          1(-16)                                                                     DS403400
37*           PZ = D0                                                                   DS403500
38*           IF (IFLG .EQ. 1) PZ = 1.0-PZ                                              DS403600
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59*          60 PZP = PZ-PHI                                                    DS403700
60*             GO TO 62                                                        DS403800
61*          61 PZP = 0.0                                                       DS403900
62*             ZT = Z(K)                                                       DS404000
63*             ZB = Z(K-1)                                                     DS404100
64*             IF (ZB .GT. ZTC.OR.ZT .LT. ZBC) GO TO 62                        DS404200
65*             IF (ZT .GT. ZTC) ZT = ZTC                                       DS404300
66*             IF (ZB .LT. ZBC) ZB = ZBC                                       DS404400
67*             PZP = SQ2I*((ZT-ZB)-((ZT-ZM)**3-(ZB-ZM)**3)*PHI)                DS404500
68*          62 Q(K-1) = PZP*QQ                                                 DS404600
69*             IF (Q(K-1) .LT. 0.0) Q(K-1) = 0.0                               DS404700
70*             IF (ISW8 .EQ. 0.AND.Q(K-1) .LT. 1.0E-20) QQ = 0.0               DS404800
71*             IF (ISW8 .EQ. 0) PHI = PZ                                       DS404900
72*             IF (K .LT. NZS) GO TO 10                                        DS405000
73*             IF (NORMAL .EQ. 0) GO TO 90                                     DS405100
74*             K = 2                                                           DS405200
75*             ZP = ZM                                                         DS405300
76*          70 IF (Z(K) .GE. ZM) GO TO 80                                      DS405400
77*             K = K+1                                                         DS405500
78*             IF (K .LE. NZS) GO TO 70                                        DS405600
79*             GO TO 90                                                        DS405700
80*          80 IF (K .GT. NZS) GO TO 90                                        DS405800
81*             Q(K-1) = QC*A*(Z(K)**B-ZP**B)+Q(K-1)                            DS405900
82*             ZP = Z(K)                                                       DS406000
83*             K = K+1                                                         DS406100
84*             GO TO 80                                                        DS406200
85*          90 CONTINUE                                                        DS406300
86*             RETURN                                                          DS406400
87*             END                                                             DS406500
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1*            SUBROUTINE DIST3, VERSION 5, REVISION 0
2*
3*            SUBROUTINE DIST3(ISW8)                                                DS300100
4*            COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,PI,GAMMAX,GAMMAY,GAMMAZ,T(21),DS300200
5*           1P(21),Z(21),UBAR(21),NZS,Q(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,  DS300300
6*           2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                    DS300400
7*            COMMON /REST/ ZM,DPDZ,K,A1,B1,PHI1,ZP,TZ,PZ,PHI,IFLG,KS           DS300500
8*            DOUBLE PRECISION D0,D1,D2,D3,D4,D5,D6                             DS300600
9*            DATA D1,D2,D3,D4,D5,D6/4.9867347D-2,2.11410061D-2,3.2776263D-3,    DS300700
10*          13.80036D-5,4.889060-5,5.383D-6/                                    DS300800
11*           IF (NORMAL .EQ. 0) GO TO 2                                         DS300900
12*           QQ = QC*(A*ZM**B+C)                                                DS301000
13*           GO TO 3                                                            DS301100
14*         2 QQ = QT                                                            DS301200
15*         3 CONTINUE                                                           DS301300
16*           IF (ISW8 .NE. 1) GO TO 4                                           DS301400
17*           ZTC = ZM*(1.0+GAMMAZ)                                              DS301500
18*           ZBC = ZM*(1.0-GAMMAZ)                                              DS301600
19*           GO TO 35                                                           DS301700
20*         4 CONTINUE                                                           DS301800
21*           IFLG = 0                                                           DS301900
22*           ZP = (HM-ZM)/(GAMMAZ*ZM*.465116279)                                DS302000
23*           PZ = 0.5                                                           DS302100
24*           IF (ZP) 5,40,10                                                    DS302200
25*         5 CONTINUE                                                           DS302300
26*           ZP = -ZP                                                           DS302400
27*           IFLG = 1                                                           DS302500
28*        10 D0 = 1.0-0.5*(1.0+ZP*(D1+ZP*(D2+ZP*(D3+ZP*(D4+ZP*(D5+ZP*D6))))))**DS302600
29*          1(-16)                                                             DS302700
30*           PZ = D0                                                            DS302800
31*           IF (IFLG .EQ. 1) PZ = 1.0-PZ                                       DS302900
32*           GO TO 40                                                           DS303000
33*        35 PZ = 0.0                                                           DS303100
34*           ZT = HM                                                            DS303200
35*           ZB = Z(1)                                                          DS303300
36*           IF (ZT .GT. ZBC) GO TO 36                                          DS303400
37*           PRINT 1000                                                         DS303500
38*      1000 FORMAT (38H0*** WARNING CLOUD IS TOTALLY ABOVE HM/)                DS303600
```

```
39*            GO TO 40                                                                    DS303700
40*          36 IF (ZB .LT. ZTC) GO TO 37                                                  DS303800
41*             PRINT 1001                                                                 DS303900
42*        1001 FORMAT (56H0*** WARNING CLOUD IS TOTALLY BELOW LOWER LAYER BOUNDARDS304000
43*            1Y/)                                                                       DS304100
44*             GO TO 40                                                                  DS304200
45*          37 IF (ZT .GT. ZTC) ZT = ZTC                                                 DS304300
46*             IF (ZB .LT. ZBC) ZB = ZBC                                                 DS304400
47*             PZ = 0.75/(GAMMAZ*ZM)*((ZT-ZB)-((ZT-ZM)**3-(ZB-ZM)**3)*1.0/(3.0*         DS304500
48*            1(GAMMAZ*ZM)**2))                                                          DS304600
49*          40 Q(1) = PZ*QQ                                                              DS304700
50*             RETURN                                                                    DS304800
51*             END                                                                       DS304900
```

```
1*            SUBROUTINE CONV, VERSION 5, REVISION 0
2*
3*            SUBROUTINE CONV(Q,I,J,K)                                          CNV00100
4*            DIMENSION ICHAR(12)                                               CNV00200
5*            DATA ICHAR/1H0,1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9,1H+,1H-/       CNV00300
6*            R = 0.0                                                           CNV00400
7*            IP = 0                                                            CNV00500
8*            K = ICHAR(11)                                                     CNV00600
9*            IF (Q) 100,55,10                                                  CNV00700
10*         10 IF (Q-1.0) 20,30,40                                               CNV00800
11*         20 IP = 0                                                            CNV00900
12*            R = Q                                                             CNV01000
13*         21 IF (R .GT. 1.0) GO TO 50                                          CNV01100
14*            IP = IP-1                                                         CNV01200
15*            R = R*10.0                                                        CNV01300
16*            GO TO 21                                                          CNV01400
17*         30 R = Q                                                             CNV01500
18*            IP = 0                                                            CNV01600
19*            GO TO 55                                                          CNV01700
20*         40 IP = 0                                                            CNV01800
21*            R = Q                                                             CNV01900
22*         41 IF (R .LT. 10.0) GO TO 50                                         CNV02000
23*            IP = IP+1                                                         CNV02100
24*            R = R*0.1                                                         CNV02200
25*            GO TO 41                                                          CNV02300
26*         50 CONTINUE                                                          CNV02400
27*            Q = R                                                             CNV02500
28*            K = ICHAR(11)                                                     CNV02600
29*            IF (IP .LT. 0) K = ICHAR(12)                                      CNV02700
30*         55 I = IABS(IP/10)                                                   CNV02800
31*            J = IABS(IP)-I*10                                                 CNV02900
32*         60 DO 70 L=1,10                                                      CNV03000
33*            IF (I .NE. L-1) GO TO 70                                          CNV03100
34*            I = ICHAR(L)                                                      CNV03200
35*            GO TO 71                                                          CNV03300
36*         70 CONTINUE                                                          CNV03400
37*            GO TO 110                                                         CNV03500
38*         71 CONTINUE                                                          CNV03600
```

```
39*           DO 80 L=1,10                                                          CNV03700
40*           IF (J .NE. L-1) GO TO 80                                              CNV03800
41*           J = ICHAR(L)                                                          CNV03900
42*           GO TO 81                                                              CNV04000
43*        80 CONTINUE                                                              CNV04100
44*           GO TO 110                                                             CNV04200
45*        81 CONTINUE                                                              CNV04300
46*        90 RETURN                                                                CNV04400
47*       100 PRINT 2000, Q                                                         CNV04500
48*           GO TO 90                                                              CNV04600
49*       110 PRINT 2001, Q                                                         CNV04700
50*           GO TO 90                                                              CNV04800
51*      2000 FORMAT (39H *-*ERROR*-* SOURCE STRENGTH NEGATIVE =,E15.8)             CNV04900
52*      2001 FORMAT (47H *-*ERROR*-* POWER OF 10 ON Q TOO MANY DIGITS =,E15.8)     CNV05000
53*           END                                                                   CNV05100
```

```
1*            SUBROUTINE DIM34, VERSION 5, REVISION 0
2*
3*            SUBROUTINE DIM34                                                    D3400100
4*            COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,P1,GAMMAX,GAMMAY,GAMMAZ,T(21),D3400200
5*           1P(21),Z(21),UBAR(21),NZS,G(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,  D3400300
6*           2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                     D3400400
7*            COMMON /SIG/ SIGX0(20),SIGY0(20),SIGZ0(20),H                       D3400500
8*            COMMON /REST/ ZM,DPDZ,K,A1,B1,PHI1,ZP,TZ,PZ,PHI,IFLG,KS            D3400600
9*            IF(IFLG .EQ. 1) GO TO 30                                           D3400700
10*     C      SOURCE DIMENSIONS FOR MODEL 3                                      D3400800
11*            IF (ZM .LT. HM-GAMMAZ*ZM) GO TO 10                                 D3400900
12*            SIGZ0(1) = (HM-ZM+GAMMAZ*ZM)*.2325581                              D3401000
13*            H = (HM+ZM-GAMMAZ*ZM)*0.5                                          D3401100
14*            GO TO 20                                                           D3401200
15*         10 SIGZ0(1) = GAMMAZ*ZM*.465116279                                    D3401300
16*            H = ZM                                                             D3401400
17*         20 SIGX0(1) = GAMMAX*ZM*.465116279                                    D3401500
18*            SIGY0(1) = GAMMAY*ZM*.465116279                                    D3401600
19*            IF (SIGZ0(1) .GT. 0.0) GO TO 50                                    D3401700
20*            H = 0.5*(HM-Z(1))                                                  D3401800
21*            SIGZ0(1) = GAMMAZ*H*.465116279                                     D3401900
22*            GO TO 50                                                           D3402000
23*     C      SOURCE DIMENSIONS FOR MODEL 4                                      D3402100
24*         30 DO 40 K=2,NZS                                                      D3402200
25*            ZK = Z(K-1)                                                        D3402300
26*            IF (K .EQ. 2) ZK = 0.0                                             D3402400
27*            ZP = 0.5*(Z(K)-ZK)+ZK                                              D3402500
28*            IF (ZP .GT. ZM) GO TO 35                                           D3402600
29*            SX0 = ZM                                                           D3402700
30*            GO TO 36                                                           D3402800
31*         35 SX0 = (2.0*ZM-ZP)                                                  D3402900
32*         36 SY0 = SX0*GAMMAY*.465116279                                        D3403000
33*            SX0 = SX0*GAMMAX*.465116279                                        D3403100
34*            IF (SY0 .LT. 0.0) SY0 = 0.0                                        D3403200
35*            IF (SX0 .LT. 0.0) SX0 = 0.0                                        D3403300
36*            IF (NORMAL .EQ. 0) GO TO 38                                        D3403400
37*            IF (ZP .LE. ZM) GO TO 38                                           D3403500
38*            IF (SX0 .LT. 93.0) SX0 = 93.0                                      D3403600
```

```
39*            IF (SYO .LT. 93.0) SYO = 93.0                          D3403700
40*         38 SIGXO(K-1) = SXO                                       D3403800
41*            SIGYO(K-1) = SYO                                       D3403900
42*            SIGZO(K-1) = 0.0                                       D3404000
43*         40 CONTINUE                                               D3404100
44*            H = ZM                                                 D3404200
45*         50 RETURN                                                 D3404300
46*            END                                                    D3404400
```

```
1*              SUBROUTINE TPZ, VERSION 5, REVISION 0
2*
3*              FUNCTION TPZ(A,B,C,D,E)                                  TPZ00100
4*              TPZ = (A-B)*(C-D)/(A-E)                                  TPZ00200
5*              RETURN                                                   TPZ00300
6*              END                                                      TPZ00400
```

```
1*              SUBROUTINE CPHI, VERSION 5, REVISION 0
2*
3*              FUNCTION CPHI(A,B)                                      PHI00100
4*              CPHI = A*(1000.0/B)**0.288                              PHI00200
5*              RETURN                                                  PHI00300
6*              END                                                     PHI00400
```

```
      SUBROUTINE PLUME1, VERSION 5, REVISION 0

      SUBROUTINE PLUME1                                                 PL100100
      COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,PI,GAMMAX,GAMMAY,GAMMAZ,T(21),PL100200
     1P(21),Z(21),UBAR(21),NZS,Q(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,  PL100300
     2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                    PL100400
      COMMON /REST/ ZM,DPDZ,K,A1,B1,PHI1,ZP,TZ,PZ,PHI,IFLG,KS           PL100500
C     PLUME RISE FOR INSTANTANEOUS SOURCE                               PL100600
      A1 = 6.0*QC*A*HEAT/(RHO*CP*PI*GAMMAX*GAMMAY*GAMMAZ)               PL100700
      B1 = 1.0/(4.0-B)                                                  PL100800
      K = 1                                                             PL100900
   10 K = K+1                                                           PL101000
   20 CALL LEAST(Z,TV,DPDZ,K,0,0.0,0.0)                                 PL101100
      IF (DPDZ .LT. 3.322E-4) DPDZ = 3.322E-4                           PL101200
      ZM = (A1/DPDZ)**B1                                                PL101300
      ZM = (A1/A*(A*ZM**B+C)/DPDZ)**0.25                                PL101400
      IF (ZM .LE. Z(K)) GO TO 30                                        PL101500
      K = K+1                                                           PL101600
      IF (K .GT. NZS) GO TO 80                                          PL101700
      GO TO 20                                                          PL101800
   30 IF (Z(K)-ZM .LE. 10.0) GO TO 70                                   PL101900
      IF (DPDZ-3.322E-4) 35,70,35                                       PL102000
   35 CONTINUE                                                          PL102100
      ZP = Z(K)                                                         PL102200
   40 ZP = ZP-10.0                                                      PL102300
      IF (ZP .LT. Z(1)) GO TO 85                                        PL102400
      TVP = TV(K)-TPZ(Z(K),ZP,TV(K),TV(K-1),Z(K-1))                     PL102500
      CALL LEAST(Z,TV,DPDZ,K-1,1,ZP,TVP)                                PL102600
      IF (DPDZ .GT. 3.322E-4) GO TO 60                                  PL102700
      DPDZ = 3.322E-4                                                   PL102800
   50 ZM = ZP                                                           PL102900
      GO TO 70                                                          PL103000
   60 ZM = (A1/DPDZ)**B1                                                PL103100
      ZM = (A1/A*(A*ZM**B+C)/DPDZ)**0.25                                PL103200
      IF (ZM .GT. ZP) GO TO 50                                          PL103300
      IF (ZM .GT. ZP-10.0) GO TO 70                                     PL103400
      IF (ZP .GE. Z(K-1)) GO TO 40                                      PL103500
      ZM = Z(K-1)                                                       PL103600
```

```
39*      C     RETURN ZM AND DPDZ FOR INSTANTANEOUS SOURCE                    PL103700
40*         70 IFLG = 0                                                       PL103800
41*            GO TO 90                                                       PL103900
42*      C     CANNOT CALCULATE ZM AND DPDZ                                   PL104000
43*         80 IFLG = 1                                                       PL104100
44*            GO TO 90                                                       PL104200
45*         85 IFLG = 2                                                       PL104300
46*         90 RETURN                                                         PL104400
47*            END                                                            PL104500
```

```
      SUBROUTINE PLUME2, VERSION 5, REVISION 0

      SUBROUTINE PLUME2                                                  PL200100
      COMMON /PLUME/ QC,A,B,C,HEAT,RHO,CP,PI,GAMMAX,GAMMAY,GAMMAZ,T(21),PL200200
     1P(21),Z(21),UBAR(21),NZS,Q(20),QT,HM,SIGEP(21),SIGAP(21),G,TAUK,  PL200300
     2NORMAL,TV(21),RH(21),NAMCAS(12),NAMT(12),SIGAR                    PL200400
      COMMON /REST/ ZM,DPDZ,K,A1,B1,PHI1,ZP,TZ,PZ,PHI,IFLG,KS           PL200500
C     PLUME RISE FOR CONTINUOUS SOURCE                                   PL200600
      ZSUM = 0.0                                                         PL200700
      UBARS = 0.0                                                        PL200800
      A1 = 6.0*QC*HEAT/(RHO*CP*PI*GAMMAX*GAMMAY)                         PL200900
      B1 = .3333333                                                      PL201000
      K = 1                                                              PL201100
   10 K = K+1                                                            PL201200
   20 CALL LEAST(Z,TV,DPDZ,K,0,0.0,0.0,0.0)                              PL201300
      IF (DPDZ .LT. 3.322E-4) DPDZ = 3.322E-4                            PL201400
      UBARS = UBARS+(Z(K)-Z(K-1))*(UBAR(K)+UBAR(K-1))*0.5                PL201500
      ZSUM = ZSUM+Z(K)-Z(K-1)                                            PL201600
      UBARK = UBARS/ZSUM                                                 PL201700
      ZM = (A1/(UBARK*DPDZ))**B1                                         PL201800
      IF (ZM .LE. Z(K)) GO TO 30                                         PL201900
      K = K+1                                                            PL202000
      IF (K .GT. NZS) GO TO 80                                           PL202100
      GO TO 20                                                           PL202200
   30 IF (Z(K)-ZM .LE. 10.0) GO TO 70                                    PL202300
      IF (DPDZ-3.322E-4) 35,70,35                                        PL202400
   35 CONTINUE                                                           PL202500
      UBARK = UBARS-(Z(K)-Z(K-1))*(UBAR(K)+UBAR(K-1))*0.5                PL202600
      ZBARK = ZSUM-(Z(K)-Z(K-1))                                         PL202700
      ZP = Z(K)                                                          PL202800
   40 ZP = ZP-10.0                                                       PL202900
      IF (ZP .LT. Z(1)) GO TO 85                                         PL203000
      TVP = TV(K)-TPZ(Z(K),ZP,TV(K),TV(K-1),Z(K-1))                      PL203100
      CALL LEAST(Z,TV,DPDZ,K-1,1,ZP,TVP)                                 PL203200
      IF (DPDZ .GT. 3.322E-4) GO TO 60                                   PL203300
      DPDZ = 3.322E-4                                                    PL203400
   50 ZM = ZP                                                            PL203500
      GO TO 70                                                           PL203600
```

```
     60 UBARZ = UBAR(K)-TPZ(Z(K),ZP,UBAR(K),UBAR(K-1),Z(K-1))                    PL203700
        UBARZ = (UBARK+(ZP-Z(K-1))*(UBARZ+UBAR(K-1))*0.5)/(ZBARK+ZP-Z(K-1)PL203800
       1)                                                                       PL203900
        ZM = (A1/(UBARZ*DPDZ))**B1                                              PL204000
        IF (ZM .GT. ZP) GO TO 50                                                PL204100
        IF (ZM .GT. ZP-10.0) GO TO 70                                           PL204200
        IF (ZP .GE. Z(K-1)) GO TO 40                                            PL204300
        ZM = Z(K-1)                                                             PL204400
C       RETURN ZM AND DPDZ FOR CONTINUOUS SOURCE                                PL204500
     70 IFLG = 0                                                                PL204600
        GO TO 90                                                                PL204700
C       CANNOT CALCULATE ZM AND DPDZ                                            PL204800
     80 IFLG = 1                                                                PL204900
        GO TO 90                                                                PL205000
     85 IFLG = 2                                                                PL205100
     90 RETURN                                                                  PL205200
        END                                                                     PL205300
```

```
1*          SUBROUTINE ARCOS, VERSION 5, REVISION 0
2*
3*          FUNCTION ARCOS(A)                                    ACS00100
4*          ARCOS = ACOS(A)                                      ACS00200
5*          RETURN                                               ACS00300
6*          END                                                  ACS00400
```

```
1*          SUBROUTINE LEAST, VERSION 5, REVISION 0
2*
3*          SUBROUTINE LEAST(Z,TV,DPDZ,K,ISW,ZP,TVP)                    LST00100
4*          DIMENSION Z(1),TV(1)                                        LST00200
5*          IF (K .LE. 1) GO TO 30                                      LST00300
6*          L = K                                                       LST00400
7*          TVB = 0.0                                                   LST00500
8*          ZB = 0.0                                                    LST00600
9*          DO 10 I=1,K                                                 LST00700
10*         TVB = TVB+TV(I)                                             LST00800
11*      10 ZB = ZB+Z(I)                                                LST00900
12*         IF (ISW .EQ. 0) GO TO 15                                    LST01000
13*         TVB = TVB+TVP                                               LST01100
14*         ZB = ZB+ZP                                                  LST01200
15*         L = L+1                                                     LST01300
16*      15 TVB = TVB/FLOAT(L)                                          LST01400
17*         ZB = ZB/FLOAT(L)                                            LST01500
18*         S1 = 0.0                                                    LST01600
19*         S2 = 0.0                                                    LST01700
20*         DO 20 I=1,K                                                 LST01800
21*         S1 = S1+(Z(I)-ZB)*(TV(I)-TVB)                               LST01900
22*      20 S2 = S2+(Z(I)-ZB)**2                                        LST02000
23*         IF (ISW .EQ. 0) GO TO 25                                    LST02100
24*         S1 = S1+(ZP-ZB)*(TVP-TVB)                                   LST02200
25*         S2 = S2+(ZP-ZB)**2                                          LST02300
26*      25 DPDZ = S1/S2                                                LST02400
27*      30 CONTINUE                                                    LST02500
28*         RETURN                                                      LST02600
29*         END                                                         LST02700
```

SECTION B

USERS' INSTRUCTIONS FOR THE NASA/MSFC MULTILAYER DIFFUSION COMPUTER PROGRAM—VERSION 6

B.1 PROGRAM DESCRIPTION

The NASA/MSFC Multilayer Diffusion Program—Version 6 is designed to calculate patterns of:

- Concentration
- Dosage
- Time-mean concentration
- Average cloud concentration
- Time of cloud passage
- Ground-level deposition due to precipitation scavenging
- Ground-level deposition due to gravitational settling

Program options include the calculation of concentration, dosage and time-mean concentration with partial reflection, with time dependent decay, and/or with depletion due to precipitation scavenging. Also, the Program is capable of calculating ground-level gravitational deposition with partial reflection of material at the surface. Other program options include the printing of all data inputs, the printing of all model calculations, the plotting of concentration, dosage and/or time-mean concentration on the printer page, and the plotting of concentration, dosage and/or time-mean concentration on the SC4020 plotter at Marshall Space Flight Center. The program can be operated alone or with the Cloud-Rise Preprocessor Program described in Section A.

The NASA/MSFC Multilayer Diffusion Computer Program—Version 6 is written in FORTRAN IV and is designed for use on the Univac 1108 computer at Marshall Space Flight Center, Huntsville, Alabama. The program requires 36,000 locations of core storage on the Univac 1108 computer. The FORTRAN source listing is shown in Section B.5, and a complete list of program input parameters and program options is given in Section B.2 and B.3. The program also requires mass storage units 9, 11 and 13 for use as scratch files. It is the users' responsibility to assign these files, and they can be assigned the Univac 1108 default file size. Also, the user may optionally use mass storage file 10 and mass storage or tape file 12. If used, these files were created by the Cloud-Rise Preprocessor Program given in Section A. The assigning and managing of these files is, again, the users' responsibility. Files 10 and 12 are discussed further under NVHCLC and INUNT on data input card 1 in Section B.2.

B.2 PROGRAM INPUT PARAMETERS

Each program input data deck consists of a case identification card followed by a namelist data deck, where the namelist name is $NAM2. These data can be in punched card form or can be on mass storage and/or magnetic tape from the Preprocessor Program. The first data card of each case contains:

Column 1 (NVHCLC) - Integer representing the vehicle for which the run is to be made

1 = Titan IIIC
2 = Space Shuttle
3 = Delta-Thor 2914
4 = Minuteman II
5 = Delta-Thor 3914

Special Note - If Column 1 (NVHCLC) is input as zero or blank, the Program assumes that multiple cases have been stacked on mass storage unit 10 and magnetic tape or mass storage unit 12 by the Preprocessor Program. This Main Program will then execute all of the cases sequentially and automatically without any additional input. All variables on this one input card must be blank or zero

Column 2-7 (METDTC) - Six digit integer giving the month, day and year of the meteorological data. Punch as MØDYYR.

Column 8-9 (NSNDC) - Hour of the meteorological sounding, right justified (00-24).

Column 10-12 (NMØDLC) - Model number (right justified). If mass storage Preprocessor Program data is being used, make sure this data item and all others on this card are punched in the same way the Preprocessor has output and printed them.

Column 13 (NPLNTC) - Number representing the pollutant.

1 = HCl
2 = CO
3 = CO_2
4 = Al_2O_3

Column 79-80 (INUNT) - Data input logical unit number (right justified). If columns 79-80 (INUNT) are 5, the program assumes the remaining namelist ($NAM2) data cards are to be read from the card reader. If columns 79-80 are zero, blank or 10 the program assumes the data case described by the variables on this card was prepared by the Preprocessor Program and is to be found on random access mass storage unit 10 and mass storage or tape unit 12. The program will then search unit 12 (directory) for this case to determine the location on unit 10 (inventory) where the case is to be found. The data is then initially read from unit 10 and at the completion of this read, will also read namelist $NAM2 from the card reader. This second read of the namelist data is for any updates to the main data. If there are no updates, include only a $NAM2 and $END card. At the completion of this case, the program will cycle around for a new case card only if the variable NPS in namelist $NAM2 below is zero.

The namelist data variables are read after the case identification card and only if column 1 (NVHCLC) is not zero and not blank. The namelist format is given in Section B.4 for those users not familiar with namelist input.

NAMCAS - 72 Hollerith characters of general case identification information. This information is printed in addition to the adjusted cloud stabilization height, range and azimuth bearing and the date and time of the run as a title page to the output listing.

TESTNO - The first 36 Hollerith characters (TESTNO (1) - TESTNO (6) contain the meteorological case information. This information is printed in the page heading and plot titles following the words "THE METEOROLOGICAL CASE IS".

Characters 37 through 60 (TESTNO (7) - TESTNO (10) contain the name of the rocket vehicle for use in the page heading. (e.g. TITAN IIIC)

Characters 61 through 72 (TESTNO (11) - TESTNO (12) contain the name of the pollutant only if it is not HCl, CO, CO_2, or Al_2O_3. (e.g. NO_x).

NPS - This parameter is used to indicate multiple cases.

If NPS is set to 0, the Program assumes there is another case to follow and cycles to read the next case identification card (data card 1).

If NPS is set to 1, the Program assumes this is the last case to process and summarizes all cases processed at the end of the output listing and stops.

ISKIP - Program control option array.

ISKIP (1) - This option, if set non-zero, indicates patterns of concentration, dosage, time-mean concentration, deposition, etc. are to be calculated and printed on the polar reference grid system defined by XX and YY below. The grid system origin is the vehicle launch site and all calculation distances are relative to the origin. This option is the ISW(12) option in the Preprocessor Program.

ISKIP (2) - This option, if set non-zero, is used to calculate maximum centerline values of concentration, dosage, time-mean concentration, and/or deposition along the cloud trajectory relative to the launch site. This option is the ISW(13) option in the Preprocessor Program.

If ISKIP (2) is set equal to 1, the model calculations are printed.

If ISKIP (2) is set equal to 2, the model calculations are plotted.

If ISKIP (2) is set equal to 3, the model calculations are both printed and plotted.

The maximum centerline concentration, dosage, time-mean concentration and deposition are determined by the use of a spline function. At each radial distance (XX) from the origin, the Program determines a curve via the cubic spline that passes through each angular (azimuth bearing YY) grid coordinate with the calculated maximum roughly in the midpoint of the curve. The Program will then determine the maximum value and output, the range and azimuth bearing to that maximum

ISKIP (3) - This option, if set non-zero, is used to calculate isopleths of concentration, dosage, time-mean concentration and/or deposition. This option is the ISW(14) option in the Preprocessor Program.

If ISKIP (3) is set equal to 1, the isopleths are printed.

If ISKIP (3) is set equal to 2, the isopleths are plotted.

If ISKIP (3) is set equal to 3, the isopleths are both printed and plotted.

ISKIP (4) - This option is used only with the calculation of ground-level precipitation deposition (Model 5). This option is the ISW(11) option in the Preprocessor Program.

If ISKIP (4) is set non-zero, the maximum possible ground-level precipitation deposition is calculated at points downwind from the cloud position. These calculations are independent of the elapsed time from T1M1 to the calculation point.

If ISKIP (4) is set equal to zero, the calculated precipitation deposition at points downwind from the cloud position at time T1M1 is dependent upon the elapsed time from T1M1 to the points.

ISKIP (5) - This option controls the pollutant name and units printed in the page heading and plot legend:

If ISKIP (5) is set equal to 1, the units of calculated HCl concentration are in parts per million (ppm) and dosage units are in parts per million seconds. If HCl precipitation deposition is being calculated (Model 5), the units of deposition are pH (surface water acidity) or milligrams per square meter depending on ISKIP(9) below.

If ISKIP (5) is set equal to 2, the units of calculated CO concentrations are in parts per million (ppm) and dosage units are in parts per million seconds.

If ISKIP (5) is set equal to 3, the units of calculated CO_2 concentrations are in parts per million (ppm) and dosage units are in parts per million seconds.

If ISKIP (5) is set equal to 4, the units of calculated Al_2O_3 concentration are in milligrams per cubic meter (mg/m^3) and dosage units are in milligram seconds per cubic meter.

If TESTNO (11) above is non-blank, then ISKIP (5) is used only for units selection and the pollutant name is taken from TESTNO (11). Also, calculated gravitational deposition (Model 6) is in units of milligrams per square meter.

ISKIP (6) - This option is used for printing purposes only and gives the type of vehicle launch for which calculations are being made and inserts the following in the page heading and plot legend.

If ISKIP (6) is set equal to 1, a "STATIC FIRE" is assumed.

If ISKIP (6) is set equal to 0 or 2, a "NORMAL LAUNCH" is assumed.

If ISKIP (6) is set equal to 4, a "SLOW BURN" is assumed.

If ISKIP (6) is set equal to 5, the program omits this option from the pageheading and plot legend.

ISKIP (7) - This option controls the meteorological data used with Model 4.

If ISKIP (7) is set equal to zero, the Program assumes Model 4 is being used to determine concentration, dosage, etc., in a layer where the pollutant distribution at cloud stabilization varies substantially with height. The meteorological data used in Model 4 is automatically determined from the meteorological inputs assigned to the initial layers or sublayers.

If ISKIP (7) is set equal to 1, the Program assumes Model 4 is being used to determine concentration, dosage, etc., resulting from changes in the meteorological layer structure. The meteorological data used in Model 4 after time TAST (time of layer structure change measured from time of cloud stabilization) is taken from the input parameters ALPHL through TEMPL.

ISKIP (8) - This option, if set non-zero, prints a detailed listing of all Program inputs.

ISKIP (9) - If set to zero, output of precipitation deposition (Model 5) is assumed in milligrams per square meter.

If set to 1, output of precipitation deposition for HCl only is assumed in pH (surface water acidity). If ISKIP (9) is set to 1, all calculation and program output assumes that 0 is the maximum possible pH and 14 is the minimum possible pH in terms of acidity.

NXS - Number of radial distances (range) XX in the polar reference grid system. If NXS is set $\leq$ 0, the default value of 41 is used for NXS and the array XX is automatically filled from values shown in Table B-3.

NYS - Number of aximuth bearings in the polar reference grid system. If NYS is set $\leq$ 0, this parameter is automatically calculated and the array of azimuth bearing coordinates (YY) is automatically filled. The value of NYS includes sufficient points in YY to provide a calculation pattern spanning 100 degrees (see Table B-3, note 9).

NZS - Total number of initial layer boundaries including the ground surface boundary.

NCI, NDI, NTI - These parameters each contain two values used in the maximum centerline calculations under ISKIP(2) and in the calculation of isopleths under ISKIP(3).

The total number of isopleth values is given in the hundreds and tens positions of NCI, NDI and/or NTI. If these positions are zero, isopleths for the respective quantity (concentration, dosage, time-mean concentration and/or deposition) is not calculated. The number of critical pollutant levels (air quality standards) to be identified in the plots for maximum centerline calculations is given in the units position of NCI, NDI and/or NTI. If this position is zero, no plot is generated. If set to 9, a plot is generated without indicators for critical pollutant levels (air quality standards).

If the units position of NCI, NDI and/or NTI is greater than zero and not equal to 9, the critical pollutant levels (standards) must be punched as the first values in the arrays CI, DI and/or TI below.

NPTS - Number of heights at which calculations are to be made. If NPTS is set equal to zero or omitted, NPTS is defaulted to 1 and ZZL (1) below is set equal to zero.

NVS - Number of droplet or particle terminal fall velocities used to calculate ground-level gravitational deposition from all layers except the layer in which a destruct occurs (Model 6 only).

NVB - Number of droplet or particle terminal fall velocities used to calculate ground-level gravitational deposition from the layer in which a vehicle destruct occurs (Model 6 only).

XX - Array of radial distances (range) for the coordinates used in calculations on the reference grid system. This array is automatically filled if NXS = 0, (see NXS above). The last 2 points in XX are used only for calculating isopleths; the second to last point should equal 1.2 times the third to the last point and the last point should equal 1.5 times the third to the lastpoint. Space the XX values uniformly and use as many as the program will allow. The user is cautioned to use the default values unless another grid is required.

YY - Array of azimuth bearings for the coordinates used in calculations on the reference grid system measured clockwise from zero degrees north. This array is automatically filled if NYS = 0 (see NYS above). Space the YY values densely toward the center of the calculation sector and use as many as the program will allow. The user is cautioned to use the default values unless another grid is required.

Z - Array of layer boundary heights in ascending order beginning with the surface boundary height (the first layer is always the surface layer).

DELX - Array of the radial distances (range) from the source location (point of cloud stabilization) in each layer to the center of the reference grid system (launch site).

DELY - Array of azimuth bearings to the source location (point of cloud stabilization) in each layer, measured clockwise from zero degrees north.

Q - Source strength within each initial layer. The source strength input units depend upon the model used and the pollutant for which calculations are being made. Table B-1 gives the appropriate input units for each model pollutant combination.

UBARK - Mean wind speed at ZRK followed by the mean wind speed at the top of each layer.

SIGAK - Standard deviation of the wind azimuth angle for reference time τ_{oK} at ZRK followed by the standard deviation of the wind azimuth angle at the top of each layer.

SIGEK - Standard deviation of the wind elevation angle at ZRK followed by the standard deviation of the wind elevation angle at the top of each layer.

SIGXO - Standard deviation of the alongwind concentration distribution of the source in the layer (alongwind source dimension).

SIGYO - Standard deviation of the crosswind concentration distribution of the source in the layer at a downwind distance XLRY from the true source (crosswind source dimension). The default value is SIGXO.

SIGZO - Standard deviation of the vertical concentration distribution of the source in the layer at a downwind distance XLRZ from the true source (vertical source dimension).

TABLE B-1

SOURCE STRENGTH INPUT UNITS

Model	Pollutant	
	HCL, CO, CO_2	AL_2O_3
1	1	2
2	1	2
3	1	2
4	1	2
5	2*	2
6	2	2

Code definition for Table B-1:

- ① $Q = Q' \frac{22.4}{M} \frac{T}{273.16} \frac{1013.2}{P}$

  (Concentration output units are parts per million (PPM)

- ② $Q = Q'$

  where

  Q = Source strength in each initial layer

  Q' = Total weight of the material in the layer in milligrams

  T = Surface temperature in degrees Kelvin

  P = Surface pressure in millibars

  M = Molecular weight of the material

*If HCl precipitation deposition (Model 5) in pH units is being calculated, then

TABLE B-1 (Concluded)

$$Q = \left(Q' \times 10^{-3} \times \frac{1}{\left(\text{Rate } \frac{\text{in.}}{\text{hr.}}\right)} \times \frac{1}{25.4} \times \frac{1}{\text{Mole. Wt. (gr)}} \times \frac{1}{\text{duration (hr)}}\right)$$

or for maximum HCl precipitation deposition in pH units

$$Q = \left(Q' \times 10^{-3} \times \frac{1}{\left(\text{Rate } \frac{\text{in.}}{\text{hr.}}\right)} \times \frac{1}{25.4} \times \frac{1}{\text{Mole. Wt. (gr)}}\right)$$

(Deposition output units for Model 5 is milligrams per square meter (mg/m^2). However, deposition output can be in pH units for HCl depending on ISKIP(9).) Deposition output units for Model 6 is milligrams per square meter (mg/m^2) and concentration output units for Models 1 through 4 are milligrams per cubic meter (mg/m^3).

ALPHA - Lateral diffusion coefficient in the layer (default value is 1).

BETA - Vertical diffusion coefficient in the layer (default value is 1).

ZRK - Reference height in the surface layer for meteorological measurements (default value is 2 meters).

TEMPK - Virtual potential temperature at each layer boundary z. This parameter is used only in the calculation of the wind speed shear in the layer. If the wind speed shear is negative and the difference between the virtual potential temperature at the top and bottom of the layer is also negative, the Program will use the absolute value of the speed shear. If the temperature difference is positive or zero, the program will use a wind speed shear of zero. If the layer wind speed shear is positive or zero, the virtual potential temperature difference is not used.

TIMAV - Time over which time-mean concentration and average cloud concentration are calculated (default value is 600 seconds except for CO, where it is 300 seconds).

THETAK - Mean wind direction at ZRK followed by the mean wind direction at the top of each layer.

TAUK - Time required for cloud stabilization

TAUOK - Reference time for the standard deviations of the wind azimuth angle SIGAK (default value is 600 seconds).

H - Adjusted cloud stabilization height.

XRY - Distance downwind from a virtual point source over which rectilinear expansion in the lateral occurs (default value is 100 meters).

XLRY - Reference from the true source at which SIGYO is measured (default value is zero).

XLRZ - Reference distance from the true source at which SIGZO is measured (default value is zero).

ZZL - Vertical calculation heights. This parameter can include any heights within the initial layer structure (default value is zero).

IZMOD - This parameter designates the model number or numbers for use in each input layer. A brief description of the six Program models is given below and a complete mathematical description of each model is given in Section 3 of the main body of the report given in the introduction. The possible model number combinations input into IZMOD are given in Table B-2.

1 - Model 1, the source extends vertically through the entire initial layer and turbulent mixing is occurring. It is assumed that the vertical distribution of material is uniform with height and the distributions of material along the along-wind and the crosswind cloud axes are Gaussian. The digit 1 is included in the array IZMOD for each layer in which Model 1 is to be used. Also, if any digit of IZMOD is 0, the Program assumes Model 1 has been designated.

2 - Model 2 refers to the same source configurations as Model 1 in that the source extends vertically through the entire depth of the layer and the distribution of material is uniform with

TABLE B-2

POSSIBLE INPUT MODEL NUMBER COMBINATIONS

IZMOD[1]	PROGRAM ASSUMES CALCULATIONS ARE MADE USING:
0	Model 1
1	Model 1
2	Model 2
3	Model 3
14	Model 1 is used prior to layer transition and Model 4 is used after layer transition occurs at time TAST
24	Model 2 is used prior to layer transition and Model 4 is used after layer transition occurs at time TAST
34	Model 3 is used prior to layer transition and Model 4 is used after layer transition occurs at time TAST
4	Model 4 is used to accomodate to a variation of source strength in the layer and layer transition is immediate (TAST = 0)
5	Model 5 is used and the layer structure and source distribution is assumed to be that of Model 1 when only the digit 5 is given in IZMOD. The digit 5 can be combined with any of the above digit combinations (145, 45, 35, etc.). When a 5 is combined with any of the above digit combinations the Program assumes the layer structure and source distribution of that combination are used with Model 5.
6	Model 6

1 The digits under IZMOD can appear in any order. For example, 14 is the same as 41 and 154 is the same as 415.

height. In Model 2, however, it is assumed that no turbulent mixing is occurring. The digit 2 is included in the array IZMOD for each layer in which Model 2 is to be used in the calculations (IZMOD = 2, 2, 2, etc.).

3 - Model 3 differs from Models 1 and 2 in that the vertical extent of the source is less than the depth of the layer. The model equation thus contains vertical expansion terms. The digit 3 is input to IZMOD for Model 3 (IZMOD = 3).

4 - Model 4, the layer-transition model, may be used to calculate concentration and dosage resulting from changes in the meteorological layer structure. Model 4 may also be used to calculate concentration and dosage in a layer where the pollutant distribution at cloud stabilization varies substantially with height.

The application of Model 4 requires the following assumptions:

- The boundaries between adjacent initial layers or sublayers is eliminated (at time TAST) and the layers are replaced by a single layer
- Turbulent mixing is occurring in the resultant single layer
- The material in each of the initial layers or sublayers is (before time TAST) uniformly distributed in the vertical
- Reflection occurs at the upper and lower boundaries of the resultant single layer

4 - Model 4, the layer-transition model, may be used to calculate concentration and dosage resulting from changes in the meteorological layer structure. Model 4 may also be used to calculate concentration and dosage in a layer where the pollutant distribution at cloud stabilization varies substantially with height.

The application of Model 4 requires the following assumptions:

- The boundaries between adjacent initial layers or sublayers is eliminated (at time TAST) and the layers are replaced by a single layer
- Turbulent mixing is occurring in the resultant single layer
- The material in each of the initial layers or sublayers is (before time TAST) uniformly distributed in the vertical
- Reflection occurs at the upper and lower boundaries of the resultant single layer

If the parameters TAST and ISKIP (7) are both set to zero (or omitted from the inputs) and Model 4 is specified for use, the program assumes the function of the model is to accommodate variations in the pollutant distribution with height in the layer at cloud stabilization. For example, the surface mixing layer can be initially divided into several sublayers where the source strength, although assumed to be vertically uniform in each sublayer, varies from layer to layer. In this case the initial layers are immediately reduced to a single layer and Model 4 calculates the contribution from each of the initial sublayers to the composite concentration and dosage field by permitting turbulent mixing across the initial layer boundaries. IZMOD would contain the digit 4 for each of the respective initial sublayers that comprise the resultant single layer.

If Model 4 is to be used to predict the concentration and dosage fields downwind from a change in meteorological structure, the meteorological parameters of the new resultant layer or layers must be specified. Also, the parameter ISKIP (7) must be set equal to 1 and the parameter TAST set equal to the time (after cloud stabilization) at which the layer transition (meteorological structure change) occurs. Each of the initial sublayers that are to be included in a single layer after layer transition are specified by including the digit 4 in the array IZMOD. For example, assume layers 1 through 4 are to be reduced to a single layer after layer transition and layers 5 and 6 are also reduced to a single layer. The first four values of IZMOD would include a 4, but they would also include the number of the model to be used prior to layer transition (14, 24 or 34). The values of IZMOD (5) and (6) for layers 5 and 6 would include a 9 and 4, respectively. The 9 is a special flag to separate the resultant 2 layers after layer transition. Also, these last two values would include the model number to be used prior to layer transition (14, 24 or 34). If Model 1 was to be used with 4 in the above example the IZMOD inputs would be coded as IZMOD = 4, 4, 4, 4, 9, 4 (or IZMOD = 4*4, 9, 4, or IZMOD = 4*14, 19, 14, etc.).

5 - Model 5 is used to calculate the amount of material on the surface by precipitation scavenging. The digit 5 must be included in the array IZMOD for each initial sublayer through which precipitation is occurring. Model 5 uses the layer structure and source distribution defined by any one of Models 1 through 4. Thus, the array IZMOD must include the appropriate model number for each layer that describes the layer structure and source distribution. For example, assume that Model 4 is being used to accommodate to variations in the pollutant distribution with height in the surface mixing layer at cloud stabilization and that the surface mixing layer has been divided into 6 initial sublayers in which the distribution of material can be

considered uniform. Also, assume that precipitation is occurring through all 6 layers. The array IZMOD would then contain six values equal to 45 for each layer 1 through 6 (IZMOD = 6*45).

6 - Model 6 is used to calculate the surface deposition due to gravitational settling. The basic source configuration is a volume source of finite lateral extent and unit vertical extent. Other source configurations are treated by summing the deposition at the ground resulting from a number of basic sources arranged to simulate the desired configuration. The model is essentially a tilted plume model in which the effects of wind shear are taken into account. The axis of a particle or droplet cloud of a given settling velocity intersects the ground plane at a distance from the source and at an angle from the mean surface wind direction that are proportional to the total angular wind shear and the residence time of the settling material in the layers between the source and the ground surface. In any layer, the inclination of the cloud axis from the horizontal is given by $\tan^{-1} V_s / \bar{u}$, where V_s is the particle or droplet settling velocity and $\bar{u}$ is the mean transport wind speed in the layer. In all cases, material released in the K^{th} layer and dispersed upwards by turbulence is assumed to be reflected downward at the interface of the K^{th} and $(K + 1)^{th}$ layers. The basic model is used to calculate the ground-level deposition pattern for a single value of the settling velocity. The total deposition pattern is obtained by summing the results for all settling velocities representative of the particle or droplet-size distribution of the released material on a reference coordinate grid system.

Only IZMOD (1) need be set equal to 6 as no other model can be executed in the same case.

DECAY - Coefficient of time-dependent decay. If DECAY is set > 0, then concentration, dosage, time-mean concentration, etc., are calculated with decay (Does not effect Model 5 or Model 6).

ZLIM - This parameter is the maximum height through which precipitation can occur. If Model 5 is selected, ZLIM is automatically determined from IZMOD. If concentration, dosage, etc., are being calculated with precipitation occurring (BLAMDA > 0.0), ZLIM is equal to the upper boundary of the uppermost layer in which precipitation occurs (ZLIM is defaulted to Z(NZS)).

BLAMDA - Precipitation scavenging (washout) coefficient. If Model 5 is selected, this parameter must be greater than 0. Also, if Model 1, 2, 3 or 4 is selected with BLAMDA > 0 and without Model 5, the Program assumes concentration, dosage, etc., are to be calculated with precipitation occurring.

$$\text{BLAMDA} \cong 5.2 \times 10^{-4} \left(\text{Rate}\left(\frac{\text{in}}{\text{hr}}\right)\right)^{0.567} \text{sec}^{-1}$$

TIM1 - Time of start of precipitation measured from the time of cloud stabilization. (Not used for maximum precipitation deposition).

CI, DI and TI - Arrays of concentration, dosage and time-mean concentration values respectively for which isopleths are calculated. There can be two groups of data in each of these arrays, where both of the groups are arranged in descending order. The values in the first group are critical pollutant levels (air quality standards). The number of values in this group is given in the units position of the parameters NCI, NDI and NTI respectively. The second group of values includes all other isopleth levels desired. The total number of values in CI, DI and TI is given in the hundreds

and tens positions of NCI, NDI and NTI respectively. If precipitation, deposition or gravitational deposition is being calculated, the array DI is used for these quantities.

TAST - Time of layer structure change (Model 4) measured from the time of cloud stabilization.

GAMMAP - This parameter is 1 minus the fraction of material reflected at the surface (partial reflection). If this parameter is set to 0, the Program assumes complete reflection; if set equal to .4, 60 percent (.6) reflection is assumed; and, if set equal to 1, no reflection is assumed. If Model 6 is selected and partial reflection is desired, the array GAMMAP must have a value for each particle settling velocity category. For all other models, only GAMMAP (1) need be set.

VS - Droplet or particle terminal fall velocity distribution used in all layers except a layer in which a vehicle destruct occurs (Model 6 only).

PERC - Frequency of occurrence of each velocity category VS (Model 6 only).

ACCUR - Accuracy constant for the line source simulation used in Model 6. A value of 0.45 ensures that the calculated ground deposition is within 10 percent of the deposition expected from a vertical line source. If ACCUR is set to 0.32, the calculated deposition is within 5 percent of that expected from a vertical line source.

VB - Droplet or particle terminal fall velocity distribution used in the layer in which a vehicle destruct occurs. The layer must be the top layer (Model 6 only).

PERCB - Frequency of occurrence of each velocity category VB (Model 6 only).

SCL - Map scale factor in inches for isopleth plots. If the map scale factor is 1 inch = 24000. inches, SCL would be input as 24000. If set to zero, the Program will scale the isopleths within the boundaries defined by XSIZE and YSIZE below.

XMAXIN - Maximum alongwind distance from the launch site in meters for isopleth plots. If set to zero, the Program will use XX(NXS-2) as the maximum distance.

YMAXIN - Maximum crosswind distance for isopleth plots in meters. If set to zero, the Program will calculate YMAXIN.

XSIZE - The number of raster counts on the SC4020 in the X or east-west horizontal plot axis for isopleths. If set to zero, the Program will use 937.

YSIZE - The number of raster counts on the SC4020 in the Y or north-south vertical plot axis for isopleths. If set to zero, the Program will use 899.

RASTIN - The number of raster counts per inch on the SC4020 for isopleth plots. If input as zero, the Program uses 163.2.

XCIZE - The number of raster counts on the SC4020 on the X or alongwind horizontal axis for maximum centerline plots. If set to zero, the Program uses 937.

YCIZE - The number of raster counts on the SC4020 on the vertical axis for maximum centerline plots. If set to zero, the Program uses 899.

XMAXJN - Maximum alongwind distance in meters from the launch site for maximum centerline plots. If set to zero, the Program uses XX(NXS-2).

YMAXJN - Maximum number of log cycles for the vertical axis of the maximum centerline plots if ISW below equals 0 or 2. Maximum value of the vertical axis if ISW below equals 1. If set to zero, the Program determines YMAXJN.

ISW - Maximum centerline plotting flag. If ISW is set to 0 or 2, the Program plots maximum centerline versus distance on a log-log plot. If set to 1, the plot is linear on both axes.

JSW - Isopleth plot switch. If JSW is set equal to 0, the Program will fit a cubic spline function to the discrete isopleth points and plot a smooth curve through the points. If JSW is set equal to 1, the Program will not use the spline function but will plot straight lines between adjacent calculated isopleth points. This option has been included because the spline function sometimes fails to fit the data points when the isopleths are sharply curved. These cases are recognized by a high frequency oscillation along the plotted curve and can be corrected by smoothing the curve by hand or replotting with JSW set equal to 1.

The layer step change (transition) parameters below are used only if ISKIP (7) equals 1 and Model 4 has been selected. These parameters are used only when Model 4 is being used to predict the concentration and dosage downwind from a change in meteorological structure (see IZMOD, Model 4 above).

ALPHL - Lateral diffusion coefficient in each new layer (Default value is 1).

BETL - Vertical diffusion coefficient in each new layer (Default value is 1).

TAUL - Time required for cloud stabilization in the new layers.

TAUOL - Reference time for the standard deviation of the wind azimuth angle SIGAL in the new layers (Default value is 600).

ZRL - Reference height in the surface layer for meteorological measurements. This must be set only if the new bottom layer includes the initial surface layer (Default value is 2).

UBARL - Mean wind speed at the bottom and top boundaries of each new layer. These values are input in ascending order of new layers with the value at the top boundary preceded by the bottom. If the new bottom layer contains the initial surface layer, UBARL at ZRL should be input as the bottom value of this layer.

SIGAL - Standard deviation of the wind azimuth angle for reference time τ_{oL} at the bottom and top boundaries of each new layer. If the new bottom layer contains the initial surface layer, SIGAL at ZRL should be input as the bottom value of this layer.

THETAL - Mean wind direction at the bottom and top boundaries of each new layer. If the new bottom layer contains the initial surface layer, THETAL at ZRL should be input as the bottom value of this layer.

TEMPL - Virtual potential temperature at the bottom and top boundaries of each new layer.

B.3 CONDENSED TABLE OF NAMELIST INPUT PARAMETERS

The namelist data input parameters required for the NASA/MSFC Multilayer Diffusion Program are given in condensed form in Table B-3. The information categories in the table are defined as follows:

NAMELIST - Name of the FORTRAN NAMELIST list to which the variables belong

FORTRAN - Fortran symbolic notation defining the program input

MODEL - Mathematical notation corresponding to the FORTRAN notation

UNITS - Dimensional units of the input parameters

LIMITS - Numberical limits on input values

VALUE - Default value should the parameter have a value of 0

ARRAY SIZE - Maximum number of core locations for the input parameter

TABLE B-3

TABLE OF INPUT PARAMETERS

NAMELIST	FORTRAN	Model	Units	Limits	Value (3)	Array Size (7)
NAM2	TESTNØ	N/A	N/A	N/A	Blanks	12
	NAMCAS	N/A	N/A	N/A	Blanks	12
	ISKIP	N/A	N/A	(1)	0	15
	NXS	N/A	N/A	≤41	41	1
	NYS	N/A	N/A	≤41	41	1
	NZS	N/A	N/A	≤16	0	1
	NDI	N/A	N/A	≤103 (10)	0	1
	NCI	N/A	N/A	≤103 (10)	0	1
	NTI	N/A	N/A	≤ 103 (10)	0	1
	NPTS	N/A	N/A	≤40	1	1
	NVS	N/A	N/A	≤20	0	1
	NVB	N/A	N/A	≤20	0	1
	XX	R	Meters	> 0.0	(8)	41
	YY	A	Degrees	$0.0 \leq \Phi \leq 360.0$	(9)	41
	NPS	N/A	N/A	0 or 1	0	1
	Z	z_{Bl} and z_{TK}	Meters	≥ 0.0	z(1) = 0.0	16

TABLE B-3

TABLE OF INPUT PARAMETERS

(Continued)

NAMELIST	FORTRAN	Model	Units	Limits	Value ③	Array Size ⑦
NAM2	DELX	R	Meters	≥ 0.0	0.0	15
	DELY	A	Degrees	$0.0 \leq \phi \leq 360.0$	0.0	15
	Q	Q	②	≥ 0.0	0.0	15
	UBARK	$\bar{u}_R$ and $\bar{u}_{TK}$	Meters Sec $^{-1}$	≥ 0.1	0.1	16
	SIGAK	$\sigma_{AR}\{\tau_o\}$ & $\sigma_{ATK}\{\tau_o\}$	Degrees	≥ 0.5	0.5	16
	SIGEK	σ_{ER} & σ_{ETK}	Degrees	≥ 0.1	0.1	16
	SIGXØ	$\sigma_{xo}\{K\}$	Meters	> 0.0	N/A	15
	SIGYØ	$\sigma_{yo}\{K\}$	Meters	> 0.0	SIGXØ	15
	SIGZØ	$\sigma_{zo}\{K\}$	Meters	≥ 0.0	0.0	15
	ALPHA	α_K	N/A	≥ 0.0	1.0	15
	BETA	β_K	N/A	≥ 0.0	1.0	15
	ZRK	z_R	Meters	$\geq z(1)$	2.0	1
	TIMAV	T_A	Seconds	≥ 0.0	600 or 360	1
	THETAK	θ_{B1} & θ_{TK}	Degrees	$0.0 \leq \theta_K \leq 360.0$	0.0	16

TABLE B-3

TABLE OF INPUT PARAMETERS

(Continued)

NAMELIST	FORTRAN	Model	Units	Limits	Value (3)	Array Size (7)
NAM2	TAUK	τ	Seconds	>0.0	N/A	1
	TAUØK	τ_o	Seconds	≥ 0.0	600.0	1
	H	H	Meters	≥ 0.0	0.0	1
	XRY	x_{ry}	Meters	≥ 0.0	100.0	1
	XRZ	x_{rz}	Meters	≥ 0.0	100.0	1
	XLRY	x_{Ry}	Meters	≥ 0.0	0.0	1
	XLRZ	x_{Rz}	Meters	≥ 0.0	0.0	1
	ZZL	z	Meters	≥ 0.0	0.0	1
	IZMØD	N/A	N/A	(11)	1	15
	DECAY	k	Seconds^{-1}	≥ 0.0	0.0	1
	ZLIM	z_{lim}	Meters	$= z_{TK}$	Z (NZS) (13)	1
	TIMI	t_1	Seconds	≥ 0.0	(5)	1
	BLAMDA	Λ	Seconds^{-1}	≥ 0.0	(5)	1
	DI	$D_K \{x_K, y_K, z_K\}$	(4)	≥ 0.0	(5)	10
	CI	$\chi_K \{x_K, y_K, z_K\}$	(4)	≥ 0.0	(5)	10
	TI	$\chi_K \{x_K, y_K, z_K; T_A\}$	(4)	≥ 0.0	(5)	10

TABLE B-3

TABLE OF INPUT PARAMETERS

(Continued)

NAMELIST	FORTRAN	Model	Units	Limits	Value (3)	Array Size (7)
NAM2	TAST	t^*	Seconds	≥0.0	0.0	5
	TEMPK	Φ_{BI} & Φ_{TK}	Degrees K	≥0.0	0.0	16
	VS	V_s	Meters sec^{-1}	≥0.0	(5)	20
	PERC	f_i	N/A	>0.0	(5)	20
	ACCUR	R_c	N/A	(6)	(5)	20
	VB	V_{SK}	Meters Sec^{-1}	>0.0	(5)	20
	PERCB	f_i	N/A	>0.0	(5)	20
	HB	H_{SK}	Meters	≥0.0	0.0	1
	GAMMAP	$1-\gamma_r$	N/A	≥0 & ≤1	0.0	20
	ALPHL	α_L	N/A	≥0.0	(13)	5
	BETL	β_L	N/A	≥0.0	(13)	5
	TAUL	τ	Seconds	>0.0	TAUK	1
	TAUØL	τ_o	Seconds	≥0.0	TAUØK	1
	ZRL	z_{RL}	Meters	≥2.0	ZRK	1
	UBARL	$\bar{u}_{BL}$ & $\bar{u}_{TL}$	Meters Sec^{-1}	≥0.0	(12)	10
	SIGAL	$\sigma_{ABL}\{\tau_o\}$ & $\sigma_{ATL}\{\tau_o\}$	Degrees	≥0.0	(12)	10

TABLE B-3

TABLE OF INPUT PARAMETERS

(Continued)

NAMELIST	FORTRAN	Model	Units	Limits	Value③	Array Size⑦
NAM2	SIGEL	σ_{EBL} & σ_{ETL}	Degrees	≥0.0	⑫	10
	THETAL	θ_{BL} & θ_{TL}	Degrees	≥0.0 & ≤360.0	⑫	10
	TEMPL	Φ_{BL} & Φ_{TL}	Degrees K	≥0.0	0.0	10
	SCL	N/A	Inches	≥0	Calculated	1
	XMAXIN	R	Meters	≥0	Calculated	1
	YMAXIN	N/A	Meters	≥0	Calculated	1
	XSIZE	N/A	Rasters	≥0	937	1
	YSIZE	N/A	Rasters	≥0	899	1
	RASTIN	N/A	Rasters/ Inch	≥0	163.2	1
	XCIZE	N/A	Rasters	≥0	937	1
	YCIZE	N/A	Rasters	≥0	899	1
	XMAXJN	N/A	Meters	≥0	XX(NXS-2)	1
	YMAXJN	N/A	Log Cycles or Meters	≥0	Calculated	1
	ISW	N/A	N/A	1 or 2	2	1
	JSW	N/A	N/A	0 or 1	0	1

TABLE B-3

TABLE OF INPUT PARAMETERS

(Continued)

(1) See Section B-2 for the range of values of the ISKIP options.

(2) Units depend on model; see Section B-2 in the definition of Q.

(3) The column under Value is used to simplify the Program input deck by providing default values should the parameter be intentionally omitted in the first data case or set to zero. All parameters in Table B-3 remain their previous value for all subsequent cases unless changed in the input list.

(4) Units of dosage and concentration isopleth values must be consistent with Program output units, milligrams/meter^3 or parts per million, etc.

(5) These parameters must have values other than zero only if they are used by the model selected and only in the applicable layers.

(6) See Section B-2 for the description of ACCUR.

(7) Several variables are dimensioned to a larger value in the Program, but the extra space is used for other purposes.

TABLE B-3

TABLE OF INPUT PARAMETERS

(Concluded)

⑧ The default values of XX are: 500, 1250, 2500, 3750, 5000, 6250, 7500, 8750, 10000, 11250, 12500, 13750, 15000, 16250, 17500, 18750, 20000, 21250, 22500, 23750, 25000, 26250, 27500, 28750, 30000, 31250, 32500, 33750, 35000, 36250, 37500, 38750, 40000, 41250, 42500, 43750, 45000, 47500, 50000, 65000, 80000 meters. Default values of XX are used only if NXS is set to 0.

⑨ The default values of the YY are the average layer wind direction $\pm$ 180^{o} rounded to the nearest 5^{o} added to each of the following angles: -40, -35, -30, -27, -24, -22, -20, -18, -16, -14, -12, -10, -8, -7, -6, -5, -5, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 16, 18, 20, 22, 24, 27, 30, 40 degrees.

⑩ The limit values given for NDI, NCI and NTI mean there is a maximum of 10 possible isopleth values with a maximum of 3 critical pollutant levels (air quality standards) within the 10. The total number of values is input in the tens and hundreds positions and the number of critical pollutant levels is input in the units position.

⑪ IZMØD is a 3 digit integer where any one of the three digits can be an integer from 0 to 6 or the integer 9. See Section B.2 for a complete explanation of IZMØD.

⑫ If these parameters are input, both bottom and top values are input respectively for each new layer in the layer step change.

⑬ ZLIM is automatically calculated if IZMØD contains a 5 (Model 5).

B.4 DATA INPUT FORMAT

This Program uses the FORTRAN NAMELIST method to input data. Input data must be in a specific form in order to be read using a NAMELIST list. The first character in each card to be read must be blank. The first card in the NAMELIST list contains the NAMELIST name NAM2 preceded by the character $ or &. The last card in the NAMELIST list contains $END (&END) to terminate the list. The form of the remaining data items in the list may be:

a. *Variable Name = Constant* - The *variable name* may be a subscripted array name or a single variable name. Subscripts must be integer constants. The *constant* may be integer, real or Hollerith (nH *alphanumeric characters*) data.

b. *Array Name = Set of Constants* (separated by commas) - The *array name* is not subscripted. The *set of constants* consists of constants of the type integer or real. The number of constants must be less than or equal to the array size. Successive occurrences of the same constant can be represented in the form *k* constant*.

The sequence of the input data parameters within the list is not significant. A more detailed explanation of the FORTRAN NAMELIST can be found in most FORTRAN language manuals. All Program input parameters are set to zero prior to input of the first case. Parameters that are not used or have default values need not appear in the input deck. When multiple cases are stacked, all parameters retain their values from the last case and are changed only by input.

B.5 FORTRAN SOURCE LISTING FOR THE NASA/MSFC MULTILAYER DIFFUSION PROGRAM — VERSION 6

This section contains the complete FORTRAN source listing of the NASA/MSFC Multilayer Program — Version 6.

```
1*        **  NASA/MSFC MULTILAYER DIFFUSION PROGRAM — VERSION 6       **
2*        **                                                           **
3*
4*            PROGRAM MODEL, VERSION 6,  REVISION 0
5*
6*      C   ***************************************************************MDL00100
7*      C   *    NASA/MSFC MULTILAYER DIFFUSION PROGRAM - VERSION 6         MDL00200
8*      C   ***************************************************************MDL00300
9*      C                                                                   MDL00400
10*     C     THIS VERSION OF THE NASA/MSFC MULTILAYER MODEL REQUIRES THE USE MDL00500
11*     C     OF MASS STORAGE LOGICAL UNIT 9 AND 13. THE NUMBER OF TRACKS CAN MDL00600
12*     C     BE THE SYSTEM DEFAULT. ALSO, IF INUNT BELOW EQUALS 0 OR 10 OR IF MDL00700
13*     C     NVHCLC BELOW EQUALS 0 THE PROGRAM REQUIRES MASS STORAGE LOGICAL MDL00800
14*     C     UNITS 10 AND 11 AND TAPE OR MASS STORAGE LOGICAL UNIT 12. THESE MDL00900
15*     C     UNITS ARE THE SAME AS THOSE USED BY THE PREPROCESSOR PROGRAM. MASSMDL01000
16*     C     STORAGE UNIT 10 REQUIRES AT LEAST 14 POSITIONS ON THE UNIVAC 1108 MDL01100
17*     C     AND FILES 12 AND 11 CAN BE THE SYSTEM DEFAULT.                MDL01200
18*     C                                                                   MDL01300
19*     C                                                                   MDL01400
20*     C     THIS VERSION OF THE NASA/MSFC MULTILAYER DIFFUSION MODEL      MDL01500
21*     C     IS DESIGNED TO BE USED WITH OR WITHOUT THE MULTILAYER         MDL01600
22*     C     PREPROCESSOR                                                  MDL01700
23*     C                                                                   MDL01800
24*     C     DATA INPUT SEQUENCE                                           MDL01900
25*     C                                                                   MDL02000
26*     C ** DATA CARD1 (READ FOR EACH PASS OF THE PROGRAM UNLESS THE LAST CASE MDL02100
27*     C                PROCESSED BY THE PROG HAD THE VARIABLE NPS SET NON-ZEROMDL02200
28*     C                                                                   MDL02300
29*     C     NVHCLC - INTEGER REPRESENTING THE VEHICLE TO BE PROCESSED     MDL02400
30*     C              1= TITAN III C, 2= SPACE SHUTTLE, 3= DELTA-THOR 2914 MDL02500
31*     C              4= MINUTEMAN II, 5= DELTA-THOR 3914  (I1 FORMAT, COL 1) MDL02600
32*     C        $$$ NOTE - IF NVHCLC IS INPUT AS ZERO THE PROGRAM ASSUMES  MDL02700
33*     C                   THAT MULTIPLE CASES HAVE BEEN STACKED ON MASS   MDL02800
34*     C                   STORAGE UNIT 10 AND TAPE OR MASS STORAGE UNIT 12 MDL02900
35*     C                   BY THE PREPROCESSOR. THIS PROGRAM WILL EXECUTE ALL MDL03000
36*     C                   OF THESE CASES SEQUENTIALLY AND AUTOMATICALLY   MDL03100
37*     C                   WITHOUT ANY ADDITIONAL INPUT. ALL VARIABLES ON  MDL03200
38*     C                   THIS ONE INPUT CARD MUST BE ZERO, I.E. INPUT ONLY MDL03300
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39*      C                    ONE BLANK CARD.                                    MDL03400
40*      C     METDTC - 3 INTEGER WORD ARRAY FOR THE DATE OF THE MET DATA        MDL03500
41*      C              MODYYR (3I2 FORMAT, COLS 2-7)                            MDL03600
42*      C     NSNDC - SOUNDING HOUR (00-24) (I2 FORMAT, COL 8-9)                MDL03700
43*      C     NMOLDC - MODEL NUMBER (I3 FORMAT, COL 10-12)                      MDL03800
44*      C              REMEMBER TO INPUT THIS NUMBER EXACTLY LIKE THE           MDL03900
45*      C              PREPROCESSOR PRINTS IT IF USING PREPROCESSOR INPUT        MDL04000
46*      C              DATA FROM MASS STORAGE.                                  MDL04100
47*      C     NPLNTC - NUMBER REPRESENTING THE POLLUTANT. 1=HCL, 2=CO,          MDL04200
48*      C              3=CO2, 4=AL2O3   (I1 FORMAT, COL 13)                     MDL04300
49*      C     INUNT - DATA UNPUT UNIT NUMBER. IF INUNT IS 0 THE PROGRAM SETS IT MDL04400
50*      C             TO 10 AND ASSUMES THE CASE IDENTIFIED BY THIS CARD DATA   MDL04500
51*      C             IS TO BE FOUND ON MASS STORAGE UNIT 10 AND TAPE OR MASS   MDL04600
52*      C             STORAGE UNIT 12. THE PROGRAM THEN READS THIS DATA AND ALSOMDL04700
53*      C             READS NAMELIST NAM2 FROM THE CARD READER FOR ANY UPDATES  MDL04800
54*      C             OR MODIFICATIONS TO THE CASE. IF INUNT IS 5 THE PROGRAM   MDL04900
55*      C             READS ALL REMAINING DATA THROUGH NAMELIST NAM2 VIA THE    MDL05000
56*      C             CARD READER. (I2 FORMAT , COL 79-80)                      MDL05100
57*      C                                                                       MDL05200
58*      C                                                                       MDL05300
59*      C     NAMELIST NAM2 INCLUDES THE VARIABLES - TESTNO,ISKIP,NXS,NYS,NZS,  MDL05400
60*      C     NDI,NCI,NPTS,NTI,TI,NVS,NVB,XX,YY,Z,DELX,DELY,Q,UBARK,SIGAK,SIGEK,MDL05500
61*      C     SIGXO,SIGYO,GAMMAP,SIGZO,ALPHA,BETA,ZRK,TIMAV,THETAK,TAUK,TAUOK,  MDL05600
62*      C     H,XRY,XRZ,XLRY,XLRZ,ZZL,IZMOD,DECAY,TIM1,BLAMDA,DI,CI,TAST,ZLIM,  MDL05700
63*      C     HB,PERCB,VB,VS,PERC,ACCUR,ALPHL,BETL,TAUL,TAUOL,ZRL,UBARL,SIGAL,  MDL05800
64*      C     SIGEL,THETAL,NPS,NAMCAS,SCL,XMAXIN,YMAXIN,ISW,XMAXJN,YMAXJN,      MDL05900
65*      C     RASTIN,XSIZE,YSIZE,XCIZE,YCIZE,TEMPK,TEMPL,JSW,NVHCL,METDAT,NSND,  MDL06000
66*      C     NMODL,NPLNT (SOME OF THESE VARIABLES ARE AUTOMATICALLY SET BY THE  MDL06100
67*      C     PROGRAM. CONSULT THE DOCUMENTATION BEFORE PROGRAM USE)             MDL06200
68*      C                                                                       MDL06300
69*      C     SEE SUBROUTINE TAPEIN AND READER FOR INPUT DATA CODING            MDL06400
70*      C                                                                       MDL06500
71*      C     IMPORTANT PROGRAM VARIABLES                                       MDL06600
72*      C                                                                       MDL06700
73*      C                                                                       MDL06800
74*      C                                                                       MDL06900
75*      C     ISKIP= PROGRAM CONTROL OPTIONS                                    MDL07000
76*      C     H = CLOUD STABILIZATION HEIGHT (METERS)                           MDL07100
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77*     C     Z    = BOUNDARY HEIGHTS OF LAYERS (METERS)                                  MDL07200
78*     C     Q = SOURCE STRENGTH IN LAYER                                                MDL07300
79*     C     UBAR = CALCULATED TRANSPORT SPEED IN LAYER                                  MDL07400
80*     C     ALPHA = LATERAL POWER LAW EXPANSION COEFFICIENT                             MDL07500
81*     C     BETA  = VERTICAL POWER LAW EXPANSION COEFFICIENT                            MDL07600
82*     C     SIGYO = STANDARD DEVIATION OF THE LATERAL SOURCE DIMENSION (METER)          MDL07700
83*     C     SIGAP = CALCULATED LATERAL DIFFUSION COEFFICIENT IN LAYER                   MDL07800
84*     C     SIGXO = STANDARD DEVIATION OF THE ALONG WIND SOURCE DIMENSION               MDL07900
85*     C             (METERS)                                                            MDL08000
86*     C     DELTHP = CALCULATED WIND DIRECTION SHEAR IN LAYER                           MDL08100
87*     C     SIGZO  = STANDARD DEVIATION OF THE VERTICAL SOURCE DIMENSION                MDL08200
88*     C             (METERS)                                                            MDL08300
89*     C     SIGEP = CALCULATED VERTICAL DIFFUSION COEFFICIENT                           MDL08400
90*     C     DELX = RANGE TO SOURCE IN LAYER RELATIVE TO ORIGIN OF REFERENCE             MDL08500
91*     C            GRID SYSTEM (METERS)                                                 MDL08600
92*     C     DELY = AZIMUTH BEARING FROM 0 DEGREES NORTH TO SOURCE IN LAYER              MDL08700
93*     C            (DEGREES)                                                           MDL08800
94*     C     THETA = CALCULATED MEAN WIND DIRECTION IN LAYER                             MDL08900
95*     C     IZMOD = MODEL OR MODELS TO USE IN LAYER                                     MDL09000
96*     C     DELU  = CALCULATED WIND SPEED SHEAR                                         MDL09100
97*     C     ZZL   = CALCULATION HEIGHTS IN LAYER                                        MDL09200
98*     C     DOS   = CALCULATED VALUE OF DOSAGE                                          MDL09300
99*     C     CON   = CALCULATED VALUE OF CONCENTRATION                                   MDL09400
100*    C     PEAKD = PART OF DOSAGE EQUATION                                             MDL09500
101*    C     XX = RANGE TO CALCULATION POINT OF THE POLAR COORDINATE REFERENCE            MDL09600
102*    C          GRID SYSTEM (METERS)                                                   MDL09700
103*    C     YY = AZIMUTH BEARING FROM 0 DEGREES NORTH TO CALCULATION POINT OF           MDL09800
104*    C          THE POLAR COORDINATE REFERENCE GRID                                    MDL09900
105*    C     LAT   = LATERAL TERM OF DOSAGE EQUATION                                     MDL10000
106*    C     VER   = VERTICAL TERM OF DOSAGE EQUATION                                    MDL10100
107*    C     VREF  = REFLECTION TERM OF DOSAGE EQUATION                                  MDL10200
108*    C     T     = SOURCE EMISSION TIME IN LAYER FOR GRAVITATIONAL DEP. (SEC)          MDL10300
109*    C     TESTNO = METEOROLOGICAL CASE INFORMATION                                    MDL10400
110*    C      DI = DOSAGE ISOPLETH VALUES OF INTEREST                                    MDL10500
111*    C      CI  = CONCENTRATION ISOPLETH VALUES OF INTEREST                            MDL10600
112*    C     TI = TIME MEAN CONCENTRATION VALUES OF INTEREST FOR ISOPLETHS               MDL10700
113*    C     SIGZ = CALCULATED STANDARD DEVIATION OF THE VERTICAL DOSAGE                 MDL10800
114*    C            DISTRIBUTION                                                         MDL10900
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C     SIGY = CALCULATED STANDARD DEVIATION OF THE LATERAL DOSAGE          MDL11000
C            DISTRIBUTION                                                 MDL11100
C     SIGX = CALCULATED STANDARD DEVIATION OF THE ALONG WIND DOSAGE       MDL11200
C            DISTRIBUTION                                                 MDL11300
C     SQR2P =  SQUARE ROOT TWO PI                                         MDL11400
C     L     = LENGTH OF CLOUD IN ALONG WIND DIRECTION                     MDL11500
C     I     = INDEX OF X COORDINATES                                      MDL11600
C     J     = INDEX OF Y COORDINATES                                      MDL11700
C     KK    = INDEX OF LAYERS                                             MDL11800
C     K = INDEX OVER CALCULATION HEIGHTS ZZL                              MDL11900
C     STO1  = TEMP STORAGE                                                MDL12000
C     STO2  = TEMP STORAGE                                                MDL12100
C     STO3  = TEMP STORAGE                                                MDL12200
C     TAST  = TIME OF LAYER STRUCTURE CHANGE (SECONDS)                    MDL12300
C     NBK = NO OF DISTINCT GROUPS OF LAYERS THAT FORM INTO ONE AT TIME    MDL12400
C            TAST.                                                        MDL12500
C     ILK   = INDEX ON NEW LAYERS AFTER TIME TAST                         MDL12600
C     NXS   = NO OF X COORDINATES                                         MDL12700
C     NYS   = NO OF Y COORDINATES                                         MDL12800
C     NZS   = NO OF LAYER BOUNDARIES                                      MDL12900
C     NDI   = NO OF DOSAGE ISOPLETHS                                      MDL13000
C     NCI   = NO OF CONCENTRATION ISOPLETHS                               MDL13100
C     NTI = NO OF TIME MEAN CONCENTRATION ISOPLETHS                       MDL13200
C     NPTS = NO OF CALCULATION HEIGHTS ZZL                                MDL13300
C     RAD   = PI/180                                                      MDL13400
C     NNZ   = NZS-1 NO OF LAYERS                                          MDL13500
C     ITOP  = TOP OF NEW LAYER AFTER TAST IN TERMS OF OLD LAYER STRUCTURMDL13600
C     IBOT  = BOTTOM OF NEW LAYER AFTER TAST IN TERMS OF OLD LAYER        MDL13700
C              STRUCTURE (ITOP AND IBOT INDEXES)                          MDL13800
C     XAST  = CALCULATE DISTANCE TO TAST                                  MDL13900
C     SIGXNK = SIGX OF NEW LAYER STRUCTURE                                MDL14000
C     BLAMDA=LAMBDA= WASHOUT COEFFICIENT                                  MDL14100
C     TIM1 = TIME OF START OF RAIN (SECONDS)                              MDL14200
C     ZLIM  = MAXIMUM HEIGHT OF WASHOUT                                   MDL14300
C     WASHOU = CALCULATE WASHOUT AT GROUND                                MDL14400
C     UBARK = WIND SPEED AT EACH LAYER BOUNDARY, LOWER BOUNDARY OF LAYERMDL14500
C              1 FOR UBARK IS ASSUMED AT ZRK  (METERS/SEC)                MDL14600
C     SIGAK = SIGAP (INITIAL) AT EACH LAYER BOUNDARY, LOWER BOUNDARY OF MDL14700
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153*      C                LAYER 1 FOR SIGAK IS ASSUMED AT ZRK (DEGREES)                MDL14800
154*      C     SIGEK = SIGEP (INITIAL) AT EACH LAYER BOUNDARY, LOWER BOUNDARY OF       MDL14900
155*      C                LAYER 1 FOR SIGEK IS ASSUMED AT ZRK (DEGREES)                MDL15000
156*      C     ZRK = REFERENCE HEIGHT IN SURFACE LAYER (METERS)                        MDL15100
157*      C     THETAK = WIND DIRECTION AT LAYER BOUNDARIES (DEGREES)                   MDL15200
158*      C     TAUK  = TIME IN SECONDS REQUIRED FOR LATERAL CLOUD STABILIZATION        MDL15300
159*      C     TAUOK = SAMPLING PERIOD IN SECONDS AT THE TOP OF THE LAYER              MDL15400
160*      C     DECAY = DECAY COEFFICIENT IN DOSAGE EQUATION                            MDL15500
161*      C     UBARL = WIND SPEED AT BOTTOM AND TOP OF EACH NEW LAYER AFTER LAYER      MDL15600
162*      C                CHANGE  (METERS/SEC)                                         MDL15700
163*      C     SIGAL = SIGAP AT BOTTOM AND TOP OF EACH NEW LAYER AFTER LAYER           MDL15800
164*      C                CHANGE  (DEGREES)                                            MDL15900
165*      C     SIGEL = SIGEP AT BOTTOM AND TOP OF EACH NEW LAYER AFTER LAYER           MDL16000
166*      C                CHANGE  (DEGREES)                                            MDL16100
167*      C     ZRL = REFERENCE HEIGHT IN SURFACE LAYER OF NEW STRUCTURE (METERS)       MDL16200
168*      C     THETAL = WIND DIRECTION AT BOTTOM AND TOP OF EACH NEW LAYER AFTER       MDL16300
169*      C     TAUL  = TIME IN SECONDS FOR LATERAL CLOUD STABILIZATION IN NEW          MDL16400
170*      C                LAYER STRUCTURE                                              MDL16500
171*      C     TAUOL = TIME IN SECONDS OF SAMPLING PERIOD AT TOP OF NEW LAYER          MDL16600
172*      C     JBOT  = INPUT LAYER NUMBER OF BOTTOM OF NEW LAYER STRUCTURE             MDL16700
173*      C                RELATIVE TO OLD                                              MDL16800
174*      C     JTOP  = INPUT LAYER NUMBER OF TOP OF NEW LAYER STRUCTURE                MDL16900
175*      C                RELATIVE TO OLD                                              MDL17000
176*      C     VS    = SETTLING VELOCITY IN GRAVITATIONAL DEPOSITION MODEL             MDL17100
177*      C     PERC  = FREQUENCY OF VS                                                 MDL17200
178*      C     ACCUR = DESIRED ACCURACY COEFFICIENT (.45) INSURES THAT GROUND          MDL17300
179*      C                DEPOSITION FROM NXCI POINT SOURCES IN THE LAYER VARIES       MDL17400
180*      C                LESS THAN TEN PERCENT FROM DEPOSITION EXPECTED FROM A        MDL17500
181*      C                VERTICAL LINE SOURCE IN THE LAYER. FOR (.32) REDUCED TO      MDL17600
182*      C                FIVE PERCENT                                                 MDL17700
183*      C     VB    = SETTLING VELOCITIES FROM A BURST OR DESTRUCT IN LAYER NNZ       MDL17800
184*      C     PERCB = FREQUENCY OF VB                                                 MDL17900
185*      C     HB    = HEIGHT OF BURST (METERS)                                        MDL18000
186*      C     PPWR  = CALCULATED WIND SPEED POWER LAW EXPONENT                        MDL18100
187*      C     QPWR  = CALCULATED SIGEP POWER LAW EXPONENT                             MDL18200
188*      C     MPWR  = CALCULATED SIGAP POWER LAW EXPONENT                             MDL18300
189*      C     DTHK  = WIND ANGLE SHEAR                                                MDL18400
190*      C     NVS   = NUMBER OF SETTLING VELOCITIES VS                                MDL18500
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191*      C     NVB    = NUMBER OF SETTLING VELOCITIES VB                                    MDL18600
192*      C     II     = INDEX ON VS AND VB                                                  MDL18700
193*      C     DEP    = TEMP STORAGE                                                        MDL18800
194*      C     YBARY = CALCULATED CORRDINATE OF POINT ON CLOUD AXIS OF VS AT               MDL18900
195*      C               INTERSECTION WITH GROUND  (DEPOSITION)                            MDL19000
196*      C     XBARX = CALCULATED CORRDINATE OF POINT ON CLOUD AXIS OF VS AT               MDL19100
197*      C               INTERSECTION WITH GROUND  (DEPOSITION)                            MDL19200
198*      C     UBARNK = CALCULATED WIND SPEED  (DEPOSITION)                                MDL19300
199*      C     BETANK = CALCULATED BETA   (DEPOSITION)                                     MDL19400
200*      C     ALPHNK = CALCULATED ALPHA  (DEPOSITION)                                     MDL19500
201*      C     SQBAR  = TEMP STORAGE                                                       MDL19600
202*      C     ANG    =  ANGLE  TO POINT XBARX,YBARY  (DEPOSITION)                         MDL19700
203*      C     NXCI   = NUMBER OF POINT SOURCES IN LAYER  (DEPOSITION)                     MDL19800
204*      C     DEPN   = CALCULATED VALUE OF GRAVITATIONAL DEPOSITION                       MDL19900
205*      C     SIGYNK = SIGY OF NEW LAYER STRUCTURE IN CALCULATION OF DOSAGE AND           MDL20000
206*      C               CONCENTRATION                                                     MDL20100
207*      C     SIGENK = CALCULATED SIGEP (DEPOSITION)                                      MDL20200
208*      C     SIGANK = CALCULATED SIGAP (DEPOSITION)                                      MDL20300
209*      C     TIMAV = CONCENTRATION AVERAGING TIME (SECONDS)                              MDL20400
210*      C     AVCON = AVERAGE CONCENTRATION                                               MDL20500
211*      C     PASSTM = TIME OF CLOUD PASSAGE                                              MDL20600
212*      C     AVMXCN = MAXIMUM AVERAGE CONCENTRATION                                      MDL20700
213*      C     XRY    = DISTANCE DOWNWIND FROM THE VIRTUAL POINT SOURCE OVER               MDL20800
214*      C               WHICH RECTILINEAR EXPANSION OCCURS LATERALLY   (METERS)           MDL20900
215*      C     XRZ    = DISTANCE DOWNWIND FROM THE VIRTUAL POINT SOURCE OVER               MDL21000
216*      C               WHICH RECTILINEAR EXPANSION OCCURS VERTICALLY  (METERS)           MDL21100
217*      C     XLRY   = DISTANCE FROM TRUE SOURCE TO POINT OF MEASUREMENT OF               MDL21200
218*      C               SIGYO  (METERS)                                                   MDL21300
219*      C     XLRZ   = DISTANCE FROM TRUE SOURCE TO POINT OF MEASUREMENT OF               MDL21400
220*      C               SIGZO  (METERS)                                                   MDL21500
221*      C     GAMMA  = FRACTION OF MATERIAL REFLECTED AT THE SURFACE (=1 FOR              MDL21600
222*      C               COMPLETE REFLECTION, =0 FOR NO REFLECTION)                        MDL21700
223*      C     GAMMAP = 1.0-GAMMA                                                          MDL21800
224*      C     NAMCAS = SPECIAL CASE IDENTIFICATION INFORMATION                            MDL21900
225*      C     SCL - MAP SCALE FACTOR IN INCHES FOR ISOPLETH PLOTS. IF THE MAP             MDL22000
226*      C           SCALE FACTOR IS 1 INCH = 24000 INCHES THEN SCL WOULD BE             MDL22100
227*      C           INPUT AS 24000. (IF 0 THE PROGRAM WILL CALCULATE SCL)               MDL22200
228*      C     ISW - SWITCH FOR MAXIMUM CENTERLINE PLOTS. IF SET TO 0 OR 2               MDL22300
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229*      C           LOG-LOG SCALING IS USED. IF SET TO 1 LINEAR IS USED.          MDL22400
230*      C     XMAXJN - MAXIMUM ALONGWIND DISTANCE FROM THE LAUNCH SITE FOR       MDL22500
231*      C              MAXIMUM CENTERLINE PLOTS (METERS) (IF 0 PROG CALCULATES) MDL22600
232*      C     XMAXIN - MAXIMUM ALONGWIND DISTANCE FROM THE LAUNCH SITE FOR       MDL22700
233*      C               ISOPLETHS (METERS) (IF 0 PROGRAM CALCULATES)            MDL22800
234*      C     YMAXIN - MAXIMUM CROSSWIND DISTANCE FOR ISOPLETHS (METERS) (IF 0  MDL22900
235*      C              PROGRAM CALCULATES)                                      MDL23000
236*      C     YMAXJN - MAXIMUM NUMBER OF LOG CYCLES FOR THE VERTICAL AXIS OF     MDL23100
237*      C              THE MAXIMUM CENTERLINE PLOTS IF ISW = 0 OR 2. OR. MAXIMUMMDL23200
238*      C              VALUE OF THE VERTICAL AXIS IF ISW = 1. (IF 0 PROGRAM     MDL23300
239*      C              CALCULATES)                                              MDL23400
240*      C     TEMPK - VIRTUAL POTENTIAL TEMPERATURE AT EACH LAYER BOUNDARY. THISMDL23500
241*      C             ARRAY IS USED TO SEE IF THERE IS A NEGATIVE LAPSE RATE    MDL23600
242*      C             IN THE LAYER. THE PROG CHECKS TO SEE IF THE WIND SPEED    MDL23700
243*      C             SHEAR IS NEGATIVE. IF IT IS AND ALSO THE LAPSE RATE IS    MDL23800
244*      C             NEGATIVE THE PROGRAM USES THE ABSOLUTE VALUE OF THE SPEED MDL23900
245*      C             SHEAR . IF THE SPEED SHEAR IS NEGATIVE AND THE LAPSE RATE MDL24000
246*      C             IS POSITIVE OR TEMPK IS NOT INPUT THE PROGRAM USES 0 WIND MDL24100
247*      C             SPEED SHEAR.                                              MDL24200
248*      C     TEMPL - VIRTUAL POTENTIAL TEMPERATURE AT EACH LAYER BOUNDARY OF   MDL24300
249*      C             THE NEW LAYER STRUCTURE.                                  MDL24400
250*      C     RASTIN = THE NUMBER OF RASTER COUNTS PER INCH ON THE SC4020 FOR    MDL24500
251*      C              ISOPLETH AND MAXIMUM CENTER LINE PLOTS.                  MDL24600
252*      C     XSIZE = THE NUMBER OF RASTER COUNTS ON THE SC4020 IN THE X OR      MDL24700
253*      C              HORIZONTAL PLOT AXIS (EAST-WEST). FOR ISOPLETHS          MDL24800
254*      C     YSIZE = THE NUMBER OF RASTER COUNTS ON THE SC4020 IN THE Y OR      MDL24900
255*      C             VERTICAL (NORTH-SOUTH) PLOT AXIS FOR ISOPLETHS            MDL25000
256*      C     XCIZE = THE NUMBER OF RASTER COUNTS ON THE SC4020 IN THE X OR      MDL25100
257*      C             ALONGWIND HORIZONTAL AXIS FOR MAXIMUM CENTERLINE PLOTS.   MDL25200
258*      C     YCIZE = THE NUMBER OF RASTER COUNTS ON THE SC4020 IN THE VERTICAL  MDL25300
259*      C             AXIS FOR MAXIMUM CENTERLINE PLOTS                         MDL25400
260*      C     NVHCL = SAME AS NVHCLC                                            MDL25500
261*      C     METDAT = SAME AS METDTC                                           MDL25600
262*      C     NSND = SAME AS NSNDC                                              MDL25700
263*      C     NMODL = SAME AS NMODLC                                            MDL25800
264*      C     NPLNT = SAME AS NPLNTC                                            MDL25900
265*      C                                                                       MDL26000
266*      C                                                                       MDL26100
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C                                                                       MDL26200
C                                                                       MDL26300
C                                                                       MDL26400
C                                                                       MDL26500
      COMMON /PARAMT/ TESTNO(12),        ISKIP(15),NXS,NYS,NZS,NDI,NCI, MDL26600
     1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),     MDL26700
     2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),      MDL26800
     3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,     MDL26900
     4XLRY,XLRZ,ZZL(40),IZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10), MDL27000
     5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),MDL27100
     6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)MDL27200
     7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                  MDL27300
      COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),MDL27400
     1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,ST01,    MDL27500
     2ST02,ST03,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR, MDL27600
     3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,    MDL27700
     4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,          MDL27800
     5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),       MDL27900
     6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,   MDL28000
     7NYSS,CDAMX(3)                                                     MDL28100
      DIMENSION CON(1),DOS(1),AVCON(1),PASSTM(1)                        MDL28200
      DIMENSION NUNM(12),DTNM(2)                                        MDL28300
      EQUIVALENCE (CON,DEPN),(DOS,DEPN(1,2)),(AVCON,DEPN(1,3)),(PASSTM,DMDL28400
     1EPN(1,4))                                                         MDL28500
      REAL MPWR,L,LAT,LAMBDA                                            MDL28600
      INTEGER TESTNO                                                    MDL28700
      DATA DTNM/6HPRECIP,6H  GRAV/,NUNM/6H(MG/M*,3H*2),6H  (PH),1H ,6H(MMDL28800
     1G/M*,3H*3),6H(MGSEC,6H/M**3),6H  (PPM,1H),6H  (PPM,5H SEC)/,NPLNTPMDL28900
     2/6HAL203 /                                                        MDL29000
      DATA ZEROES/0,0/                                                  MDL29100
C                    *** INPUT SECTION ***                              MDL29200
      SQR2P = 2.5066283                                                 MDL29300
      RAD = .01745329                                                   MDL29400
      IFF = 1                                                           MDL29500
      MBR = 0                                                           MDL29600
C                          READ MODEL PARAMETERS                        MDL29700
    1 CALL READER(IFF)                                                  MDL29800
      IFF = 2                                                           MDL29900
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305*            IF (KSW(1) .LE. 0) GO TO 5                                          MDL30000
306*      C                    EXECUTE GRAVITATIONAL DEPOSITION MODEL                MDL30100
307*            CALL DEPOS                                                          MDL30200
308*            GO TO 700                                                           MDL30300
309*          5 CONTINUE                                                            MDL30400
310*            IF (ISKIP(2) .LE. 1.AND.ISKIP(3) .LE. 1) GO TO 6                    MDL30500
311*            IF (MBR .EQ. 5) GO TO 6                                             MDL30600
312*            MBR = 5                                                             MDL30700
313*            CALL IDENT(35,'HARD COPY, 1 EACH, PLUS FILM')                       MDL30800
314*            CALL SETMIV(0,0,0,0)                                                MDL30900
315*          6 CONTINUE                                                            MDL31000
316*            DO 8 I=1,3                                                          MDL31100
317*          8 CDAMX(I) = 0.0                                                      MDL31200
318*            IF (ISKIP(5) .EQ. 1.AND.ISKIP(9) .EQ. 1) CDAMX(1) = 14.0            MDL31300
319*            ILK = 1                                                             MDL31400
320*            DO 10 J=1,41                                                        MDL31500
321*            DO 10 I=1,41                                                        MDL31600
322*         10 DEPN(I,J) = 0.0                                                     MDL31700
323*         20 CONTINUE                                                            MDL31800
324*            KTK = 1                                                             MDL31900
325*            K = 1                                                               MDL32000
326*            NYSS = NYS                                                          MDL32100
327*            IMB = 0                                                             MDL32200
328*            IFG = 0                                                             MDL32300
329*            DO 500 KK=1,NNZ                                                     MDL32400
330*      C                    *** LIST INPUT PARAMETERS ***                        MDL32500
331*            WRITE (6,903) KK                                                    MDL32600
332*            WRITE (6,904)                                                       MDL32700
333*            IF (KK .NE. 1) GO TO 92                                             MDL32800
334*            WRITE (6,905) Q(KK),ZRK,UBARK(KK),UBARK(KK+1),SIGAK(KK),SIGAK(KK+1MDL32900
335*           1),SIGEK(KK),SIGEK(KK+1),TAUK,TAUOK,SIGXO(KK),SIGYO(KK),SIGZO(KK), MDL33000
336*           2THETAK(KK),THETAK(KK+1),Z(KK),ALPHA(KK),BETA(KK),H,DELX(KK),       MDL33100
337*           3DELY(KK),IZMOD(KK),TIM1,ZLIM,LAMBDA,TIMAV,XRY,XRZ,XLRY,XLRZ        MDL33200
338*           4,GAMMAP(1)                                                         MDL33300
339*            GO TO 93                                                           MDL33400
340*         92 CONTINUE                                                            MDL33500
341*            WRITE (6,918) Q(KK),UBARK(KK),UBARK(KK+1),SIGAK(KK),SIGAK(KK+1),    MDL33600
342*           1SIGEK(KK),SIGEK(KK+1),SIGXO(KK),SIGYO(KK),SIGZO(KK),THETAK(KK),    MDL33700
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343*          2THETAK(KK+1),Z(KK),ALPHA(KK),BETA(KK),DELX(KK),DELY(KK),          MDL33800
344*          3IZMOD(KK)                                                         MDL33900
345*         93 IF (KK .NE. NNZ) GO TO 94                                        MDL34000
346*            WRITE (6,919) Z(KK+1)                                            MDL34100
347*         94 CONTINUE                                                         MDL34200
348*            NNZILK = NNZ+ILK                                                 MDL34300
349*            IF (NBK .EQ. 0.OR.KK .NE. JBOT(ILK)) GO TO 97                    MDL34400
350*            IF (JBOT(ILK) .NE. 1) GO TO 96                                   MDL34500
351*            LSP = ILK*2-1                                                    MDL34600
352*            WRITE (6,920) ZRL,UBARL(LSP),UBARL(LSP+1),SIGAL(LSP),SIGAL(LSP+1),MDL34700
353*           1SIGEL(LSP),SIGEL(LSP+1),THETAL(LSP),THETAL(LSP+1),TAUL,TAUOL,    MDL34800
354*           2ALPHA(NNZILK),BETA(NNZILK),TAST(ILK),JBOT(ILK),JTOP(ILK)         MDL34900
355*            GO TO 97                                                         MDL35000
356*         96 CONTINUE                                                         MDL35100
357*            LSP = ILK*2-1                                                    MDL35200
358*            WRITE (6,921) UBARL(LSP),UBARL(LSP+1),SIGAL(LSP),SIGAL(LSP+1),   MDL35300
359*           1SIGEL(LSP),SIGEL(LSP+1),THETAL(LSP),THETAL(LSP+1),TAUL,TAUOL,ALPHAMDL35400
360*           2(NNZILK),BETA(NNZILK),TAST(ILK),JBOT(ILK),JTOP(ILK)              MDL35500
361*         97 CONTINUE                                                         MDL35600
362*            WRITE (6,922) UBAR(KK),THETA(KK),DELTHP(KK),DELU(KK),SIGAP(KK),  MDL35700
363*           1SIGEP(KK)                                                        MDL35800
364*            IF (NBK .EQ. 0.OR.KK.NE. JBOT(ILK)) GO TO 98                     MDL35900
365*            WRITE (6,923) UBAR(NNZILK),THETA(NNZILK),DELTHP(NNZILK),         MDL36000
366*           1DELU(NNZILK),SIGAP(NNZILK),SIGEP(NNZILK)                         MDL36100
367*         98 CONTINUE                                                         MDL36200
368*             CALL TESTR(KTK)                                                 MDL36300
369*            WRITE (6,917)                                                    MDL36400
370*      C                  *** GENERAL GRID PATTERN CALCULATIONS ***           MDL36500
371*        140 CONTINUE                                                        MDL36600
372*            JF = NNZ+ILK-1                                                   MDL36700
373*            IF (KSW(2) .LE. 0) GO TO 145                                     MDL36800
374*            IF (IFG .EQ. 1) GO TO 500                                        MDL36900
375*            GO TO 148                                                        MDL37000
376*        145 CONTINUE                                                        MDL37100
377*            IF (K .GT. NPTS) GO TO 500                                       MDL37200
378*            IF (ZZL(K)-Z(KK+1)) 148,500,500                                  MDL37300
379*        148 MDLS = MODLS(KK)                                                 MDL37400
380*            IF (NBK.GT.0.AND.KK.GE.IBOT.AND.KK.LE.ITOP) MDLS = 4             MDL37500
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381*            IF (NBK .LE. 0) GO TO 149                                    MDL37600
382*            IF (KK .LT. IBOT.OR.KK .GT. ITOP) GO TO 149                  MDL37700
383*            YT = THETA(JF)+180.0                                         MDL37800
384*            ZBSL = Z(IBOT)                                               MDL37900
385*            ZTPL = Z(ITOP+1)                                             MDL38000
386*            GO TO 150                                                    MDL38100
387*          149 YT = THETA(KK)+180.0                                       MDL38200
388*            ZBSL = Z(KK)                                                 MDL38300
389*            ZTPL = Z(KK+1)                                               MDL38400
390*          150 CONTINUE                                                   MDL38500
391*        C     DEFAULT YY (ANGULAR AXES)                                  MDL38600
392*            IF (IMB .EQ. 1) GO TO 153                                    MDL38700
393*            IF (NYS .GT. 0) GO TO 153                                    MDL38800
394*            DEP = YT                                                     MDL38900
395*            NYSS = 41                                                    MDL39000
396*            DO 152 J=1,NYSS                                              MDL39100
397*          152 YY(J) = DEP+YSV(J)                                         MDL39200
398*          153 CONTINUE                                                   MDL39300
399*            DO 200 I=1,NXS                                               MDL39400
400*            DO 160 J=1,NYSS                                              MDL39500
401*            IF (KSW(2) .GT. 0) GO TO 155                                 MDL39600
402*            CALL BREAK(K,XX(I),YY(J))                                    MDL39700
403*            CDAMX(1) = AMAX1(CDAMX(1),CON(J))                            MDL39800
404*            CDAMX(2) = AMAX1(CDAMX(2),DOS(J))                            MDL39900
405*            CDAMX(3) = AMAX1(CDAMX(3),AVCON(J))                          MDL40000
406*            GO TO 160                                                    MDL40100
407*          155 CALL WASHT                                                 MDL40200
408*          160 CONTINUE                                                   MDL40300
409*            IF (KSW(2) .LE. 0) GO TO 170                                 MDL40400
410*            IMB = 1                                                      MDL40500
411*             GO TO 200                                                   MDL40600
412*          170 CONTINUE                                                   MDL40700
413*        C     OUTPUT GENERAL GRID PATTERN CALCULATIONS                   MDL40800
414*            KOUT = 4*I-3                                                 MDL40900
415*            CALL INTOUT(CON,KOUT,NYSS,2,1,1)                             MDL41000
416*            KOUT = 4*I-2                                                 MDL41100
417*            CALL INTOUT(DOS,KOUT,NYSS,2,1,1)                             MDL41200
418*            KOUT = 4*I-1                                                 MDL41300
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419*            CALL INTOUT(AVCON,KOUT,NYSS,2,1,1)                                  MDL41400
420*            KOUT = 4*1                                                          MDL41500
421*            CALL INTOUT(PASSTM,KOUT,NYSS,2,1,1)                                 MDL41600
422*          200 CONTINUE                                                          MDL41700
423*            IF (KSW(2) .LE. 0) GO TO 210                                        MDL41800
424*            IF (Z(KK+1) .LT. ZLIM) GO TO 500                                    MDL41900
425*            IFG = 1                                                             MDL42000
426*        C   OUTPUT WASHOUT DEPOSITION PATTERNS                                  MDL42100
427*            DO 205 J=1,NYSS                                                     MDL42200
428*            DO 205 I=1,NXS                                                      MDL42300
429*            IF (ISKIP(5) .GT. 1.OR.ISKIP(9) .EQ. 0) GO TO 204                   MDL42400
430*            IF (DEPN(I,J) .LE. 0.0) GO TO 205                                   MDL42500
431*            IF (DEPN(I,J) .GT. 1.0) DEPN(I,J) = 1.0                             MDL42600
432*            IF (DEPN(I,J) .LT. 1.0E-14) DEPN(I,J) = 1.0E-14                     MDL42700
433*            DEPN(I,J) = -ALOG10(DEPN(I,J))                                      MDL42800
434*            IF (DEPN(I,J) .LE. 0.0) DEPN(I,J) = 1.0E-20                         MDL42900
435*            CDAMX(1) = AMIN1(CDAMX(1),DEPN(I,J))                                MDL43000
436*            GO TO 205                                                           MDL43100
437*          204 CDAMX(1) = AMAX1(CDAMX(1),DEPN(I,J))                              MDL43200
438*          205 CONTINUE                                                          MDL43300
439*            MDLS = 5                                                            MDL43400
440*            ZZL(1) = Z(1)                                                       MDL43500
441*            CALL GENPRT(1,ZBSL,ZTPL)                                            MDL43600
442*            GO TO 500                                                           MDL43700
443*          210 CONTINUE                                                          MDL43800
444*            CALL GENPRT(K,ZBSL,ZTPL)                                            MDL43900
445*            K = K+1                                                             MDL44000
446*            IF (K .GT. NPTS) GO TO 500                                          MDL44100
447*            IF (ZZL(K) .LT. Z(KK+1)) GO TO 148                                  MDL44200
448*          500 CONTINUE                                                          MDL44300
449*        C      **** LOOP FOR NEXT TEST *****                                    MDL44400
450*          700 CONTINUE                                                          MDL44500
451*            WRITE (9) (ZEROES,J=1,6)                                            MDL44600
452*            IF (NPS .EQ. 0) GO TO 1                                             MDL44700
453*          777 CONTINUE                                                          MDL44800
454*          800 CONTINUE                                                          MDL44900
455*        C   READ AND WRITE OUT SUMMARY INFO. FOR THIS RUN                       MDL45000
456*        C                                                                       MDL45100
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457*            LSTMDL = 0                                                      MDL45200
458*            ENDFILE 9                                                       MDL45300
459*             REWIND 9                                                       MDL45400
460*            IRUN = 1                                                        MDL45500
461*          810 READ (9,END=880) IVHC1,IVHC2,IVHC3,MMNTH,MDAY,MYEAR,MHR,NMODL,MDL45600
462*             1IPLNT1                                                      MDL45700
463*            READ (9) SUMH,SUMRNG,SUMAZM,TIMX                              MDL45800
464*            READ (9) (CDAMX(K),K=1,3),RTOMX,ATOMX,ZTOMX,ZBSL,ZTPL         MDL45900
465*            NWMDL = 1                                                     MDL46000
466*            IF (CDAMX(3) .GE. 0.0) GO TO 850                              MDL46100
467*            IF (CDAMX(3)+6.0) 840,840,815                                 MDL46200
468*          815 CONTINUE                                                    MDL46300
469*            NWMDL = 5                                                     MDL46400
470*            I = 1                                                         MDL46500
471*            J = 1                                                         MDL46600
472*            IF (CDAMX(2) .LT. 0.0) J = 3                                  MDL46700
473*          820 IF (NWMDL .EQ. LSTMDL) GO TO 830                            MDL46800
474*            LSTMDL = NWMDL                                                MDL46900
475*          829 LINES = 7                                                   MDL47000
476*            WRITE (6,926) DTNM(I),NUNM(J),NUNM(J+1),DTNM(I),DTNM(I)       MDL47100
477*          830 LINES = LINES+1                                             MDL47200
478*            IF (LINES .GT. 55) GO TO 829                                  MDL47300
479*            WRITE (6,927) IRUN,IVHC1,IVHC2,IVHC3,MMNTH,MDAY,MYEAR,MHR,NMODL,MDL47400
480*             1IPLNT1,SUMH,RTOMX,ATOMX,ZTOMX,ZBSL,ZTPL,CDAMX(1)            MDL47500
481*          831 READ (9) (CDAMX(K),K=1,3),RTOMX,ATOMX,ZTOMX,ZBSL,ZTPL       MDL47600
482*            YT = CDAMX(3)+RTOMX+ATOMX+ZTOMX+ZBSL+ZTPL                     MDL47700
483*            IF (YT) 832,833,832                                           MDL47800
484*          832 LINES = LINES+1                                             MDL47900
485*            IF (LINES .GT. 55) GO TO 829                                  MDL48000
486*            WRITE (6,929) RTOMX,ATOMX,ZTOMX,ZBSL,ZTPL,CDAMX(1)            MDL48100
487*            GO TO 831                                                     MDL48200
488*          833 CONTINUE                                                    MDL48300
489*            GO TO 870                                                     MDL48400
490*          840 I = 2                                                       MDL48500
491*            NWMDL = 6                                                     MDL48600
492*            J = 1                                                         MDL48700
493*            GO TO 820                                                     MDL48800
494*          850 IF (NWMDL .EQ. LSTMDL) GO TO 860                            MDL48900
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495*            LSTMDL = NWMDL                                                  MDL49000
496*            J = 9                                                           MDL49100
497*            I = 11                                                          MDL49200
498*            IF (IPLNT1 .NE. NPLNTP) GO TO 855                               MDL49300
499*            J = 5                                                           MDL49400
500*            I = 7                                                           MDL49500
501*         855 CONTINUE                                                       MDL49600
502*            TIMX = TIMX/60.0                                                MDL49700
503*         857 LINES = 7                                                      MDL49800
504*            WRITE (6,925) TIMX,NUNM(J),NUNM(J+1),NUNM(I),NUNM(I+1),NUNM(J), MDL49900
505*           1NUNM(J+1)                                                       MDL50000
506*         860 LINES = LINES+1                                                MDL50100
507*            IF (LINES .GT. 55) GO TO 857                                    MDL50200
508*            WRITE (6,928) IRUN,IVHC1,IVHC2,IVHC3,MMNTH,MDAY,MYEAR,MHR,NMODL, MDL50300
509*           1IPLNT1,SUMH,RTOMX,ATOMX,ZTOMX,ZBSL,ZTPL,(CDAMX(K),K=1,3)         MDL50400
510*         861 READ (9) (CDAMX(K),K=1,3),RTOMX,ATOMX,ZTOMX,ZBSL,ZTPL          MDL50500
511*            YT = CDAMX(1)+CDAMX(2)+CDAMX(3)+RTOMX+ATOMX+ZTOMX+ZBSL+ZTPL     MDL50600
512*            IF (YT) 862,863,862                                             MDL50700
513*         862 LINES = LINES+1                                                MDL50800
514*            IF (LINES .GT. 52) GO TO 857                                    MDL50900
515*            WRITE (6,930) RTOMX,ATOMX,ZTOMX,ZBSL,ZTPL,(CDAMX(K),K=1,3)      MDL51000
516*            GO TO 861                                                       MDL51100
517*         863 CONTINUE                                                       MDL51200
518*         870 CONTINUE                                                       MDL51300
519*            IRUN = IRUN+1                                                   MDL51400
520*            GO TO 810                                                       MDL51500
521*         880 CONTINUE                                                       MDL51600
522*            IF (MBR .EQ. 5) CALL ENDJOB                                     MDL51700
523*         903 FORMAT (1H0,55X,11H***** LAYER,I2,6H *****)                    MDL51800
524*         904 FORMAT (1H0,57X,16H** INPUT DATA **)                           MDL51900
525*         905 FORMAT (4H0 Q=,E14.8,6H, ZRK=,F7.3,17H, UBAR AT BOTTOM=,F8.4,14H, MDL52000
526*           1UBAR AT TOP=,F8.4,18H, SIGAK AT BOTTOM=,F8.5/14H SIGAK AT TOP=,F8.MDL52100
527*           25,18H, SIGEK AT BOTTOM=,F8.5,15H, SIGEK AT TOP=,F8.5,7H, TAUK=,F8.MDL52200
528*           33,8H, TAUOK=,F8.3/7H SIGXO=,F9.4,8H, SIGYO=,F9.4,8H, SIGZO=,F9.4,1MDL52300
529*           49H, THETAK AT BOTTOM=,F8.3,16H, THETAK AT TOP=,F8.3,4H, Z=,F9.3/7HMDL52400
530*           5 ALPHA=,F4.1,6H BETA=,F4.1,4H, H=,F9.3,7H, DELX=,E14.8,7H, DELY=,EMDL52500
531*           614.8,8H, IZMOD=,I3,7H, TIM1=,E14.8/6H ZLIM=,F9.3,              MDL52600
532*           79H, LAMBDA=,F7.4,8H, TIMAV=,F8.3,6H, XRY=,F8.3,6H, XRZ=,F8.3,7H, XMDL52700
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533*        8LRY=,F8.3,7H, XLRZ=,F6.3,9H, GAMMAP=,F5.3)                                MDL52800
534*      917 FORMAT (12X,18(6H------)/)                                               MDL52900
535*      918 FORMAT (4H0 Q=,E14.8,17H, UBAR AT BOTTOM=,F8.4,14H, UBAR AT TOP=,FMDL53000
536*         18.4,18H, SIGAK AT BOTTOM=,F8.5,15H, SIGAK AT TOP=,F8.5/17H SIGEK AMDL53100
537*         2T BOTTOM=,F6.5,15H, SIGEK AT TOP=,F8.5,8H, SIGXO=,F9.4,8H, SIGYO=,MDL53200
538*         3F9.4,8H, SIGZO=,F9.4,19H, THETAK AT BOTTOM=,F8.3/15H THETAK AT TOPMDL53300
539*         4=,F8.3,4H, Z=,F9.3,8H, ALPHA=,F4.1,7H, BETA=,F4.1,          7H, MDL53400
540*         5DELX=,E14.8,7H, DELY=,E14.8/7H IZMOD=,I3)                              MDL53500
541*      919 FORMAT (1X,10H Z AT TOP=,F10.4)                                          MDL53600
542*      920 FORMAT (6H0 ZRL=,F7.3,18H, UBARL AT BOTTOM=,F8.4,15H, UBARL AT TOPMDL53700
543*         1=,F6.4,18H, SIGAL AT BOTTOM=,F8.5,15H, SIGAL AT TOP=,F8.5/17H SIGEMDL53800
544*         2L AT BOTTOM=,F8.5,15H, SIGEL AT TOP=,F8.5,19H, THETAL AT BOTTOM=,FMDL53900
545*         38.3,16H, THETAL AT TOP=,F8.3,7H, TAUL=,F8.3/7H TAUOL=,F8.3,8H, ALPMDL54000
546*         4HL=,F4.1,7H, BETL=,F4.1,7H, TAST=,E14.8,7H, JBOT=,I2,7H, JTOP=,I2)MDL54100
547*      921 FORMAT (18H0 UBARL AT BOTTOM=,F8.4,15H, UBARL AT TOP=,F8.4,18H, SIMDL54200
548*         1GAL AT BOTTOM=,F8.5,15H, SIGAL AT TOP=,F8.5/17H SIGEL AT BOTTOM=,FMDL54300
549*         28.5,15H, SIGEL AT TOP=,F8.5,19H, THETAL AT BOTTOM=,F8.3,16H, THETAMDL54400
550*         3L AT TOP=,F8.3,7H, TAUL=,F8.3/7H TAUOL=,F8.3,8H, ALPHL=,F4.1,7H, BMDL54500
551*         4ETL=,F4.1,7H, TAST=,E14.8,7H, JBOT=,I2,7H, JTOP=,I2)                   MDL54600
552*      922 FORMAT (1H0,56HCALCULATED INPUT PARAMETERS FOR MODELS 1,2,3 **** UMDL54700
553*         1BAR =,F10.5,9H, THETA =,F10.5,10H, DELTHP =,F10.5,8H, DELU =,F10.5MDL54800
554*         2/1X,09H, SIGAP =,F10.5,9H, SIGEP =,F10.5)                              MDL54900
555*      923 FORMAT (1H0,63HCALCULATED INPUT PARAMETERS FOR LAYER CHANGE MODEL MDL55000
556*         14 *** UBAR =,F10.5,9H, THETA =,F10.5,10H, DELTHP =,F10.5/1X,8H  DEMDL55100
557*         2LU =,F10.5,9H, SIGAP =,F10.5,9H, SIGEP =,F10.5)                        MDL55200
558*      925 FORMAT (1H1,56X,15HSUMMARY OF RUNS/131H  R       VEHICLE            DAMDL55300
559*         1TE   TIME  M CONST- CLD RISE RANGE    AZIMUTH   HEIGHT  LAYER    LMDL55400
560*         2AYER    MAX PEAK      MAX      MAX PEAK/3H  U,20X,098HMO DY YR     MDL55500
561*         3  O ITUENT  HEIGHT   TO         TO         OF    BOTTOM    TOP     MDL55600
562*         4 CONC      DOSAGE  ,F5.1,5H MIN,/3H  N,28X,8H(HR-Z) D,10X,51H(M)  MDL55700
563*         5 MAX PEAK MAX PEAK    CALC.    (M)       (M)     ,A6,A3,2A6,10H TIME MDL55800
564*         6MEAN/38X,1HE,18X,22HCONC     CONC       (M),46X,4HCONC/38X,1HL,18X,MDL55900
565*         73H(M),6X,5H(DEG),51X,A6,A3/1X,65(2H--))                                MDL56000
566*      926 FORMAT (1H1,56X,15HSUMMARY OF RUNS/113H  R       VEHICLE          DAMDL56100
567*         1TE   TIME  M CONST- CLD RISE   RANGE        AZIMUTH   HEIGHT  LAYERMDL56200
568*         2    LAYER   MAX PEAK/3H  U,20X,38HMO DY YR        O ITUENT  HEIGHT MDL56300
569*         3    TO,11X,2HTO,8X,22HOF    BOTTOM    TOP   ,A6,4H DEP/3H  N,28X,8MDL56400
570*         4H(HR-Z) D,10X,56H(M)     MAX PEAK    MAX PEAK    CALC.    (M)      MDL56500
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571*          5(M)    ,A6,A3/38X,1HE,16X,A6,6H DEP  ,A6,12H DEP     (M)/38X,1HL,2MDL56600
572*          60X,3H(M),7X,5H(DEG)/1X,58(2H--))                                  MDL56700
573*        927 FORMAT (1X,I2,1X,3A6,I3,2(1H/,I2),I5,I3,1X,A6,F8.2,F10.2,F11.2,F12MDL56800
574*          1.2,2F8.2,F11.3)                                                   MDL56900
575*        928 FORMAT (1X,I2,1X,3A6,I3,2(1H/,I2),I5,I3,1X,A6,F8.2,F9.2,F8.2,F10.2MDL57000
576*          1,F8.2,F9.2,3F11.3)                                                MDL57100
577*        929 FORMAT (53X,2F11.2,F12.2,2F8.2,F11.3)                            MDL57200
578*        930 FORMAT (54X,F9.2,F8.2,F10.2,F8.2,F9.2,3F11.3)                    MDL57300
579*            STOP                                                           MDL57400
580*            END                                                            MDL57500
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1*            SUBROUTINE READER, VERSION  6,  REVISION 0
2*
3*            SUBROUTINE READER(IFF)                                                    RDR00100
4*            COMMON /PARAMT/ TESTNO(12),         ISKIP(15),NXS,NYS,NZS,NDI,NCI,        RDR00200
5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),             RDR00300
6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),              RDR00400
7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,             RDR00500
8*           4XLRY,XLRZ,ZZL(40),IZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),         RDR00600
9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),RDR00700
10*          6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)RDR00800
11*          7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                          RDR00900
12*           COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),RDR01000
13*          1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,ST01,            RDR01100
14*          2ST02,ST03,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,         RDR01200
15*          3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,            RDR01300
16*          4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,                  RDR01400
17*          5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),               RDR01500
18*          6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,           RDR01600
19*          7NYSS,CDAMX(3)                                                             RDR01700
20*     C     THIS SUBROUTINE READS ALL INPUT DATA AND CALCULATES NECESSARY            RDR01800
21*     C     LAYER PARAMETERS                                                         RDR01900
22*           INTEGER TESTNO                                                           RDR02000
23*           REAL MPWR,L,LAMBDA                                                       RDR02100
24*           DIMENSION XSV(41),IZR1(1)                                                RDR02200
25*           COMMON /LOCALS/ BLAMDA,TEMPK(16),TEMPL(10),NSND,METDAT(3),NVHCL,         RDR02300
26*          1NMODL,NPLNT                                                              RDR02400
27*           DIMENSION NTFB(2)                                                        RDR02500
28*           COMMON /PLTISO/ SCL,XMAXIN,YMAXIN,XSIZE,YSIZE,RASTIN,JSW                 RDR02600
29*           COMMON /PLTLLO/ ISW,XMAXJN,YMAXJN,XCIZE,YCIZE                            RDR02700
30*           EQUIVALENCE(NTFB,ITOP)                                                   RDR02800
31*           EQUIVALENCE (IZR1,ISKIP)                                                 RDR02900
32*           DATA YSV/-35.,-30.,-26.,-22.,-18.,-15.,-12.,-10.,-8.,-6.,-5.,-4.,       RDR03000
33*          1-3.,-2.5,-2.,-1.5,-1.,-.75,-.5,-.25,0.,.25,.5,.75,1.,1.5,2.,2.5,         RDR03100
34*          23.,4.,5.,6.,8.,10.,12.,15.,18.,22.,26.,30.,35./                          RDR03200
35*           DATA XSV/25.,100.,200.,400.,600.,800.,1000.,2000.,3000.,4000.,           RDR03300
36*          15000.,6000.,7000.,8000.,9000.,10000.,11000.,12000.,13000.,14000.,RDR03400
37*          215000.,16000.,17000.,18000.,20000.,22000.,24000.,26000.,28000.,          RDR03500
38*          330000.,32000.,34000.,36000.,38000.,40000.,42000.,44000.,46000.,          RDR03600
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39*          450000.,65000.,60000./                                                    RDR03700
40*     C     MACHINE DEPENDENT STATEMENT ASSUMES SIX BYTES/WORD                        RDR03800
41*           DATA TESTNO/12*6H      /,NAMCAS/12*6H      /                             RDR03900
42*     C     SR12I =  1.0/SQRT(12.0)                                                   RDR04000
43*           NAMELIST /NAM2/ TESTNO,ISKIP,NXS,NYS,NZS,NDI,NCI,NPTS,NTI,TI,             RDR04100
44*          1NVS,NVB,XX,YY,Z,DELX,DELY,Q,UBARK,SIGAK,SIGEK,SIGXO,SIGYO,GAMMAP,       RDR04200
45*          2SIGZO,ALPHA,BETA,ZRK,TIMAV,THETAK,TAUK,TAUOK,H,XRY,XRZ,XLRY,XLRZ,       RDR04300
46*          3ZZL,IZMOD,DECAY,TIM1,BLAMDA,DI,CI,TAST,ZLIM,HB,PERCB,VB,                RDR04400
47*          4VS,PERC,ACCUR,ALPHL,BETL,TAUL,TAUOL,ZRL,UBARL,SIGAL,SIGEL,THETAL,       RDR04500
48*          5NPS,NAMCAS,SCL,XMAXIN,YMAXIN,ISW,XMAXJN,YMAXJN,RASTIN                   RDR04600
49*          6,XSIZE,YSIZE,XCIZE,YCIZE,TEMPK,TEMPL,JSW                                RDR04700
50*          7,NVHCL,METDAT,NSND,NMODL,NPLNT                                          RDR04800
51*           IF (IFF .GT. 1) GO TO 2                                                 RDR04900
52*     C     ZERO OUT INPUT LISTS FOR PROCESSORS WHERE CORE IS NOT                    RDR05000
53*     C     INITIALIZE TO ZERO, 608 IS THE LENGTH OF COMMON /PARAMT/, SUBTRACT       RDR05100
54*     C     12 FOR TESTNO AND 12 FOR NAMCAS                                          RDR05200
55*           DO 1 I=1,584                                                            RDR05300
56*         1 IZR1(I) = 0                                                             RDR05400
57*         2 CONTINUE                                                                RDR05500
58*           CALL TAPEIN(IFF)                                                        RDR05600
59*           IF (IFF .NE. 0) GO TO 3                                                 RDR05700
60*           RETURN                                                                  RDR05800
61*         3 CONTINUE                                                                RDR05900
62*           DO 71 I=1,20                                                            RDR06000
63*        71 GAMMA(I) = 1.0-GAMMAP(I)                                                RDR06100
64*           NNZ = NZS-1                                                             RDR06200
65*           LAMBDA = BLAMDA                                                         RDR06300
66*           NCC = NCI/10                                                            RDR06400
67*           NDD = NDI/10                                                            RDR06500
68*           NTT = NTI/10                                                            RDR06600
69*           NCCC = NCI-NCC*10                                                       RDR06700
70*           NDDD = NDI-NDD*10                                                       RDR06800
71*           NTTT = NTI-NTT*10                                                       RDR06900
72*           IF (XSIZE .LE. 0.0) XSIZE = 5.5                                         RDR07000
73*           IF (YSIZE .LE. 0.0) YSIZE = 5.5                                         RDR07100
74*           IF (XCIZE .LE. 0.0) XCIZE = 5.5                                         RDR07200
75*           IF (YCIZE .LE. 0.0) YCIZE = 5.5                                         RDR07300
76*           IF (ISW .LE. 0) ISW = 2                                                 RDR07400
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77*      CC                                                              RDR07500
78*            RASTIN = 1.0                                              RDR07600
79*      CC    IF (RASTIN .LE. 0.0) RASTIN = 163.2                       RDR07700
80*      CC    XSIZE = 937.0                                             RDR07800
81*      CC    YSIZE = 899.0                                             RDR07900
82*      CC    XCIZE = 937.0                                             RDR08000
83*      CC    YCIZE = 899.0                                             RDR08100
84*            IF (NXS .GT. 0) GO TO 5                                   RDR08200
85*      C     DEFAULT XA                                                RDR08300
86*            NXS = 41                                                  RDR08400
87*            DO 4 I=1,NXS                                              RDR08500
88*          4 XA(I) = XSV(I)                                            RDR08600
89*          5 CONTINUE                                                  RDR08700
90*            IF (TAUOK .GT. 0.0) GO TO 6                               RDR08800
91*      C     DEFAULT TAUOK                                             RDR08900
92*            TAUOK = 600.0                                             RDR09000
93*          6 CONTINUE                                                  RDR09100
94*          8 DO 16 I=1,NNZ                                             RDR09200
95*      C     DEFAULT SIGYO                                             RDR09300
96*            IF (SIGYO(I) .GT. 0.0) GO TO 9                            RDR09400
97*            SIGYO(I) = SIGXO(I)                                       RDR09500
98*          9 CONTINUE                                                  RDR09600
99*            IF (ALPHA(I) .GT. 0.0) GO TO 10                           RDR09700
100*     C     DEFAULT ALPHA                                             RDR09800
101*           ALPHA(I) = 1.0                                            RDR09900
102*        10 IF (BETA(I) .GT. 0.0) GO TO 12                            RDR10000
103*     C     DEFAULT BETA                                              RDR10100
104*           BETA(I) = 1.0                                             RDR10200
105*        12 CONTINUE                                                  RDR10300
106*           IF (IZMOD(I) .GT. 0) GO TO 16                             RDR10400
107*     C     DEFAULT IZMOD                                             RDR10500
108*           IZMOD(I) = 1                                              RDR10600
109*        16 CONTINUE                                                  RDR10700
110*           IF (XRY .GT. 0.0) GO TO 18                                RDR10800
111*     C     DEFAULT XRY                                               RDR10900
112*           XRY = 100.0                                               RDR11000
113*        18 IF (XRZ .GT. 0.0) GO TO 20                                RDR11100
114*     C     DEFAULT XRZ                                               RDR11200
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115*            XRZ = 100.0                                                    RDR11300
116*         20 IF (TIMAV .GT. 0.0) GO TO 24                                   RDR11400
117*      C     DEFAULT TIMAV                                                  RDR11500
118*            TIMAV = 600.0                                                  RDR11600
119*            IF (ISKIP(5) .EQ. 2) TIMAV = 360.0                             RDR11700
120*         24 IF (ZRK .GT. 0.0) GO TO 26                                     RDR11800
121*      C     DEFAULT ZRK                                                    RDR11900
122*            ZRK = 2.0                                                      RDR12000
123*         26 CONTINUE                                                       RDR12100
124*            IF (ISKIP(6) .EQ. 0) ISKIP(6) = 2                              RDR12200
125*      C     CHECK IZMOD                                                    RDR12300
126*            KSW(2) = 0                                                     RDR12400
127*            NBK = 0                                                        RDR12500
128*            KSW(1) = 0                                                     RDR12600
129*            DO 75 I=1,5                                                    RDR12700
130*            JBOT(I) = 0                                                    RDR12800
131*         75 JTOP(I) = 0                                                    RDR12900
132*            DO 34 I=1,NNZ                                                  RDR13000
133*            I1 = IZMOD(I)/100                                              RDR13100
134*            I2 = (IZMOD(I)-I1*100)/10                                      RDR13200
135*            I3 = IZMOD(I)-I1*100-I2*10                                     RDR13300
136*            IF (I .GT. 1) GO TO 27                                         RDR13400
137*            IF (I1 .NE. 6.AND.I2 .NE. 6.AND.I3 .NE. 6) GO TO 27            RDR13500
138*            KSW(1) = 1                                                     RDR13600
139*            GO TO 72                                                       RDR13700
140*         27 IF (I1.NE.5.AND.I2.NE.5.AND.I3.NE.5) GO TO 28                  RDR13800
141*            ZLIM = Z(I+1)                                                  RDR13900
142*            KSW(2) = 1                                                     RDR14000
143*            I1 = I                                                         RDR14100
144*         28 IF (I2.EQ.9.OR.I1.EQ.9.OR.I3 .EQ. 9) GO TO 29                  RDR14200
145*            IF (I2.NE.4.AND.I1.NE.4.AND.I3 .NE. 4) GO TO 31                RDR14300
146*            IF (NBK .GT. 0) GO TO 30                                       RDR14400
147*         29 NBK = NBK+1                                                    RDR14500
148*            JBOT(NBK) = I                                                  RDR14600
149*         30 JTOP(NBK) = I                                                  RDR14700
150*         31 NTAL = 0                                                       RDR14800
151*            MODLS(I) = 1                                                   RDR14900
152*         32 NTAL = NTAL+1                                                  RDR15000
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153*            IF (NTAL .GT. 3) GO TO 33                                          RDR15100
154*            IF (I1 .EQ. NTAL.OR.I2 .EQ. NTAL.OR.I3 .EQ. NTAL) GO TO 33         RDR15200
155*            GO TO 32                                                           RDR15300
156*         33 IF (NTAL .LT. 4) MODLS(I) = NTAL                                   RDR15400
157*         34 CONTINUE                                                           RDR15500
158*            IF (KSW(2) .NE. 1) GO TO 72                                        RDR15600
159*            NPTS = II                                                          RDR15700
160*            DO 70 I=1,II                                                       RDR15800
161*         70 ZZL(I) = Z(I)                                                      RDR15900
162*            GO TO 73                                                           RDR16000
163*         72 IF (NPTS .GT. 0) GO TO 73                                          RDR16100
164*            NPTS = 1                                                           RDR16200
165*            ZZL(1) = 0.0                                                       RDR16300
166*         73 CONTINUE                                                           RDR16400
167*            IF (LAMBDA .LE. 0.0) GO TO 74                                      RDR16500
168*            IF (ZLIM .LE. 0.0) ZLIM = Z(NZS)                                   RDR16600
169*         74 CONTINUE                                                           RDR16700
170*            DO 36 I=1,NZS                                                      RDR16800
171*      C     CHECK MINIMUM LIMITS                                               RDR16900
172*            IF (SIGAK(I) .LT. .5) SIGAK(I) = .5                                RDR17000
173*            IF (SIGEK(I) .LT. .1) SIGEK(I) = .1                                RDR17100
174*            IF (UBARK(I) .LT. .1) UBARK(I) = .1                                RDR17200
175*         36 CONTINUE                                                           RDR17300
176*            IF (NBK .EQ. 0) GO TO 57                                           RDR17400
177*            IF (ISKIP(7) .GT. 0) GO TO 40                                      RDR17500
178*      C     DETERMINE LAYER CHANGE PARAMETERS                                  RDR17600
179*            ZRL = ZRK                                                          RDR17700
180*            II = -1                                                            RDR17800
181*            DO 38 I=1,NBK                                                      RDR17900
182*            II = II+2                                                          RDR18000
183*            NTAL = JBOT(I)                                                     RDR18100
184*            NTAK = JTOP(I)                                                     RDR18200
185*            UBARL(II) = UBARK(NTAL)                                            RDR18300
186*            UBARL(II+1) = UBARK(NTAK+1)                                        RDR18400
187*            SIGAL(II) = SIGAK(NTAL)                                            RDR18500
188*            SIGAL(II+1) = SIGAK(NTAK+1)                                        RDR18600
189*            SIGEL(II) = SIGEK(NTAL)                                            RDR18700
190*            SIGEL(II+1) = SIGEK(NTAK+1)                                        RDR18800
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1191*            THETAL(II) = THETAK(NTAL)                                  RDR18900
1192*            THETAL(II+1) = THETAK(NTAK+1)                              RDR19000
1193*            ALPHL(I) = ALPHA(NTAL)                                     RDR19100
1194*            BETL(I) = BETA(NTAL)                                       RDR19200
1195*            TEMPL(II) = TEMPK(NTAL)                                    RDR19300
1196*            TEMPL(II+1) = TEMPK(NTAK+1)                                RDR19400
1197*         38 CONTINUE                                                   RDR19500
1198*            TAUOL = TAUOK                                              RDR19600
1199*            TAUL = TAUK                                                RDR19700
2200*            GO TO 52                                                   RDR19800
2201*         40 CONTINUE                                                   RDR19900
2202*            IF (TAUOL .GT. 0.0) GO TO 42                               RDR20000
2203*      C     DEFAULT TAUOL                                              RDR20100
2204*            TAUOL = 600.0                                              RDR20200
2205*         42 IF (ZRL .GT. 0.0) GO TO 44                                 RDR20300
2206*      C     DEFAULT ZRL                                                RDR20400
2207*            ZRL = ZRK                                                  RDR20500
2208*         44 DO 48 I=1,NBK                                              RDR20600
2209*            IF (ALPHL(I) .GT. 0.0) GO TO 46                            RDR20700
2210*      C     DEFAULT ALPHL                                              RDR20800
2211*            ALPHL(I) = 1.0                                             RDR20900
2212*         46 IF (BETL(I) .GT. 0.0) GO TO 48                             RDR21000
2213*      C     DEFAULT BETL                                               RDR21100
2214*            BETL(I) = 1.0                                              RDR21200
2215*         48 CONTINUE                                                   RDR21300
2216*            NTAL = 2*NBK                                               RDR21400
2217*            DO 50 I=1,NTAL                                             RDR21500
2218*      C     CHECK MINIMUM VALUES                                       RDR21600
2219*            IF (SIGAL(I) .LT. .5) SIGAL(I) = .5                        RDR21700
2220*            IF (UBARL(I) .LT. .1) UBARL(I) = .1                        RDR21800
2221*            IF (SIGEL(I) .LT. .1) SIGEL(I) = .1                        RDR21900
2222*         50 CONTINUE                                                   RDR22000
2223*         52 NTAK = NNZ+1                                               RDR22100
2224*            NTAL = NNZ+NBK                                             RDR22200
2225*      C     COMBINE ALPHA AND BETA WITH ALPHL AND BETL                 RDR22300
2226*            DO 54 I=NTAK,NTAL                                          RDR22400
2227*            INNZ = I-NNZ                                               RDR22500
2228*            ALPHA(I) = ALPHL(INNZ)                                     RDR22600
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      BETA(I) = BETL(INNZ)                                                    RDR22700
   54 CONTINUE                                                                RDR22800
   57 CONTINUE                                                                RDR22900
   58 CONTINUE                                                                RDR23000
      ST01 = (TAUK/TAU0K)**(0.2)*RAD                                          RDR23100
      S = (Z(2)/ZRK)                                                          RDR23200
      S1 = 1.0/ALOG(S)                                                        RDR23300
      P = RB8(UBARK(2),UBARK(1),S1)                                           RDR23400
C     CALCULATE UBAR FOR LAYER 1                                              RDR23500
      UBAR(1) = RB11(UBARK(1),P,Z(2),ZRK)                                     RDR23600
      PPWR = P                                                                RDR23700
      IF (NNZ .LT. 2) GO TO 152                                               RDR23800
      DO 150 I=2,NNZ                                                          RDR23900
C     CALCULATE UBAR FOR LAYERS 2 TO NNZ                                      RDR24000
  150 UBAR(I) = 0.5*(UBARK(I+1)+UBARK(I))                                     RDR24100
  152 P = RB8(SIGAK(2),SIGAK(1),S1)                                           RDR24200
C     CALCULATE SIGAP FOR LAYER 1                                             RDR24300
      SIGAP(1) = ST01*RB11(SIGAK(1),P,Z(2),ZRK)                               RDR24400
      MPWR = P                                                                RDR24500
      IF (NNZ .LT. 2) GO TO 162                                               RDR24600
      ST02 = RAD*(TAUK/600.0)**.2                                             RDR24700
      DO 160 I=2,NNZ                                                          RDR24800
C     CALCULATE SIGAP FOR LAYERS 2 TO NNZ                                     RDR24900
  160 SIGAP(I) = 0.5*ST02*(SIGAK(I+1)+SIGAK(I))                               RDR25000
  162 P = RB8(SIGEK(2),SIGEK(1),S1)                                           RDR25100
C     CALCULATE SIGEP FOR LAYER 1                                             RDR25200
      SIGEP(1) = RB11(SIGEK(1),P,Z(2),ZRK)*RAD                                RDR25300
      IF (NNZ .LT. 2) GO TO 172                                               RDR25400
      QPWR = P                                                                RDR25500
      DO 170 I=2,NNZ                                                          RDR25600
C     CALCULATE SIGEP FOR LAYERS 2 TO NNZ                                     RDR25700
  170 SIGEP(I) = ((SIGEK(I+1)+SIGEK(I))*RAD)*0.5                              RDR25800
  172 DO 180 I=1,NNZ                                                          RDR25900
      J = I                                                                   RDR26000
C     CALCULATE THETA FOR ALL LAYERS                                          RDR26100
      THETA(I) = 0.5*(THETAK(J+1)+THETAK(J))                                  RDR26200
      IF (ABS(THETAK(J+1)-THETAK(J)) .GT. 180.0) THETA(1) = THETA(I)-         RDR26300
     1180.0                                                                   RDR26400
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267*      C     CALCULATE DELTHP FOR ALL LAYERS                                  RDR26500
268*            DELTHP(I) = THETAK(J+1)-THETAK(J)                                RDR26600
269*            IF (DELTHP(I) .GT. 180.0) DELTHP(I) = 360.0-DELTHP(I)            RDR26700
270*            IF (DELTHP(I) .LT. -180.0) DELTHP(I) = 360.0+DELTHP(I)           RDR26800
271*        180 CONTINUE                                                         RDR26900
272*            DO 185 I=1,NNZ                                                   RDR27000
273*      C     CALCULATE DELU FOR ALL LAYERS                                    RDR27100
274*            DELU(I) = UBARK(I+1)-UBARK(I)                                    RDR27200
275*            IF (DELU(I) .GE. 0.0) GO TO 185                                  RDR27300
276*            IF (TEMPK(I+1)-TEMPK(I) .GE. 0.0) GO TO 185                      RDR27400
277*            DELU(I) = ABS(DELU(I))                                           RDR27500
278*        185 CONTINUE                                                         RDR27600
279*            IF (KSW(1) .GT. 0) GO TO 250                                     RDR27700
280*            IF (NBK .EQ. 0) GO TO 250                                        RDR27800
281*            ST01 = (TAUL/TAUOL)**(0.2)*RAD                                   RDR27900
282*            M = JTOP(1)                                                      RDR28000
283*            IF (JBOT(1) .GT. 1) GO TO 186                                    RDR28100
284*            S = (Z(M+1)/ZRL)                                                 RDR28200
285*            S1 = 1.0/ALOG(S)                                                 RDR28300
286*        186 IF (ISKIP(7) .GT. 0) GO TO 192                                   RDR28400
287*            DO 188 I=1,NBK                                                   RDR28500
288*            NNZ1 = NNZ+1                                                     RDR28600
289*            M1 = JBOT(I)                                                     RDR28700
290*            M2 = JTOP(I)                                                     RDR28800
291*            S = 0.0                                                          RDR28900
292*            DO 187 J=M1,M2                                                   RDR29000
293*        187 S = S+0.5*(UBARK(J)+UBARK(J+1))*(Z(J+1)-Z(J))                    RDR29100
294*            UBAR(NNZI) = S/(Z(M2+1)-Z(M1))                                   RDR29200
295*        188 CONTINUE                                                         RDR29300
296*            GO TO 202                                                        RDR29400
297*        192 CONTINUE                                                         RDR29500
298*            IF (JBOT(1) .GT. 1) GO TO 193                                    RDR29600
299*            P = RB8(UBARL(2),UBARL(1),S1)                                    RDR29700
300*      C     CALCULATE UBAR FOR NEW LAYER 1 (IF CONTAINS SURFACE)             RDR29800
301*            UBAR(NNZ+1) = RB11(UBARL(1),P,Z(M+1),ZRL)                        RDR29900
302*            QPWR = P                                                         RDR30000
303*            GO TO 197                                                        RDR30100
304*      C     CALCULATE UBAR FOR NEW LAYER 1 (IF DOES'NT CONTAIN SURFACE)      RDR30200
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305*          193 UBAR(NNZ+1) = (UBARL(1)+UBARL(2))*0.5                    RDR30300
306*          197 IF (NBK .LT. 2) GO TO 202                                RDR30400
307*              DO 200 I=2,NBK                                           RDR30500
308*              J = I*2-1                                                RDR30600
309*        C     CALCULATE UBAR FOR NEW LAYERS 2 TO NBK                   RDR30700
310*              NNZI = NNZ+I                                             RDR30800
311*          200 UBAR(NNZI) = (UBARL(J+1)+UBARL(J))*0.5                   RDR30900
312*          202 IF (JBOT(1) .GT. 1) GO TO 210                            RDR31000
313*              P = RB8(SIGEL(2),SIGEL(1),S1)                            RDR31100
314*        C     CALCULATE SIGEP FOR NEW LAYER 1 (IF CONTAINS SURFACE)    RDR31200
315*              SIGEP(NNZ+1) = RB11(SIGEL(1),P,Z(M+1),ZRL)*RAD           RDR31300
316*              GO TO 215                                                RDR31400
317*        C     CALCULATE SIGEP FOR NEW LAYER 1 (IF DOES'NT CONTAIN SURFACE) RDR31500
318*          210 SIGEP(NNZ+1) = ((SIGEL(2)+SIGEL(1))*RAD)*0.5             RDR31600
319*          215 IF (NBK .LT. 2) GO TO 217                                RDR31700
320*              DO 216 I=2,NBK                                           RDR31800
321*              J = I*2-1                                                RDR31900
322*        C     CALCULATE SIGEP FOR NEW LAYERS 2 TO NBK                  RDR32000
323*              NNZI = NNZ+I                                             RDR32100
324*          216 SIGEP(NNZI) = ((SIGEL(J+1)+SIGEL(J))*RAD)*0.5            RDR32200
325*          217 IF (ISKIP(7) .GT. 0) GO TO 226                           RDR32300
326*              DO 225 I=1,NBK                                           RDR32400
327*        C     CALCULATE THETA FOR NEW LAYERS 1 TO NBK                  RDR32500
328*              NNZI = NNZ+I                                             RDR32600
329*              M1 = JBOT(I)                                             RDR32700
330*              M2 = JTOP(I)                                             RDR32800
331*              T1 = THETAK(M1)                                          RDR32900
332*              ANG(M1) = T1                                             RDR33000
333*              S = 0.0                                                  RDR33100
334*              DO 222 J=M1,M2                                           RDR33200
335*              T2 = THETAK(J+1)                                         RDR33300
336*              IF (ABS(T2-T1) .LE. 180.0) GO TO 221                     RDR33400
337*              IF (T2 .GT. T1) GO TO 220                                RDR33500
338*              T2 = T2+360.0                                            RDR33600
339*              GO TO 221                                                RDR33700
340*          220 T2 = T2-360.0                                            RDR33800
341*          221 P = 0.5*(T2+T1)                                          RDR33900
342*              T1 = T2                                                  RDR34000
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343*            ANG(J+1) = T1                                                    RDR34100
344*        222 S = S+P*(Z(J+1)-Z(J))                                            RDR34200
345*            THETA(NNZI) = S/(Z(M2+1)-Z(M1))                                  RDR34300
346*            T1 = 0.0                                                         RDR34400
347*            T2 = 0.0                                                         RDR34500
348*            M2 = M2+1                                                        RDR34600
349*            DO 223 J=M1,M2                                                   RDR34700
350*            T1 = T1+Z(J)                                                     RDR34800
351*        223 T2 = T2+ANG(J)                                                   RDR34900
352*            P = 1.0/FLOAT(M2-M1+1)                                           RDR35000
353*            T2 = T2*P                                                        RDR35100
354*            T1 = T1*P                                                        RDR35200
355*            P = 0.0                                                          RDR35300
356*            S = 0.0                                                          RDR35400
357*            DO 224 J=M1,M2                                                   RDR35500
358*            P = P+(Z(J)-T1)*(ANG(J)-T2)                                      RDR35600
359*        224 S = S+(Z(J)-T1)**2                                               RDR35700
360*            DELTHP(NNZI) = (Z(M2)-Z(M1))*P/S                                 RDR35800
361*            IF (DELTHP(NNZI) .GT. 180.0) DELTHP(NNZI) = 360.0-DELTHP(NNZI)   RDR35900
362*            IF (DELTHP(NNZI) .LT. -180.0) DELTHP(NNZI) = 360.0+DELTHP(NNZI)  RDR36000
363*        225 CONTINUE                                                         RDR36100
364*            GO TO 230                                                        RDR36200
365*        226 DO 227 I=1,NBK                                                   RDR36300
366*            J = 2*I-1                                                        RDR36400
367*            NNZI = NNZ+1                                                     RDR36500
368*            THETA(NNZI) = 0.5*(THETAL(J+1)+THETAL(J))                        RDR36600
369*            IF(ABS(THETAL(J+1)-THETAL(J)).GT.180.)THETA(NNZI)=THETA(NNZI)+180.RDR36700
370*            DELTHP(NNZI) = THETAL(J+1)-THETAL(J)                             RDR36800
371*            IF (DELTHP(NNZI) .GT. 180.0) DELTHP(NNZI) = 360.0-DELTHP(NNZI)   RDR36900
372*            IF (DELTHP(NNZI) .LT. -180.0) DELTHP(NNZI) = 360.0+DELTHP(NNZI)  RDR37000
373*        227 CONTINUE                                                         RDR37100
374*        230 CONTINUE                                                         RDR37200
375*            DO 235 I=1,NBK                                                   RDR37300
376*            J = I*2-1                                                        RDR37400
377*            NNZI = NNZ+1                                                     RDR37500
378*            IF (ISKIP(7) .NE. 0) GO TO 233                                   RDR37600
379*            M1 = JBOT(I)                                                     RDR37700
380*            M2 = JTOP(I)                                                     RDR37800
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381*            T1 = 0.0                                                    RDR37900
382*            T2 = 0.0                                                    RDR38000
383*            DO 231 J=M1,M2                                              RDR38100
384*            T1 = T1+UBARK(J)                                            RDR38200
385*        231 T2 = T2+Z(J)                                                RDR38300
386*            P = 1.0/FLOAT(M2-M1+1)                                      RDR38400
387*            T1 = T1*P                                                   RDR38500
388*            T2 = T2*P                                                   RDR38600
389*            P = 0.0                                                     RDR38700
390*            S = 0.0                                                     RDR38800
391*            DO 232 J=M1,M2                                              RDR38900
392*            P = P+(Z(J)-T2)*(UBARK(J)-T1)                               RDR39000
393*        232 S = S+(Z(J)-T2)**2                                          RDR39100
394*            DELU(NNZI) = (Z(M2)-Z(M1))*P/S                              RDR39200
395*            GO TO 234                                                   RDR39300
396*        233 CONTINUE                                                    RDR39400
397*            DELU(NNZI) = UBARL(J+1)-UBARL(J)                            RDR39500
398*        234 CONTINUE                                                    RDR39600
399*            IF (DELU(NNZI) .GE. 0.0) GO TO 235                          RDR39700
400*            IF (TEMPL(J+1)-TEMPL(J) .GT. 0.0) GO TO 235                 RDR39800
401*            DELU(NNZI) = ABS(DELU(NNZI))                                RDR39900
402*        235 CONTINUE                                                    RDR40000
403*        237 IF (JBOT(1) .GT. 1) GO TO 242                               RDR40100
404*            P = RBB(SIGAL(2),SIGAL(1),S1)                               RDR40200
405*      C     CALCULATE SIGAP FOR NEW LAYER 1 (IF CONTAINS SURFACE)       RDR40300
406*            SIGAP(NNZ+1) = ST01*RB11(SIGAL(1),P,Z(M+1),ZRL)             RDR40400
407*            GO TO 243                                                   RDR40500
408*      C     CALCULATE SIGAP FOR NEW LAYER 1 (IF DOES'NT CONTAIN SURFACE) RDR40600
409*        242 ST01 = RAD*(TAUL/600.0)**.2                                 RDR40700
410*            SIGAP(NNZ+1) = 0.5*ST01*(SIGAL(1)+SIGAL(2))                 RDR40800
411*        243 CONTINUE                                                    RDR40900
412*            IF (NBK .LT. 2) GO TO 250                                   RDR41000
413*            IF (JBOT(1) .EQ. 1) ST01 = (TAUL/600.0)**.2*RAD             RDR41100
414*            DO 245 I=2,NBK                                              RDR41200
415*            J = I*2-1                                                   RDR41300
416*      C     CALCULATE SIGAP FOR NEW LAYERS 2 TO NBK                     RDR41400
417*            NNZI = NNZ+I                                                RDR41500
418*        245 SIGAP(NNZI) = 0.5*ST01*(SIGAL(J+1)+SIGAL(J))                RDR41600
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419*        250 CONTINUE                                                          RDR41700
420*            DO 395 I=2,NZS                                                    RDR41800
421*            IF (H .LE. Z(I)) GO TO 396                                        RDR41900
422*        395 CONTINUE                                                          RDR42000
423*        396 RNG = DELX(I-1)                                                   RDR42100
424*            AZM = DELY(I-1)                                                   RDR42200
425*      CCC   GET DATE AND TIME (UNIVAC 1108 ONLY)                              RDR42300
426*            CALL ERTRAN(9,NTFB(1),NTFB(2))                                    RDR42400
427*      C     LOAD MM/DD/YY INTO IDATE(1) AND (2) ON FIRST LOOP                 RDR42500
428*      C     LOAD HR:MN:SC INTO ITIME(1) AND (2) ON SECOND LOOP                RDR42600
429*            N = '/'                                                           RDR42700
430*            DO 400 I=1,2                                                      RDR42800
431*            J = 2*I-1                                                         RDR42900
432*            CALL MSFLD(0,12,NTFB(I),0,IDATE(J))                               RDR43000
433*            CALL MSFLD(0,6,N,12,IDATE(J))                                     RDR43100
434*            CALL MSFLD(12,12,NTFB(I),18,IDATE(J))                             RDR43200
435*            CALL MSFLD(0,6,N,30,IDATE(J))                                     RDR43300
436*            CALL MSFLD(24,12,NTFB(I),0,IDATE(J+1))                            RDR43400
437*        400 CONTINUE                                                          RDR43500
438*      CCC   END DATE AND TIME - PRINT WITH A6,A2 FORMAT                       RDR43600
439*            WRITE (6,1000) NAMCAS,(TESTNO(I),I=1,6),IDATE,ITIME,H,RNG,AZM     RDR43700
440*      C                                                                       RDR43800
441*      C  SAVE INFO FOR END OF RUN SUMMARY                                     RDR43900
442*            WRITE (9) H,RNG,AZM,TIMAV                                         RDR44000
443*            IF (ISKIP(8) .EQ. 1) WRITE (6,NAM2)                               RDR44100
444*            RETURN                                                            RDR44200
445*       1000 FORMAT (1H1,11(/),24X,21(4H****)/24X,1H*,82X,1H*/24X,1H*,5X,12A6,5RDR44300
446*           1X,1H*/24X,1H*,82X,1H*/24X,1H*,23X,6A6,23X,1H*/24X,1H*,82X,1H*/    RDR44400
447*           1                              24X,1H*,25X,7HDATE = ,A6,A2,9H, TIME = ,RDR44500
448*           2A6,A2,25X,1H*,3(/24X,1H*,82X,1H*)/24X,30H* ADJUSTED CLOUD RISE HEIRDR44600
449*           3GHT =,F8.2,9H, RANGE =,F9.2,19H, AZIMUTH BEARING =,F7.2,2H */24X,1RDR44700
450*           4H*,82X,1H*/24X,21(4H****)/1H1)                                   RDR44800
451*            END                                                              RDR44900
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1*            SUBROUTINE TAPEIN, VERSION 6,  REVISION 0
2*
3*            SUBROUTINE TAPEIN (IFF)                                                    TPN00100
4*            COMMON/PARAMT/ TESTNO(12),ISKIP(15),NXS,NYS,NZS,NDI,NCI,                   TPN00200
5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),              TPN00300
6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),               TPN00400
7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,              TPN00500
8*           4XLRY,XLRZ,ZZL(40),IZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),          TPN00600
9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),         TPN00700
10*          6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)        TPN00800
11*          7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                          TPN00900
12*           COMMON /LOCALS/ BLAMDA,TEMPK(16),TEMPL(10),NSND,METDAT(3),NVHCL,          TPN01000
13*          1NMODL,NPLNT                                                               TPN01100
14*           DIMENSION METDTC(3)                                                       TPN01200
15*           COMMON/PLTLLO/ ISW,XMAXJN,YMAXJN,XCIZE,YCIZE                              TPN01300
16*           COMMON/PLTISO/ SCL,XMAXIN,YMAXIN,XSIZE,YSIZE,RASTIN,JSW                   TPN01400
17*           DIMENSION IVHCT(3,5),IPLNT(4)                                             TPN01500
18*           DATA IVHCT/6HTITAN ,6HIII C ,6H       ,                                   TPN01600
19*          1 6HSPACE ,6HSHUTTL,6HE      ,                                            TPN01700
20*          2 6HDELTA-,6HTHOR 2,6H914    ,                                            TPN01800
21*          3 6HMINUTE,6HMAN II,6H       ,                                            TPN01900
22*          4 6HDELTA-,6HTHOR 3,6H914    /                                            TPN02000
23*           DATA IPLNT/6HHCL   ,6HCO    ,6HC02   ,6HAL203 /                        TPN02100
24*           DIMENSION ICARD(14)                                                       TPN02200
25*           NAMELIST/NAM2/ TESTNO,ISKIP,NXS,NYS,NZS,NDI,NCI,NPTS,NTI,TI,              TPN02300
26*          1NVS,NVB,XX,YY,Z,DELX,DELY,Q,UBARK,SIGAK,SIGEK,SIGXO,SIGYO,GAMMAP,         TPN02400
27*          3SIGZO,ALPHA,BETA,ZRK,TIMAV,THETAK,TAUK,TAUOK,H,XRY,XRZ,XLRY,XLRZ,         TPN02500
28*          3ZZL,IZMOD,DECAY,TIM1,BLAMDA,DI,CI,TAST,ZLIM,HB,PERCB,VB,                  TPN02600
29*          4VS,PERC,ACCUR,ALPHL,BETL,TAUL,TAUOL,ZRL,UBARL,SIGAL,SIGEL,THETAL,         TPN02700
30*          5NPS,NAMCAS,SCL,XMAXIN,YMAXIN,ISW,XMAXJN,YMAXJN,RASTIN                     TPN02800
31*          6,XSIZE,YSIZE,XCIZE,YCIZE,TEMPK,TEMPL,JSW                                  TPN02900
32*          7,NVHCL,METDAT,NSND,NMODL,NPLNT                                            TPN03000
33*     C     NVHCLC - VEHICLE NUMBER 1=TITAN,2=SHUTTLE,3=DELTA-THOR 2914,              TPN03100
34*     C              4=MINUTEMAN II,5=DELTA-THOR 3914 (I1 FORMAT COL 1)               TPN03200
35*     C     METDTC - MET DATE MO,DY,YR, (3I2 FORMAT COL 2-7)                          TPN03300
36*     C     NSNDC - SOUNDING NUMBER (I2 FORMAT COL 8-9)                               TPN03400
37*     C     NMOLDC - MODEL NUMBER (I3 FORMAT COL 10-12)                               TPN03500
38*     C     NPLNTC - POLLUTANT NUMBER 1=HCL,2=CO,3=C02,4=AL203 (I1 FORMAT             TPN03600
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C              COL 13)                                                          TPN03700
C     INUNT - INPUT UNIT NUMBER (DEFAULT = 10, ALTERNATE = 5) (I2 FORMATTPN03800
C             COL, 79-80)                                                      TPN03900
      ICONTN = ICONTN+1                                                        TPN04000
   10 CONTINUE                                                                 TPN04600
      IF (ICONTN .GT. 3) GO TO 60                                              TPN04700
      READ (5,1000,END=140) NVHCLC,(METDTC(J),J=1,3),NSNDC,NMODLC,             TPN04800
     1NPLNTC,INUNT                                                             TPN04900
      IF (INUNT .EQ. 0) INUNT = 10                                             TPN05000
      IF (NVHCLC .LE. 0) ICONTN = 4                                            TPN05100
      IF (ICONTN .EQ. 4) GO TO 30                                              TPN05200
   20 CONTINUE                                                                 TPN05300
      WRITE (6,1010) NVHCLC,(METDTC(J),J=1,3),NSNDC,NMODLC,NPLNTC,INUNT        TPN05400
      WRITE (6,1030) (IVHCT(J,NVHCLC),J=1,3),(METDTC(J),J=1,3),NSNDC,          TPN05500
     1NMODLC,IPLNT(NPLNTC),INUNT                                               TPN05600
      IF (INUNT .EQ. 5) GO TO 110                                              TPN05700
      IF (ICONTN .GE. 4) GO TO 120                                             TPN05800
   30 IF (ICONTN .NE. 1.AND.ICONTN .NE. 4) GO TO 50                            TPN05900
      DEFINE FILE 10(100000,80,L,IASV)                                         TPN06600
      REWIND 12                                                                TPN06800
   50 CONTINUE                                                                 TPN06900
      IF (ICONTN .LT. 4) REWIND 12                                             TPN07000
   60 READ (12,1040,END=130) NVHCL,(METDAT(J),J=1,3),NSND,NMODL,NPLNT,         TPN07100
     1ISTRT,IEND                                                               TPN07200
      IF (ICONTN .LT. 4) GO TO 80                                              TPN07300
      NVHCLC = NVHCL                                                           TPN07400
      NMODLC = NMODL                                                           TPN07500
      NPLNTC = NPLNT                                                           TPN07600
      NSNDC = NSND                                                             TPN07700
      DO 70 I=1,3                                                              TPN07800
   70 METDTC(I) = METDAT(I)                                                    TPN07900
      GO TO 90                                                                 TPN08000
   80 CONTINUE                                                                 TPN08100
      IF (NVHCL .NE. NVHCLC) GO TO 60                                          TPN08200
      IF (METDAT(3) .NE. METDTC(3)) GO TO 60                                   TPN08300
      IF (METDAT(1) .NE. METDTC(1)) GO TO 60                                   TPN08400
      IF (METDAT(2) .NE. METDTC(2)) GO TO 60                                   TPN08500
      IF (NMODL .NE. NMODLC) GO TO 60                                          TPN08600
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77*            IF (NPLNT .NE. NPLNTC) GO TO 60                                    TPN08700
78*            IF (NSND .NE. NSNDC) GO TO 60                                      TPN08800
79*      C  HAVE FOUND THE MATCH.  EXTRACT THE NAMELIST SET(CARD IMAGES ISTRT      TPN08900
80*      C  TO IEND) FROM FILE 10 AND PLACE THEM ON FILE 11 FOR NAMELIST READ.    TPN09000
81*      C                                                                        TPN09100
82*         90 DO 100 I=ISTRT,IEND                                                TPN09200
83*            IASV = I                                                           TPN09300
84*            READ (10'IASV,1050) ICARD                                          TPN09400
85*            WRITE (11,1050) ICARD                                              TPN09500
86*        100 CONTINUE                                                           TPN09600
87*            ENDFILE 11                                                         TPN09700
88*            REWIND 11                                                          TPN09800
89*            READ (11,NAM2)                                                     TPN09900
90*            REWIND 11                                                          TPN10000
91*            IF (ICONTN .GE. 4) GO TO 20                                        TPN10100
92*        110 READ (5,NAM2)                                                      TPN10200
93*            ICONTN = 2                                                         TPN10300
94*      C                                                                        TPN10400
95*      C     SAVE ID INFO. FOR SUMMARY AT END OF RUN                            TPN10500
96*        120 WRITE (9) (IVHCT(I,NVHCLC),I=1,3),(METDTC(I),I=1,3),NSNDC,NMODLC, TPN10600
97*           1IPLNT(NPLNTC)                                                      TPN10700
98*            RETURN                                                             TPN10800
99*        130 IF (ICONTN .GE. 4) GO TO 140                                       TPN10900
100*           WRITE (6,1002)                                                     TPN11000
101*           READ (5,NAM2)                                                      TPN11100
102*           GO TO 10                                                           TPN11200
103*       140 WRITE (6,1003)                                                     TPN11300
104*           NPS = 1                                                            TPN11400
105*           IFF = 0                                                            TPN11500
106*           RETURN                                                             TPN11600
107*      1000 FORMAT(I1,3I2,I2,I3,I1,65X,I2)                                     TPN11700
108*      1002 FORMAT (1H ,49H**  ERROR - NO DATA ON TAPE FOR THE ABOVE CASE **)  TPN11800
109*      1003 FORMAT (1H1,21H**** END OF DATA ****)                              TPN11900
110*      1010 FORMAT(1H1,29X,21H  ***  CASE CARD  ***,/1H ,I1,3I2,I2,I3,I1,      TPN12000
111*          1 65X,I2,//)                                                        TPN12100
112*      1020 FORMAT(2I10)                                                       TPN12200
113*      1030 FORMAT(1H ,8HVEHICLE=,1X,3A6,/1H ,                                 TPN12300
114*          1 17HDATE OF MET DATA=,1X,I2,1H/,I2,1H/,I2,/1H ,                    TPN12400
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115*          2 16HSOUNDING NUMBER=,I5,/1H ,13HMODEL NUMBER=,I5,                TPN12500
116*          3 /1H ,10HPOLLUTANT=,1X,A6,/1H ,                                  TPN12600
117*          4 19HFORTRAN INPUT UNIT=,I5)                                      TPN12700
118*       1040 FORMAT (I3,3I2,I2,I3,I1,2I6)                                    TPN12800
119*       1050 FORMAT (13A6,A2)                                                TPN12900
120*            END                                                             TPN13000
```

```
1*            SUBROUTINE  DEPOS, VERSION 6,  REVISION 0
2*
3*            SUBROUTINE DEPOS                                                    DEP00100
4*            COMMON /PARAMT/ TESTNO(12),        ISKIP(15),NXS,NYS,NZS,NDI,NCI,   DEP00200
5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),       DEP00300
6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),        DEP00400
7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,       DEP00500
8*           4XLRY,XLRZ,ZZL(40),IZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),   DEP00600
9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),DEP00700
10*          6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)DEP00800
11*          7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                    DEP00900
12*           COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),DEP01000
13*          1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,ST01,      DEP01100
14*          2ST02,ST03,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,   DEP01200
15*          3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,      DEP01300
16*          4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,            DEP01400
17*          5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),         DEP01500
18*          6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,     DEP01600
19*          7NYSS,CDAMX(3)                                                       DEP01700
20*    C      **** THIS SUBROUTINE CALCULATES GRAVITATIONAL DEPOSITION AT GROUNDDEP01800
21*    C                                                                          DEP01900
22*    C                                                                          DEP02000
23*            DIMENSION DTHK(21)                                                 DEP02100
24*            EQUIVALENCE (DTHK,XAST)                                            DEP02200
25*            REAL MPWR,L,LAMBDA                                                 DEP02300
26*            INTEGER TESTNO                                                     DEP02400
27*    C                                                                          DEP02500
28*            WRITE (6,905)                                                      DEP02600
29*            NBK = 0                                                            DEP02700
30*            DO 10 I=1,NNZ                                                      DEP02800
31*    C                              LIST INPUT PARAMETERS                       DEP02900
32*            IF (I .GT. 1) GO TO 7                                              DEP03000
33*            WRITE (6,900) I,UBARK(I),UBARK(I+1),SIGAK(I),SIGAK(I+1),SIGEK(I),  DEP03100
34*           1SIGEK(I+1),Q(I),DELX(I),DELY(I),SIGYO(I),SIGZO(I),ALPHA(I),BETA(I)DEP03200
35*           2,THETAK(I),TAUK,TAUOK,Z(I),THETAK(I+1)                             DEP03300
36*            GO TO 8                                                            DEP03400
37*          7 CONTINUE                                                           DEP03500
38*            WRITE (6,906) I,UBARK(I+1),SIGAK(I+1),SIGEK(I+1),Q(I),DELX(I),     DEP03600
```

```
39*          1DELY(I),SIGYO(I),SIGZO(I),ALPHA(I),BETA(I),Z(I),THETAK(I+1)        DEP03700
40*        8 IF (I .LT. NNZ) GO TO 9                                             DEP03800
41*          WRITE (6,907) Z(I+1)                                                DEP03900
42*        9 SIGAP(I) = SIGAK(I)*(TAUK/TAUOK)**(0.2)                             DEP04000
43*       10 CONTINUE                                                            DEP04100
44*          WRITE (6,901) (I,VS(I),I,PERC(I),I=1,NVS)                           DEP04200
45*          WRITE (6,902) (I,GAMMAP(I),I=1,NVS)                                 DEP04300
46*          IF (NVB .LE. 0) GO TO 12                                            DEP04400
47*          WRITE (6,908) HB,(I,VB(I),I,PERCB(I),I=1,NVB)                       DEP04500
48*       12 CONTINUE                                                            DEP04600
49*          THETA(1) = THETAK(1)                                                DEP04700
50*          IF (THETA(1) .LT. 180.0) THET = (THETA(1)+180.0)*RAD                DEP04800
51*          IF (THETA(1) .GE. 180.0) THET = (THETA(1)-180.0)*RAD                DEP04900
52*          DTHK(1) = 0.0                                                       DEP05000
53*          DO 20 N=2,NZS                                                       DEP05100
54*       20 DTHK(N) = DTHK(N-1)+DELTHP(N-1)                                     DEP05200
55*          NYSS = NYS                                                          DEP05300
56*          IF (NYS .GT. 0) GO TO 23                                            DEP05400
57*          S = THETA(1)+0.5*DTHK(NZS)/FLOAT(NNZ)+180.0                         DEP05500
58*          S = AMOD(S,360.0)                                                   DEP05600
59*          S = AMOD(S,360.0)                                                   DEP05700
60*          NYS = 41                                                            DEP05800
61*          NYSS = 41                                                           DEP05900
62*          DO 22 J=1,NYS                                                       DEP06000
63*       22 YY(J) = YSV(J)+S                                                    DEP06100
64*       23 CONTINUE                                                            DEP06200
65*          DO 25 N=2,NZS                                                       DEP06300
66*       25 DTHK(N) = DTHK(N)*RAD                                               DEP06400
67*          DO 30 J=1,NYS                                                       DEP06500
68*          DO 30 I=1,NXS                                                       DEP06600
69*       30 DEPN(I,J) = 0.0                                                     DEP06700
70*          NTAD = 1                                                            DEP06800
71*          NTAL = 1                                                            DEP06900
72*          IF (NVB .GT. 0) NTAD = 2                                            DEP07000
73*          IF (NVB .LE. 0.AND.NNZ .EQ. 1) NTAL = 2                             DEP07100
74*          DO 73 JF=NTAL,NTAD                                                  DEP07200
75*          NTAP = NVS                                                          DEP07300
76*          IF (JF .EQ. 2) NTAP = NVB                                           DEP07400
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```
 77*            DO 73 II=1,NTAP                                          DEP07500
 78*            IF (JF .EQ. 2.OR.VS(II) .LE. 10.0) GO TO 35              DEP07600
 79*            WRITE (6,903) VS(II)                                     DEP07700
 80*            RETURN                                                   DEP07800
 81*         35 CONTINUE                                                 DEP07900
 82*            NTAK = 1                                                 DEP08000
 83*            NTAR = NNZ                                               DEP08100
 84*            IF (NVB .LE. 0) GO TO 45                                 DEP08200
 85*            IF (JF .EQ. 2) GO TO 40                                  DEP08300
 86*            NTAR = NTAR-1                                            DEP08400
 87*            GO TO 45                                                 DEP08500
 88*         40 NTAK = NNZ                                               DEP08600
 89*         45 DO 72 KK=NTAK,NTAR                                       DEP08700
 90*            IF (JF .EQ. 2) GO TO 50                                  DEP08800
 91*            IZ = 1                                                   DEP08900
 92*            S = ((Z(KK+1)-Z(KK))*.3333333)+Z(KK)                     DEP09000
 93*            CALL SGP(S,KK,SIGENK(1),1,IDMY,DMY,DMY,1)                DEP09100
 94*            CALL SGP(S,KK,DMY,2,IZ,UBHK,DMY,2)                       DEP09200
 95*      C     DETERMINE NO. SOURCES IN LINE SOURCE SIMULATION          DEP09300
 96*            DHK = ACCUR*SIGENK(1)*SQBAR*SQRT(1.0+VS(II)/UBHK)        DEP09400
 97*            IF (DHK .LT. 10.0) DHK = 10.0                            DEP09500
 98*            S = (Z(KK+1)-Z(KK))/DHK                                  DEP09600
 99*            NXCI = S+1.0                                             DEP09700
100*            IF (NXCI .LT. 3) NXCI = 3                                DEP09800
101*            IF (NXCI .GT. 40) NXCI = 40                              DEP09900
102*            IF (JF .EQ. 1) WRITE (6,909) VS(II),KK,NXCI              DEP10000
103*            DHK = (Z(KK+1)-Z(KK))/FLOAT(NXCI)                        DEP10100
104*            STO1 = Z(KK)                                             DEP10200
105*            GO TO 55                                                 DEP10300
106*         50 NXCI = 1                                                 DEP10400
107*            STO1 = 0.0                                               DEP10500
108*            DHK = HB                                                 DEP10600
109*         55 DO 60 IZ=1,NXCI                                          DEP10700
110*            STO1 = STO1+DHK                                          DEP10800
111*            ZZL(IZ) = STO1                                           DEP10900
112*            CALL SGP(ZZL(IZ),KK,SIGENK(IZ),1,IDMY,DMY,DMY,1)         DEP11000
113*            CALL SGP(ZZL(IZ),KK,SIGANK(IZ),2,IDMY,DMY,DMY,1)         DEP11100
114*            CALL SGP(ZZL(IZ),KK,DMY,2,IZ,UBHK,DMY,2)                 DEP11200
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115*            CALL SGP(ZZL(IZ),KK,DMY,2,IZ,DMY,DMY,4)                          DEP11300
116*         60 CONTINUE                                                          DEP11400
117*            DO 71 I=1,NXS                                                     DEP11500
118*            DO 71 J=1,NYS                                                     DEP11600
119*            CALL COORD(N,1,X,Y,XX(I),YY(J),ASP,XS,1)                          DEP11700
120*            IF (N .EQ. 9) GO TO 71                                            DEP11800
121*            DO 70 IZ=1,NXCI                                                   DEP11900
122*            PHI = ABS(ASP-(THET+ANG(IZ)))                                     DEP12000
123*            IF (PHI .GT. 3.1415926536) PHI = 6.2831853072-PHI                 DEP12100
124*            Y =XS*SIN(PHI)                                                    DEP12200
125*            X =XS*COS(PHI)                                                    DEP12300
126*            IF (X .LE. 0.0) GO TO 70                                          DEP12400
127*            DEP = 0.0                                                         DEP12500
128*            CALL SGP(DMY,KK,DMY,2,IZ,DMY,X,3)                                 DEP12600
129*            IF (SIGYNK .LE. 0.0) GO TO 70                                     DEP12700
130*            DMY = -0.5*(Y/SIGYNK)**2                                          DEP12800
131*            IF (DMY .LT. -30.0) GO TO 70                                      DEP12900
132*            DEP = DEP*EXP(DMY)                                                DEP13000
133*            DEPN(I,J) = DEPN(I,J)+DEP                                         DEP13100
134*         70 CONTINUE                                                          DEP13200
135*         71 CONTINUE                                                          DEP13300
136*         72 CONTINUE                                                          DEP13400
137*         73 CONTINUE                                                          DEP13500
138*      C     OUTPUT GRAVITATIONAL DEPOSITION                                   DEP13600
139*            DO 80 I=1,NXS                                                     DEP13700
140*            DO 80 J=1,NYSS                                                    DEP13800
141*         80 CDAMX(1) = AMAX1(CDAMX(1),DEPN(I,J))                              DEP13900
142*            MULS = 6                                                          DEP14000
143*            ZZL(1) = Z(1)                                                     DEP14100
144*            ZBSL = Z(1)                                                       DEP14200
145*            ZTPL = Z(NZS)                                                     DEP14300
146*            CALL GENPRT(1,ZBSL,ZTPL)                                          DEP14400
147*      C                                                                       DEP14500
148*            DO 90 I=1,NXS                                                     DEP14600
149*            DO 90 J=1,NYS                                                     DEP14700
150*            DEPN(I,J) = 0.0                                                   DEP14800
151*         90 CONTINUE                                                          DEP14900
152*            RETURN                                                            DEP15000
```

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153*        900 FORMAT (23H0*** DATA INPUTS LAYER ,I2,18H, UBARK AT BOTTOM=,F8.4,1DEP15100
154*           15H, UBARK AT TOP=,F8.4,18H, SIGAK AT BOTTOM=,F8.5,15H, SIGAK AT TODEP15200
155*           2P=,F8.5/17H SIGEK AT BOTTOM=,F8.5,15H, SIGEK AT TOP=,F8.5,4H, Q=,EDEP15300
156*           314.8,7H, DELX=,E14.8,7H, DELY=,E14.8/7H SIGYO=,F9.4,8H, SIGZO=,F9.DEP15400
157*           44,8H, ALPHA=,F4.1,7H, BETA=,F4.1,19H, THETAK AT BOTTOM=,F8.3,7H, TDEP15500
158*           5AUK=,F8.3,8H, TAUOK=,F8.3/4H  Z=,F9.3                              DEP15600
159*           6,16H, THETAK AT TOP=,F8.3)                                         DEP15700
160*        901 FORMAT (1H0,3(3HVS(,I2,2H)=,F10.5,7H, PERC(,I2,2H)=,F10.5,2H, )/(1DEP15800
161*           1X,3HVS(,I2,2H)=,F10.5,7H, PERC(,I2,2H)=,F10.5,5H, VS(,I2,2H)=,F10.DEP15900
162*           25,7H, PERC(,I2,2H)=,F10.5,5H, VS(,I2,2H)=,F10.5,7H, PERC(,I2,2H)=,DEP16000
163*           3F10.5,2H, ))                                                       DEP16100
164*        902 FORMAT ((1X,7(7HGAMMAP(,I2,2H)=,F5.3,2H, )))                       DEP16200
165*        903 FORMAT (1H0,67H****** ERROR ****** VS HAS EXCEEDED MAXIMUM ALLOWABDEP16300
166*           1LE VALUE 10, VS=,F9.4)                                             DEP16400
167*        905 FORMAT (1H1,48X,36H***** GRAVITATIONAL DEPOSITION *****)           DEP16500
168*        906 FORMAT (8H0 LAYER ,I2,15H, UBARK AT TOP=,F8.4,15H, SIGAK AT TOP=,FDEP16600
169*           18.5,15H, SIGEK AT TOP=,F8.5,4H, Q=,E14.8,7H, DELX=,E14.8/6H DELY=,DEP16700
170*           2E14.8,8H, SIGYO=,F9.4,8H, SIGZO=,F9.4,8H, ALPHA=,F4.1,7H, BETA=,F4DEP16800
171*           3.1,4H, Z=,F9.3/15H THETAK AT TOP=,F8.3)                            DEP16900
172*        907 FORMAT (1X,10H Z AT TOP=,F10.4)                                    DEP17000
173*        908 FORMAT (1X,19HHEIGHT OF BURST HB=,F10.4,3HVB(,I2,2H)=,F10.5,8H, PEDEP17100
174*           1RCB(,I2,2H)=,F10.5,2H, /(1X,3HVB(,I2,2H)=,F10.5,8H, PERCB(,I2,2H)=DEP17200
175*           2,F10.5,5H, VB(,I2,2H)=,F10.5,8H, PERCB(,I2,2H)=,F10.5,5H, VB(,I2, DEP17300
176*           32H)=,F10.5,8H, PERCB(,I2,2H)=,F10.5,2H, ))                         DEP17400
177*        909 FORMAT (1H0,10X,4HVS =,F8.4,12H, LAYER NO. ,I2,18H, NO. OF SOURCESDEP17500
178*           1 =,I6)                                                             DEP17600
179*            END                                                                DEP17700
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```
1*            SUBROUTINE GENPRT, VERSION 6, REVISION 0
2*
3*            SUBROUTINE GENPRT(K,ZBSL,ZTPL)                                        GPT00100
4*            COMMON /PARAMT/ TESTNO(12),        ISKIP(15),NXS,NYS,NZS,NDI,NCI,     GPT00200
5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),         GPT00300
6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),          GPT00400
7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,         GPT00500
8*           4XLRY,XLRZ,ZZL(40),IZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),     GPT00600
9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),GPT00700
10*          6HO,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)GPT00800
11*          7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                      GPT00900
12*           COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),GPT01000
13*          1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,STO1,        GPT01100
14*          2ST02,ST03,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,     GPT01200
15*          3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,        GPT01300
16*          4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,              GPT01400
17*          5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),           GPT01500
18*          6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,       GPT01600
19*          7NYSS,CDAMX(3)                                                         GPT01700
20*    C      THIS PROGRAM CONTROLS PRINTING OF ALL PROGRAM CALCULATIONS            GPT01800
21*           DIMENSION LINE(1),YB(1),DPN(41,1),IX(1)                               GPT01900
22*           DIMENSION JLINE(70),KLINE(10),NUNIT(8)                                GPT02000
23*           REAL LAMBDA                                                           GPT02100
24*           COMMON /LBLLBL/ J1(9),J2(4),J3(48),J5(6),J7(3),J8(16),J9(13),J10,     GPT02200
25*          1J4(12),J11(2),UNIT(15)                                                GPT02300
26*           EQUIVALENCE (YBARY,LINE),(YB,SIGENK),(DPN,BETANK),(IX,XI)             GPT02400
27*           COMMON /BNDS/ XRIT,XLFT,YBOT,YTOP,XPL,YPL                             GPT02500
28*           COMMON /ILPLTS/ XMAX,XMIN,YMAX,YMIN,XLM1,YBM1,HT,CHARF,SCLX,SCLY,     GPT02600
29*          1XSIZE1,YSIZE1                                                         GPT02700
30*           COMMON /PLTLLO/ ISW,XMAXJN,YMAXJN,XCIZE,YCIZE                         GPT02800
31*           COMMON /XYXYPT/ YP(41),XP(41),A(41),B(41),C(41),D(41),XI(41),YI(41GPT02900
32*          1),NUM(3),NC                                                           GPT03000
33*           DATA ISP/1H0/,JSP/1H /,MS/57/                                         GPT03100
34*           DATA UNIT/1H ,5H(PPM),1H ,6H    (P,6HPM SEC,1H),6H    (S,6HECONDS,GPT03200
35*          11H),6H    (M,6HG/M**3,1H),5H  (MG,6HSEC/M*,3H*3)/                    GPT03300
36*           DATA NUNIT/6H(MG/M*,3H*2),4H(PH),1H ,6HMG/M**,1H2,4H  PH,1H /         GPT03400
37*           DATA ZEROES/0.0/                                                      GPT03410
38*           JM = 5                                                                GPT03500
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59*            IT1 = 1                                                    GPT03600
40*            IT2 = 7                                                    GPT03700
41*            IT3 = 13                                                   GPT03800
42*            J4(9) = NUNIT(5)                                           GPT03900
43*            J4(10) = NUNIT(6)                                          GPT04000
44*            LFLG4 = 0                                                  GPT04100
45*            NCV1 = 14                                                  GPT04200
46*            NCV2 = 7                                                   GPT04300
47*            NCV3 = 24                                                  GPT04400
48*            IF (KSW(1) .LE. 0) GO TO 10                                GPT04500
49*           .IT1 = 19                                                   GPT04600
50*            GO TO 20                                                   GPT04700
51*         10 IF (KSW(2) .LE. 0) GO TO 30                                GPT04800
52*            LFLG4 = 0                                                  GPT04900
53*            IF (ISKIP(9) .EQ. 0) GO TO 15                              GPT05000
54*            IF (ISKIP(5) .NE. 1) GO TO 15                              GPT05100
55*            LFLG4 = 1                                                  GPT05200
56*            J4(9) = NUNIT(7)                                           GPT05300
57*            J4(10) = NUNIT(8)                                          GPT05400
58*         15 CONTINUE                                                   GPT05500
59*            IT1 = 31                                                   GPT05600
60*         20 NCV1 = 25                                                  GPT05700
61*            NCV2 = -1                                                  GPT05800
62*            NCV3 = -1                                                  GPT05900
63*            JM = 1                                                     GPT06000
64*         30 CONTINUE                                                   GPT06100
65*            XPRT = TIMAV/60.0                                          GPT06200
66*            NXSS = NXS-2                                               GPT06300
67*            IF (ISKIP(1) .LE. 0) GO TO 170                             GPT06400
68*      C     PRINT GENERAL GRID CALCULATIONS                            GPT06500
69*      C     GET Y IN PROPER INTERVAL                                   GPT06600
70*            DO 100 J=1,NYSS                                            GPT06700
71*            YB(J) = AMOD(YY(J),360.0)                                  GPT06800
72*            IF (YB(J) .LT. 0.0) YB(J) = 360.0+YB(J)                    GPT06900
73*        100 CONTINUE                                                   GPT07000
74*            IB = 0                                                     GPT07100
75*            DO 160 KS=1,JM                                             GPT07200
76*            IF (JM .EQ. 1) GO TO 110                                   GPT07300
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77*            IF (KS .EQ. 5) IB = 1                                                GPT07400
78*            CALL INPTS(KS,IB,NXS,II,NYSS,DEPN,SIGANK)                            GPT07500
79*          110 CALL HEDING(KSW,KS,1,0)                                            GPT07600
80*            CALL LABELS(K)                                                       GPT07700
81*            CALL VRTCLE(KS,JM,KSW,SIGANK,ISKIP(5),NCV,LFLG4)                     GPT07800
82*            N1 = -9                                                              GPT07900
83*          120 N1 = N1+10                                                         GPT08000
84*            N2 = N1+9                                                            GPT08100
85*            IF (N1 .GT. NYSS) GO TO 160                                          GPT08200
86*            IF (N2 .GT. NYSS) N2 = NYSS                                          GPT08300
87*            LINES = 80                                                           GPT08400
88*            DO 150 I=1,NXSS                                                      GPT08500
89*            LINES = LINES+1                                                      GPT08600
90*            IF (LINES .LT. MS) GO TO 140                                         GPT08700
91*            IF (JM .GT. 1) GO TO 125                                             GPT08800
92*            CALL PRTTTL(NWD,LINES,LINE,0.0,0.0,ZBSL,ZTPL)                        GPT08900
93*            GO TO 126                                                            GPT09000
94*          125 CALL PRTTTL(NWD,LINES,LINE,DECAY,LAMBDA,ZBSL,ZTPL)                 GPT09100
95*          126 CONTINUE                                                           GPT09200
96*            IF (KS .GT. 3) GO TO 130                                             GPT09300
97*            WRITE (6,900) CDAMX(KS),(SIGANK(J),J=1,NCV)                          GPT09400
98*            LINES = LINES+2                                                      GPT09500
99*          130 WRITE (6,901) (YB(J),J=N1,N2)                                      GPT09600
100*           WRITE (6,902) (SIGANK(J),J=1,NCV)                                    GPT09700
101*           LINES = LINES+4                                                      GPT09800
102*         140 WRITE (6,905) XX(I),(DEPN(I,J),J=N1,N2)                            GPT09900
103*         150 CONTINUE                                                           GPT10000
104*           IF (N2 .LT. NYSS) GO TO 120                                          GPT10100
105*         160 CONTINUE                                                           GPT10200
106*         170 CONTINUE                                                           GPT10300
107*           IF (JM .GT. 1) GO TO 190                                             GPT10400
108*           DO 180 I=1,NXS                                                       GPT10500
109*           KOUT = 4*I-3                                                         GPT10600
110*           CALL INTOUT(DEPN,KOUT,NYSS,2,41,I)                                   GPT10700
111*         180 CONTINUE                                                           GPT10800
112*         190 CONTINUE                                                           GPT10900
113*       C   PRINT AND/OR PLOT CENTERLINE CALCULATIONS                            GPT11000
114*           IF (ISKIP(2) .LE. 0) GO TO 480                                       GPT11100
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115*            IB = 0                                                                  GPT11200
116*            DO 340 KS=1,JM                                                          GPT11300
117*            IF (JM .EQ. 1) GO TO 250                                                GPT11400
118*            IF (KS .EQ. 5) IB = 1                                                   GPT11500
119*            CALL INPTS(KS,IB,NXS,II,NYSS,DEPN,SIGANK)                               GPT11600
120*        250 CONTINUE                                                                GPT11700
121*            DO 340 I=1,NXS                                                          GPT11800
122*            I1 = IX(I)                                                              GPT11900
123*            IF (KS .GT. 1) GO TO 270                                                GPT12000
124*            IX(I) = NYSS/2+1                                                        GPT12100
125*            YMAX = 0.0                                                              GPT12200
126*      C     FIND INDEX AT OR CLOSE TO MAXIMUM                                       GPT12300
127*      C     OR MINIMUM OTHER THAN ZERO IF LFLG4 = 1 (PRECIP DEP IN PH)              GPT12400
128*            IF (LFLG4 .EQ. 1) YMAX = 1.0E8                                          GPT12500
129*            DO 260 J=1,NYSS                                                         GPT12600
130*            IF (LFLG4 .EQ. 1) GO TO 155                                             GPT12700
131*            IF (DEPN(I,J) .LE. YMAX) GO TO 260                                      GPT12800
132*            GO TO 156                                                               GPT12900
133*        155 IF (DEPN(I,J) .GE. YMAX) GO TO 260                                      GPT13000
134*            IF (DEPN(I,J) .LE. 0.0) GO TO 260                                       GPT13100
135*        156 CONTINUE                                                                GPT13200
136*            IX(I) = J                                                               GPT13300
137*            YMAX = DEPN(I,J)                                                        GPT13400
138*        260 CONTINUE                                                                GPT13500
139*            I1 = IX(I)                                                              GPT13600
140*            YP(I) = YY(I1)                                                          GPT13700
141*        270 I2 = MAX0(1,I1-3)                                                       GPT13800
142*            I3 = MIN0(NYSS,I1+3)                                                    GPT13900
143*        271 IF (DEPN(I,I2) .GT. 0.0) GO TO 272                                      GPT14000
144*            I2 = I2+1                                                               GPT14100
145*            IF (I2 .LT. I1) GO TO 271                                               GPT14200
146*        272 IF (DEPN(I,I3) .GT. 0.0) GO TO 273                                      GPT14300
147*            I3 = I3-1                                                               GPT14400
148*            IF (I3 .GT. I1) GO TO 272                                               GPT14500
149*        273 IF (I3-I2 .LT. 2) GO TO 275                                             GPT14600
150*            YPL = DEPN(I,I2)/DEPN(I,I3)                                             GPT14700
151*            IF (YPL .LE. 10.0.AND.YPL .GE. 0.1) GO TO 275                           GPT14800
152*            IF (DEPN(I,I2) .LT. DEPN(I,I3)) GO TO 274                               GPT14900
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153*            I2 = I2+1                                                       GPT15000
154*            IF (I2 .GT. I1) I2 = I1                                         GPT15100
155*            GO TO 275                                                       GPT15200
156*        274 I3 = I3-1                                                       GPT15300
157*            IF (I3 .LT. I1) I3 = I1                                         GPT15400
158*        275 DPN(I,KS) = DEPN(I,I1)                                          GPT15500
159*            IF (I1 .EQ. I2.OR.I1 .EQ. I3) GO TO 340                         GPT15600
160*            I3 = I3-I2+1                                                    GPT15700
161*            IF (I3 .LT. 3) GO TO 340                                        GPT15800
162*            IF (KS .GT. 1.AND.KS .NE. 4) GO TO 310                          GPT15900
163*            DO 280 J=1,I3                                                   GPT16000
164*        280 XP(J) = ALOG(DEPN(I,I2+J-1))                                    GPT16100
165*            CALL SPLINE(YY(I2),XP,A,B,C,D,I3,IER)                           GPT16200
166*            IF (IER .EQ. 1) GO TO 340                                       GPT16300
167*            IF (KS .GT. 1) GO TO 310                                        GPT16400
168*            I3 = I1                                                         GPT16500
169*            I4 = I1+1                                                       GPT16600
170*            IF (LFLG4 .EQ. 1) GO TO 282                                     GPT16700
171*            IF (DEPN(I,I4) .GT. DEPN(I,I1-1)) GO TO 290                     GPT16800
172*            IF (DEPN(I,I4) .LT. DEPN(I,I1-1)) GO TO 285                     GPT16900
173*            GO TO 283                                                       GPT17000
174*        282 IF (DEPN(I,I4) .LT. DEPN(I,I1-1)) GO TO 290                     GPT17100
175*            IF (DEPN(I,I4) .GT. DEPN(I,I1-1)) GO TO 285                     GPT17200
176*        283 CONTINUE                                                        GPT17300
177*            IF (ABS(YY(I3)-YY(I3-1))-ABS(YY(I3)-YY(I4))) 290,340,285        GPT17400
178*        285 I3 = I1-1                                                       GPT17500
179*            I4 = I1                                                         GPT17600
180*        290 I5 = I3-I2+1                                                    GPT17700
181*            I6 = I4-I2+1                                                    GPT17800
182*            A(41) = 0.5*A(I5)                                               GPT17900
183*            B(41) = (2.0*C(I5)+C(I6)+A(I5)*(-YY(I4)-2.0*YY(I3)))*.33333333  GPT18000
184*            C(41) = B(I5)+(YY(I4)*(2.0*(A(I5)*YY(I3)-C(I5))-C(I6))+YY(I3)*(-2.GPT18100
185*           10*C(I5)-C(I6)+A(I5)*YY(I3)))*.16666666                          GPT18200
186*            YMAX = B(41)*B(41)-4.0*A(41)*C(41)                              GPT18300
187*            IF (YMAX .LT. 0.0) GO TO 340                                    GPT18400
188*            YMAX = SQRT(YMAX)                                               GPT18500
189*            YPL = 1.0/(2.0*A(41))                                           GPT18600
190*            YP(1) = (-B(41)-YMAX)*YPL                                       GPT18700
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191*            XPL = (-B(41)+YMAX)*YPL                                                 GPT18800
192*            IF (ABS(YY(I1)-YP(I)) .GT. ABS(YY(I1)-XPL)) YP(I) = XPL                 GPT18900
193*        310 I3 = I1                                                                 GPT19000
194*            I4 = I1+1                                                               GPT19100
195*            IF (YY(I3) .LE. YP(I).AND.YP(I) .LE. YY(I4)) GO TO 320                  GPT19200
196*            I3 = I1-1                                                               GPT19300
197*            I4 = I1                                                                 GPT19400
198*        320 IF (KS .EQ. 4) GO TO 330                                                GPT19500
199*            XPL = YP(I)-YY(I3)                                                      GPT19600
200*            YPL = YP(I)-YY(I4)                                                      GPT19700
201*            XPL = XPL*XPL                                                           GPT19800
202*            YPL = YPL*YPL                                                           GPT19900
203*            XPL = (XPL*ALOG(DEPN(I,I4))-YPL*ALOG(DEPN(I,I3)))/(XPL-YPL)             GPT20000
204*            IF (XPL .LT. -80.0) XPL = -80.0                                         GPT20100
205*            IF (XPL .GT. 80.0) XPL = 80.0                                           GPT20200
206*            DPN(I,KS) = EXP(XPL)                                                    GPT20300
207*            GO TO 340                                                               GPT20400
208*        330 I3 = I3-I2+1                                                            GPT20500
209*            I6 = I4-I2+1                                                            GPT20600
210*            IF (YP(I) .LT. YY(I4)) GO TO 335                                        GPT20700
211*            DPN(I,KS) = DEPN(I,I4)                                                  GPT20800
212*            GO TO 340                                                               GPT20900
213*        335 XPL = YP(I)-YY(I3)                                                      GPT21000
214*            DPN(I,KS) = XP(I5)+XPL*(B(I5)+(YP(I)-YY(I4))*(2.0*C(I5)+C(I6)+A(I5GPT21100
215*           1)*XPL)*.16666666)                                                       GPT21200
216*            DPN(I,KS) = EXP(DPN(I,KS))                                              GPT21300
217*        340 CONTINUE                                                                GPT21400
218*      C     PRINT MAXIMUM CENTERLINE CALCULATIONS                                   GPT21500
219*            IF (ISKIP(2) .EQ. 2) GO TO 420                                          GPT21600
220*            CALL HEDING(KSW,1,2,1)                                                  GPT21700
221*            CALL LABELS(K)                                                          GPT21800
222*            LINES = 80                                                              GPT21900
223*            CDAMX(1) = 0.0                                                          GPT22000
224*            IF (LFLG4 .EQ. 1) CDAMX(1) = 14.0                                       GPT22100
225*            CDAMX(2) = 0.0                                                          GPT22200
226*            CDAMX(3) = 0.0                                                          GPT22300
227*            DO 350 I=1,NXSS                                                         GPT22400
228*            DO 350 J=1,3                                                            GPT22500
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229*            IF (LFLG4 .EQ. 1) GO TO 345                                          GPT22600
230*            IF (DPN(I,J) .LT. CDAMX(J)) GO TO 350                                GPT22700
231*            CDAMX(J) = DPN(I,J)                                                  GPT22800
232*            IF (J .EQ. 1) GO TO 346                                              GPT22900
233*            GO TO 350                                                            GPT23000
234*        345 IF (DPN(I,J) .LE. 0.0) GO TO 350                                     GPT23100
235*            IF (DPN(I,J) .GT. CDAMX(J)) GO TO 350                                GPT23200
236*            CDAMX(J) = DPN(I,J)                                                  GPT23300
237*            IF (J .NE. 1) GO TO 350                                              GPT23400
238*        346 YPL = AMOD(YP(I),360.0)                                              GPT23500
239*            IF (YPL .LT. 0.0) YPL = YPL+360.0                                    GPT23600
240*            RTOMX = XX(I)                                                        GPT23700
241*            ATOMX = YPL                                                          GPT23800
242*        350 CONTINUE                                                             GPT23900
243*            IF (JM .GT. 1) GO TO 370                                             GPT24000
244*            IF (KSW(1) .GT. 0) GO TO 360                                         GPT24100
245*            I1 = 31                                                              GPT24200
246*            I2 = 35                                                              GPT24300
247*            I3 = 33                                                              GPT24400
248*            K1 = 1                                                               GPT24500
249*            K2 = 2                                                               GPT24600
250*            IF (ISKIP(9) .EQ. 0.OR.ISKIP(5) .NE. 1) GO TO 380                    GPT24700
251*            K1 = 3                                                               GPT24800
252*            K2 = 4                                                               GPT24900
253*            GO TO 380                                                            GPT25000
254*        360 I1 = 19                                                              GPT25100
255*            I2 = 23                                                              GPT25200
256*            I3 = 21                                                              GPT25300
257*            K1 = 1                                                               GPT25400
258*            K2 = 2                                                               GPT25500
259*            GO TO 380                                                            GPT25600
260*        370 CONTINUE                                                             GPT25700
261*            I1 = 1                                                               GPT25800
262*            I2 = 6                                                               GPT25900
263*            I3 = 3                                                               GPT26000
264*            IF (ISKIP(5) .NE. 4) GO TO 380                                       GPT26100
265*            I1 = 10                                                              GPT26200
266*            I2 = 15                                                              GPT26300
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      I3 = 12                                                                    GPT26400
  330 CONTINUE                                                                   GPT26500
      DO 410 I=1,NXSS                                                            GPT26600
      IF (DPN(I,1) .LE. 0.0) GO TO 410                                           GPT26700
      LINES = LINES+1                                                            GPT26800
      IF (LINES .LT. MS) GO TO 395                                               GPT26900
      IF (JM .GT. 1) GO TO 390                                                   GPT27000
      CALL PRTTTL(NWD,LINES,LINE,0.0,0.0,ZBSL,ZTPL)                              GPT27100
      WRITE (6,910) ISP,CDAMX(1),(J3(J),J=I1,I2),J4(9),J4(10)                    GPT27200
      WRITE (6,905) (J3(J),J=I1,I3),(NUNIT(J),J=K1,K2)                           GPT27300
      LINES = LINES+6                                                            GPT27400
      GO TO 395                                                                  GPT27500
  390 CALL PRTTTL(NWD,LINES,LINE,DECAY,LAMBDA,ZBSL,ZTPL)                         GPT27600
      WRITE (6,904) ISP,CDAMX(1),(J3(J),J=1,3)                                   GPT27700
      WRITE (6,907) JSP,CDAMX(2),(J3(J),J=7,8)                                   GPT27800
      WRITE (6,908) JSP,CDAMX(3),XPRT,(J3(J),J=13,16)                            GPT27900
      WRITE (6,906) XPRT,(UNIT(J),J=I1,I2),(UNIT(J),J=I1,I3),(UNIT(J),J=GPT28000
     17,9),(UNIT(J),J=I1,I3)                                                     GPT28100
      LINES = LINES+8                                                            GPT28200
  395 CONTINUE                                                                   GPT28300
      YPL = AMOD(YP(I),360.0)                                                    GPT28400
      IF (YPL .LT. 0.0) YPL = YPL+360.0                                          GPT28500
      WRITE (6,909) XX(I),YPL,(DPN(I,J),J=1,JM)                                  GPT28600
  410 CONTINUE                                                                   GPT28700
      IF (KSW(2) .EQ. 0) GO TO 415                                               GPT28800
      CDAMX(3) = -5.0                                                            GPT28900
      CDAMX(2) = 0.0                                                             GPT29000
      IF (LFLG4 .EQ. 1) CDAMX(2) = -1.0                                          GPT29100
      GO TO 416                                                                  GPT29200
  415 IF (KSW(1) .EQ. 0) GO TO 416                                               GPT29300
      CDAMX(3) = -6.0                                                            GPT29400
      CDAMX(2) = 0.0                                                             GPT29500
  416 CONTINUE                                                                   GPT29600
C     SAVE MAX VALUES FOR SUMMARY AT END OF RUN                                  GPT29700
      WRITE (9) (CDAMX(J),J=1,3),RTOMX,ATOMX,ZZL(K),ZBSL,ZTPL                    GPT29800
C                                                                                GPT29900
C     IF MAX. PEAK CONC IS VERY LOW, ABORT THIS CASE                             GPT30000
      IF (LFLG4 .EQ. 1) GO TO 412                                                GPT30100
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      IF (CDAMX(1) .GE. 0.001) GO TO 420                                GPT30200
  411 WRITE (6,911)                                                     GPT30300
      GO TO 540                                                         GPT30400
  412 IF (CDAMX(1) .GE. 13.9) GO TO 411                                 GPT30500
  420 CONTINUE                                                          GPT30600
C     PLOT MAXIMUM CENTERLINE CALCULATIONS                              GPT30700
      IF (ISKIP(2) .EQ. 1) GO TO 480                                    GPT30800
      HT = 0.0                                                          GPT30900
      XPL = 0.0                                                         GPT31000
      YPL = 0.0                                                         GPT31100
      DO 430 I=1,NXS                                                    GPT31200
      X1 = XX(I)*SIN(YP(I)*RAD)                                         GPT31300
      Y1 = XX(I)*COS(YP(I)*RAD)                                         GPT31400
      YB(I) = SQRT((X1-XPL)**2+(Y1-YPL)**2)+HT                          GPT31500
      HT = YB(I)                                                        GPT31600
      XPL = X1                                                          GPT31700
  430 YPL = Y1                                                          GPT31800
      IF (ISW .NE. 2) GO TO 436                                         GPT31900
      DO 435 I=1,NXS                                                    GPT32000
      YB(I) = ALOG10(YB(I))                                             GPT32100
  435 CONTINUE                                                          GPT32200
  436 CONTINUE                                                          GPT32300
      CALL FSTPLT(H,RNG,AZM,NAMCAS,IDATE,ITIME,CDAMX(1),CDAMX(2),CDAMX(3GPT32400
     1),J3(IT1),J3(IT2),J3(IT3),NCV1,NCV2,NCV3,XPRT)                    GPT32500
      IF (JM .GT. 3) JM = 3                                             GPT32600
      DO 470 KS=1,JM                                                    GPT32700
      CALL HEDING(KSW,KS,2,0)                                           GPT32800
      CALL LABELS(K)                                                    GPT32900
      CALL VRTCLE(KS,JM,KSW,SIGANK,ISKIP(5),NCV,LFLG4)                  GPT33000
      NCV = NCV*6                                                       GPT33100
      GO TO (440,450,460),KS                                            GPT33200
  440 IF (KSW(1) .GT. 0.OR.KSW(2) .GT. 0) GO TO 450                     GPT33300
C     PLOT MAXIMUM CENTERLINE CONCENTRATION                             GPT33400
      IF (NCCC .LE. 0) GO TO 470                                        GPT33500
      CALL LLPLOT(DPN(1,KS),YB,NXSS,LINE,CI,NCCC,NWD,SIGANK,NCV,ZBSL,   GPT33600
     1ZIPL)                                                             GPT33700
      NWD = NWD*6                                                       GPT33800
      CALL LSSOPT(YB,DPN(1,KS),NXSS,NCCC,CI,SIGANK,LINE,NCV,NWD)        GPT33900
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343*            GO TO 470                                                       GPT34000
344*      C     CENTERLINE DEPOSITION OR DOSAGE                                 GPT34100
345*        450 IF (NDDD .LE. 0) GO TO 470                                      GPT34200
346*            CALL LLPLOT(DPN(1,KS),YB,NXSS,LINE,DI,NDDD,NWD,SIGANK,NCV,ZBSL, GPT34300
347*           1ZIPL)                                                           GPT34400
348*            NWD = NWD*6                                                     GPT34500
349*            CALL LSSOPT(YB,DPN(1,KS),NXSS,NDDD,DI,SIGANK,LINE,NCV,NWD)      GPT34600
350*            GO TO 470                                                       GPT34700
351*      C     CENTERLINE TIME-MEAN CONCENTRATION                              GPT34800
352*        460 IF (NTTT .LE. 0) GO TO 470                                      GPT34900
353*            CALL LLPLOT(DPN(1,KS),YB,NXSS,LINE,TI,NTTT,NWD,SIGANK,NCV,ZBSL, GPT35000
354*           1ZIPL)                                                           GPT35100
355*            NWD = NWD*6                                                     GPT35200
356*            CALL LSSOPT(YB,DPN(1,KS),NXSS,NTTT,TI,SIGANK,LINE,NCV,NWD)      GPT35300
357*        470 CONTINUE                                                        GPT35400
358*        480 CONTINUE                                                        GPT35500
359*            IF (ISKIP(2) .LE. 0) WRITE (9) (ZEROES,J=1,8)                   GPT35510
360*      C     PLOT ISOPLETHS                                                  GPT35600
361*            IF (ISKIP(3) .LE. 0) GO TO 540                                  GPT35700
362*            IF (ISKIP(3) .EQ. 1) GO TO 485                                  GPT35800
363*            CALL FSTPLT(H,RNG,AZM,NAMCAS,IDATE,ITIME,CDAMX(1),CDAMX(2),CDAMX(3GPT35900
364*           1),JS(IT1),JS(IT2),JS(IT3),NCV1,NCV2,NCV3,XPRT)                  GPT36000
365*        485 CONTINUE                                                        GPT36100
366*            IF (JM .GT. 3) JM = 3                                           GPT36200
367*            DO 530 KS=1,JM                                                  GPT36300
368*            IF (JM .EQ. 1) GO TO 490                                        GPT36400
369*            CALL INPTS(KS,0,NXS,II,NYSS,DEPN,SIGANK)                        GPT36500
370*        490 CONTINUE                                                        GPT36600
371*            CALL HEDING(KSW,KS,3,0)                                         GPT36700
372*            CALL LABELS(K)                                                  GPT36800
373*            CALL VRTCLE(KS,JM,KSW,KLINE,ISKIP(5),NCV,LFLG4)                 GPT36900
374*            DO 495 J=1,NWD                                                  GPT37000
375*        495 JLINE(J) = LINE(J)                                              GPT37100
376*            NWD = NWD*6                                                     GPT37200
377*            GO TO (500,510,520),KS                                          GPT37300
378*        500 IF (KSW(1) .GT. 0.OR.KSW(2) .GT. 0) GO TO 510                   GPT37400
379*            IF (NCC .LE. 0) GO TO 530                                       GPT37500
380*            CALL ISSOPT(XX,YY,NXS,NCC,CI,JLINE,NWD,DEPN,NYSS,YBARY,DEPN,II,KS,GPT37600
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     1YT,ISKIP(3),KLINE,NCV,JM,DECAY,LAMBDA,ZBSL,ZTPL)                  GPT37700
      GO TO 530                                                         GPT37800
  510 IF (NDD .LE. 0) GO TO 530                                         GPT37900
      CALL ISSOPT(XX,YY,NXS,NDD,DI,JLINE,NWD,DEPN,NYSS,YBARY,DEPN,II,KS,GPT38000
     1YT,ISKIP(3),KLINE,NCV,JM,DECAY,LAMBDA,ZBSL,ZTPL)                  GPT38100
      GO TO 530                                                         GPT38200
  520 IF (NTT .LE. 0) GO TO 530                                         GPT38300
      CALL ISSOPT(XX,YY,NXS,NTT,TI,JLINE,NWD,DEPN,NYSS,YBARY,DEPN,II,KS,GPT38400
     1YT,ISKIP(3),KLINE,NCV,JM,DECAY,LAMBDA,ZBSL,ZTPL)                  GPT38500
  530 CONTINUE                                                          GPT38600
  540 CONTINUE                                                          GPT38700
      RETURN                                                            GPT38800
  900 FORMAT (1H0,38X,F9.3,21H IS THE MAXIMUM GRID ,6A6)                GPT38900
  901 FORMAT (1H0,6H RANGE,44X,29H- AZIMUTH BEARING (DEGREES) -/1X,8H(MEGPT39000
     1ITERS),10(3X,F7.2,2X))                                            GPT39100
  902 FORMAT (52X,6A6)                                                  GPT39200
  903 FORMAT (1X,F8.1,10(F10.3,2X))                                     GPT39300
  904 FORMAT (A1,38X,F9.3,20H IS THE MAXIMUM PEAK,5A6)                  GPT39400
  905 FORMAT (1H0,23X,12HMAXIMUM PEAK/18H  RANGE    AZIMUTH,6X,2A6,A2/11GPT39500
     1X,24HBEARING       DEPOSITION/1X,25H(METERS) (DEGREES)        ,A6,AGPT39600
     23)                                                                GPT39700
  906 FORMAT (1H0,23X,12HMAXIMUM PEAK,13X,7HMAXIMUM,13X,12HMAXIMUM PEAK/GPT39800
     17H  RANGE,4X,7HAZIMUTH,6X,13HCONCENTRATION,13X,6HDOSAGE,8X,F5.1,17GPT39900
     2H MINUTE TIME-MEAN,8X,7HTIME OF,12X,13HAVERAGE CLOUD/11X,7HBEARINGGPT40000
     3,51X,13HCONCENTRATION,9X,13HCLOUD PASSAGE,9X,13HCONCENTRATION/1X,1GPT40100
     49H(METERS) (DEGREES) ,5(2X,3A6,2X))                               GPT40200
  907 FORMAT (A1,44X,F9.3,15H IS THE MAXIMUM,5A6)                       GPT40300
  908 FORMAT (A1,32X,F9.3,20H IS THE MAXIMUM PEAK,F5.1,7H MINUTE,5A6)   GPT40400
  909 FORMAT (1X,F8.1,2X,F8.3,6X,F10.3,11X,F10.3,13X,F10.3,2(12X,F10.3))GPT40500
  910 FORMAT (A1,32X,F9.3,20H IS THE MAXIMUM PEAK,4A6,A1,4H IN ,A6,A1)  GPT40600
  911 FORMAT (1H0,59H**  MAX. PEAK VALUES ARE INSIGNIFICANT, ABORT THIS GPT40700
     1CASE  **)                                                         GPT40800
      END                                                               GPT40900
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```
1*            SUBROUTINE LABELS, VERSION 6,  REVISION 0
2*
3*            SUBROUTINE LABELS(K)                                                    LBL00100
4*            COMMON /PARAMT/ TESTNO(12),        ISKIP(15),NXS,NYS,NZS,NDI,NCI,       LBL00200
5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),           LBL00300
6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),            LBL00400
7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,           LBL00500
8*           4XLRY,XLRZ,ZZL(40),IMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),        LBL00600
9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),      LBL00700
10*          6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)     LBL00800
11*          7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                       LBL00900
12*           COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),     LBL01000
13*          1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,ST01,         LBL01100
14*          2ST02,ST03,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,      LBL01200
15*          3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,         LBL01300
16*          4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,               LBL01400
17*          5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),            LBL01500
18*          6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,        LBL01600
19*          7NYSS,CDAMX(3)                                                          LBL01700
20*           DIMENSION LINE(1)                                                      LBL01800
21*           COMMON /LBLLBL/ J1(9),J2(4),J3(48),J5(6),J7(3),J8(16),J9(13),J10,      LBL01900
22*          1J4(12),J11(2),UNIT(15)                                                 LBL02000
23*           EQUIVALENCE (YBARY,LINE)                                               LBL02100
24*           INTEGER TESTNO                                                         LBL02200
25*           DATA IBLNK/6H      /                                                   LBL02300
26*     C     CHANGE FOLLOWING TWO STATEMENTS FOR 7044                               LBL02400
27*     C     DATA IBLK/0000000000060/,IBLP/0000000000033/                           LBL02500
28*           DATA IBLK/0000000000005/,IBLP/0000000000075/                           LBL02600
29*           DATA J1/54HCALCULATIONS OF   MAXIMUM CENTERLINEISOPLETHS              /LBL02700
30*           DATA J11/7H MINUTE/                                                    LBL02800
31*           DATA J2/24H HCL   CO    CO2   AL203/                                   LBL02900
32*           DATA J3/14H CONCENTRATION,3*1H ,7H DOSAGE,4*1H ,24H TIME-MEAN CONCLBL03000
33*          1ENTRATION,2*2H  ,25H GRAVITATIONAL DEPOSITION,1H ,13H CALCULATIONSLBL03100
34*          2,3*1H ,25H PRECIPITATION DEPOSITION,1H ,22H TIME OF CLOUD PASSAGE,LBL03200
35*          32*1H ,28H AVERAGE CLOUD CONCENTRATION,1H /                            LBL03300
36*           DATA J10/3H IN/                                                       LBL03400
37*           DATA J4/3HPPM,1H ,6HPPM SE,1HC,6HMG/M**,1H3,6HMG SEC,5H/M**3,6HMG/LBL03500
38*          1M**,1H2,6HSECOND,1HS/                                                 LBL03600
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39*          DATA J5/36H AT A HEIGHT OF                METERS/                    LBL03700
40*          DATA J7/18H DOWNWIND FROM A  /                                       LBL03800
41*          DATA J8/96H STATIC FIRE.              NORMAL LAUNCH.          SINGLELBL03900
42*         1 ENGINE BURN.     SLOW BURN.              /                         LBL04000
43*          DATA J9/78HMODEL       WAS USED IN THE CALCULATIONS AND THE METEORLBL04100
44*         1OLOGICAL CASE IS      /                                            LBL04200
45*          DO 10 J=1,80                                                       LBL04300
46*       10 LINE(J) = IBLNK                                                    LBL04400
47*          DO 20 J=1,3                                                        LBL04500
48*          N = KSW(3)+J                                                       LBL04600
49*       20 LINE(J+3) = J1(N)                                                  LBL04700
50*       30 IF (TESTNO(11) .NE. IBLNK) GO TO 40                                LBL04800
51*          N = ISKIP(5)                                                       LBL04900
52*          LINE(8) = J2(N)                                                    LBL05000
53*          GO TO 50                                                           LBL05100
54*       40 LINE(8) = TESTNO(11)                                               LBL05200
55*          LINE(9) = TESTNO(12)                                               LBL05300
56*       50 IF (KSW(4) .NE. 12) GO TO 60                                       LBL05400
57*          B = TIMAV/60.0                                                     LBL05500
58*          CALL NMBRS(B,LINE(10),IDUM)                                        LBL05600
59*          LINE(12) = J11(1)                                                  LBL05700
60*          LINE(13) = J11(2)                                                  LBL05800
61*       60 DO 70 J=1,6                                                        LBL05900
62*          N = KSW(4)+J                                                       LBL06000
63*       70 LINE(J+13) = J3(N)                                                 LBL06100
64*          IF (KSW(4) .NE. 24) LINE(20) = J10                                 LBL06200
65*          IF (KSW(4) .EQ. 24) GO TO 100                                      LBL06300
66*          M = 8                                                              LBL06400
67*          IF (KSW(4) .EQ. 30.OR.KSW(4) .EQ. 18) GO TO 80                     LBL06500
68*          M = 0                                                              LBL06600
69*          IF (ISKIP(5) .EQ. 4) M = 4                                         LBL06700
70*          IF (KSW(4) .EQ. 6) M = M+2                                         LBL06800
71*          IF (KSW(4) .EQ. 36) M = 10                                         LBL06900
72*       80 DO 90 J=1,2                                                        LBL07000
73*          N = M+J                                                            LBL07100
74*       90 LINE(J+20) = J4(N)                                                 LBL07200
75*      100 DO 110 J=1,6                                                       LBL07300
76*      110 LINE(J+22) = J5(J)                                                 LBL07400
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77*          CALL NMBRS(ZZL(K),LINE(26),IDUM)                          LBL07500
78*      130 DO 140 J=1,3                                              LBL07600
79*      140 LINE(J+28) = J7(J)                                        LBL07700
80*          DO 150 J=1,4                                              LBL07800
81*      150 LINE(J+31) = TESTNO(J+6)                                  LBL07900
82*          IF (ISKIP(6) .EQ. 5) GO TO 165                            LBL08000
83*          DO 160 J=1,4                                              LBL08100
84*          N = ISKIP(6) *4-4+J                                       LBL08200
85*      160 LINE(J+35) = J8(N)                                        LBL08300
86*      165 J = 39                                                    LBL08400
87*          NWD = 1                                                   LBL08500
88*          GO TO 190                                                 LBL08600
89*      166 IF (N .EQ. 6) JS = JS+1                                   LBL08700
90*          DO 170 J=1,13                                             LBL08800
91*      170 LINE(J+JS) = J9(J)                                        LBL08900
92*          B = MDLS                                                  LBL09000
93*          CALL NMBRS(B,LINE(JS+2),IDUM)                             LBL09100
94*          JS = JS+13                                                LBL09200
95*          DO 180 J=1,6                                              LBL09300
96*      180 LINE(J+JS) = TESTNO(J)                                    LBL09400
97*          J = JS+6                                                  LBL09500
98*          NWD = 2                                                   LBL09600
99*      190 N = 7                                                     LBL09700
100*     191 N = N-1                                                   LBL09800
101*         IF (N .GT. 0) GO TO 200                                   LBL09900
102*         N = 6                                                     LBL10000
103*         J = J-1                                                   LBL10100
104*     200 JS = IABS(6*(N-1))                                        LBL10200
105*         M = 0                                                     LBL10300
106*         CALL MSFLD(JS,6,LINE(J),30,M)                             LBL10400
107*         IF (M .EQ. IBLK) GO TO 191                                LBL10500
108*         IF (M .EQ. IBLP) GO TO 220                                LBL10600
109*         N = N+1                                                   LBL10700
110*         IF (N .LT. 7) GO TO 210                                   LBL10800
111*         N = 1                                                     LBL10900
112*         J = J+1                                                   LBL11000
113*     210 JS = IABS(6*(N-1))                                        LBL11100
114*         CALL MSFLD(30,6,IBLP,JS,LINE(J))                          LBL11200
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```
115*        220 JS = J                                                    LBL11300
116*            GO TO (166,230),NWD                                       LBL11400
117*        230 NWD = JS                                                  LBL11500
118*            CALL PACKS(LINE,NWD)                                      LBL11600
119*            RETURN                                                    LBL11700
120*            END                                                       LBL11800
```

```
1*            SUBROUTINE  PACKS, VERSION  5, REVISION 0
2*
3*            SUBROUTINE PACKS(LINE,NWD)                                        PCK00100
4*      C     THIS SUBROUTINE REMOVES EXCESSIVE BLANKS FROM THE TITLE AND PACKS PCK00200
5*      C     IT INTO SUCCESSIVE LINES OF 15 WORDS PER LINE                     PCK00300
6*            DIMENSION LINE(1)                                                 PCK00400
7*            DATA IBLK/0000000000005/                                          PCK00500
8*      CC    DATA IBLK/0000000000000/  - IBM 7044 -                            PCK00600
9*            NFLG = 0                                                          PCK00700
10*           NR = 0                                                            PCK00800
11*           JB = 16                                                           PCK00900
12*     C     JB IS 15+1 OR 15 WORDS PER LINE                                   PCK01000
13*           IB = 1                                                            PCK01100
14*           LST = IBLK                                                        PCK01200
15*           M = 1                                                             PCK01300
16*           N = 0                                                             PCK01400
17*           J = 0                                                             PCK01500
18*        10 J = J+1                                                           PCK01600
19*           IF (J .LE. NWD) GO TO 15                                          PCK01700
20*           NFLG = 1                                                          PCK01800
21*           L = IBLK                                                          PCK01900
22*           N1 = N+1                                                          PCK02000
23*           IF (N1 .GT. 6) GO TO 80                                           PCK02100
24*           M1 = M                                                            PCK02200
25*           GO TO 60                                                          PCK02300
26*        15 K = LINE(J)                                                       PCK02400
27*           I = 0                                                             PCK02500
28*        20 I = I+1                                                           PCK02600
29*           IF (I .GT. 6) GO TO 10                                            PCK02700
30*           II = IABS(6*(I-1))                                                PCK02800
31*           CALL MSFLD(II,6,K,30,L)                                           PCK02900
32*           IF (L .NE. IBLK) GO TO 30                                         PCK03000
33*           IF (LST .EQ. IBLK) GO TO 20                                       PCK03100
34*        25 IBLK = I                                                          PCK03200
35*           JJBLK = J                                                         PCK03300
36*        30 N = N+1                                                           PCK03400
37*           NR = NR+1                                                         PCK03500
38*           IF (N .LT. 7) GO TO 40                                            PCK03600
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```
      N = 1                                                              PCK03700
      IB = IB+1                                                          PCK03800
      M = M+1                                                            PCK03900
   40 II = IABS(6*(N-1))                                                 PCK04000
      IF (L .NE. IBLK) GO TO 50                                          PCK04100
      NNBLK = N                                                          PCK04200
      MMBLK = M                                                          PCK04300
   50 IF (IB .LT. JB) GO TO 70                                           PCK04400
      IF (LST .EQ. IBLK.OR.L .EQ. IBLK) GO TO 69                         PCK04500
      L = IBLK                                                           PCK04600
      NR = NR-1                                                          PCK04700
      N1 = NNBLK+1                                                       PCK04800
      M1 = MMBLK                                                         PCK04900
      IF (N1 .LT. 7) GO TO 60                                            PCK05000
      M1 = M1+1                                                          PCK05100
      N1 = 1                                                             PCK05200
   60 I1 = IABS(6*(N1-1))                                                PCK05300
      CALL MSFLD(30,6,L,I1,LINE(M1))                                     PCK05400
      IF (NFLG .EQ. 1) GO TO 63                                          PCK05500
      GO TO 64                                                           PCK05600
   63 NR = NR+1                                                          PCK05700
   64 CONTINUE                                                           PCK05800
      N1 = N1+1                                                          PCK05900
      IF (N1 .LT. 7) GO TO 60                                            PCK06000
      IF (NFLG .EQ. 1) GO TO 80                                          PCK06100
      N1 = 1                                                             PCK06200
      M1 = M1+1                                                          PCK06300
      IF (M1 .LT. M) GO TO 60                                            PCK06400
      J = JJBLK                                                          PCK06500
      I = IIBLK                                                          PCK06600
      N = 7                                                              PCK06700
      M = M-1                                                            PCK06800
      LST = IBLK                                                         PCK06900
      IB = 0                                                             PCK07000
      K = LINE(J)                                                        PCK07100
      GO TO 20                                                           PCK07200
   69 IB = 1                                                             PCK07300
      LST = IBLK                                                         PCK07400
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```
77*          IF (L .NE. IBLK) GO TO 70                                  PCK07500
78*          NR = NR-1                                                  PCK07600
79*          IB = 0                                                     PCK07700
80*          N = 7                                                      PCK07800
81*          M = M-1                                                    PCK07900
82*          GO TO 20                                                   PCK08000
83*       70 LST = L                                                    PCK08100
84*       75 CALL MSFLD(30,6,L,II,LINE(M))                              PCK08200
85*          GO TO 20                                                   PCK08300
86*       80 NWD = NR/6                                                 PCK08400
87*          IB = NWD*6                                                 PCK08500
88*          IF (IB .LT. NR) NWD = NWD+1                                PCK08600
89*          RETURN                                                     PCK08700
90*          END                                                        PCK08800
```

```
1*            SUBROUTINE PRTTTL, VERSION 6,  REVISION 0
2*
3*            SUBROUTINE PRTTTL(NWD,LINES,LINE,A,B,ZB,ZT)                    PRT00100
4*      C     THIS SUBROUTINE PRINTS THE PAGE HEADING                        PRT00200
5*            DIMENSION LINE(1)                                              PRT00300
6*            DATA IB/1H1/,JB/1H /                                           PRT00400
7*            N = IB                                                         PRT00500
8*            LINES = 3                                                      PRT00600
9*            N1= 1                                                          PRT00700
10*           N2 = 15                                                        PRT00800
11*        10 IF (N2 .GT. NWD) N2 = NWD                                      PRT00900
12*           WRITE (6,50) N,(LINE(I),I=N1,N2)                               PRT01000
13*           LINES = LINES+1                                                PRT01100
14*           N = JB                                                         PRT01200
15*           IF (N2 .GE. NWD) GO TO 20                                      PRT01300
16*           N1 = N2+1                                                      PRT01400
17*           N2 = N2+15                                                     PRT01500
18*           GO TO 10                                                       PRT01600
19*        20 IF (A .GE. 0.0) WRITE (6,80)                                   PRT01700
20*           LINES = LINES+1                                                PRT01800
21*           IF (A .LE. 0.0) GO TO 30                                       PRT01900
22*           WRITE (6,60)                                                   PRT02000
23*           LINES = LINES+1                                                PRT02100
24*        30 IF (B .LE. 0.0) GO TO 40                                       PRT02200
25*           WRITE (6,70)                                                   PRT02300
26*           LINES = LINES+1                                                PRT02400
27*        40 WRITE (6,90) ZB,ZT                                             PRT02500
28*           LINES = LINES+1                                                PRT02600
29*           RETURN                                                         PRT02700
30*        50 FORMAT (A1,19X,15A6)                                           PRT02800
31*        60 FORMAT (42X,45H(DECAY HAS BEEN INCLUDED IN THE CALCULATIONS))  PRT02900
32*        70 FORMAT (33X,64H(PRECIPITATION SCAVENGING HAS BEEN INCLUDED IN THE PRT03000
33*          1CALCULATIONS))                                                 PRT03100
34*        80 FORMAT ( )                                                     PRT03200
35*        90 FORMAT (34X,37HCALCULATIONS APPLY TO THE LAYER FROM ,F7.2,4H TO ,FPRT03300
36*          18.2,7H METERS)                                                 PRT03400
37*           END                                                            PRT03500
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```
1*            SUBROUTINE VRTCLE, VERSION  6, REVISION 0
2*
3*            SUBROUTINE VRTCLE(KS,JM,KSW,ISTOR,ISKIP5,NCV,IFLG4)                VRT00100
4*            DIMENSION KSW(1),ISTOR(1)                                          VRT00200
5*            DIMENSION NPH(2)                                                   VRT00300
6*            COMMON /LBLLBL/ J1(9),J2(4),J3(48),J5(6),J7(3),J8(16),J9(13),J10,  VRT00400
7*           1J4(12),J11(2),UNIT(15)                                             VRT00500
8*            INTEGER UNIT                                                       VRT00600
9*            DATA NPH/5H   PH,1H /                                              VRT00700
10*           IF (JM .GT. 1) GO TO 20                                            VRT00800
11*           I1 = 31                                                            VRT00900
12*           IF (KSW(2) .GT. 0) GO TO 10                                        VRT01000
13*           I1 = 19                                                            VRT01100
14*       10  I2 = I1+4                                                         VRT01200
15*           I3 = 8                                                             VRT01300
16*           GO TO 82                                                           VRT01400
17*       20  GO TO (30,40,50,60,70),KS                                         VRT01500
18*       30  I1 = 1                                                            VRT01600
19*           I2 = 3                                                             VRT01700
20*           GO TO 80                                                           VRT01800
21*       40  I1 = 7                                                            VRT01900
22*           I2 = 8                                                             VRT02000
23*           I3 = 3                                                             VRT02100
24*           GO TO 81                                                           VRT02200
25*       50  I1 = 13                                                           VRT02300
26*           I2 = 17                                                            VRT02400
27*           GO TO 80                                                           VRT02500
28*       60  I1 = 37                                                           VRT02600
29*           I2 = 40                                                            VRT02700
30*           I3 = 6                                                             VRT02800
31*           GO TO 82                                                           VRT02900
32*       70  I1 = 43                                                           VRT03000
33*           I2 = 47                                                            VRT03100
34*       80  I3 = 0                                                           VRT03200
35*       81  IF (ISKP5 .EQ. 4) I3 = I3+9                                      VRT03300
36*       82  ISTOR(1) = J3(4)                                                  VRT03400
37*           DO 90 I=I1,I2                                                      VRT03500
38*       90  ISTOR(I-I1+2) = J3(I)                                            VRT03600
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39*           NCV = I2-I1+2                                          VRT03700
40*           IF (JM .GT. 1) GO TO 110                               VRT03800
41*           DO 100 I=1,2                                           VRT03900
42*           IF (IFLG4 .NE. 0) GO TO 95                             VRT04000
43*           ISTOR(NCV+I) = J4(I3+I)                                VRT04100
44*           GO TO 100                                              VRT04200
45*        95 ISTOR(NCV+I) = NPH(I)                                  VRT04300
46*       100 CONTINUE                                               VRT04400
47*           NCV = NCV+2                                            VRT04500
48*           GO TO 130                                              VRT04600
49*       110 DO 120 I=1,3                                           VRT04700
50*       120 ISTOR(NCV+I) = UNIT(I3+I)                              VRT04800
51*           NCV = NCV+3                                            VRT04900
52*       130 CALL PACKS(ISTOR,NCV)                                  VRT05000
53*           RETURN                                                 VRT05100
54*           END                                                    VRT05200
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 1*            SUBROUTINE  NMBRS, VERSION  5, REVISION 0
 2*
 3*            SUBROUTINE NMBRS(A,NUM,NC)                                    NMB00100
 4*            DIMENSION IM(15),NUM(3)                                       NMB00200
 5*            NC = 0                                                        NMB00300
 6*            IF (A) 20,10,30                                               NMB00400
 7*         10 NC = 1                                                        NMB00500
 8*            NUM(1) = '0      '                                            NMB00600
 9*            GO TO 110                                                     NMB00700
10*         20 NC = NC+1                                                     NMB00800
11*            IM(1) = '      -'                                            NMB00900
12*         30 B = ABS(A)                                                    NMB01000
13*            K = 6                                                         NMB01100
14*            M = B                                                         NMB01200
15*            IF (M .EQ. 0) GO TO 41                                        NMB01300
16*            M = ALOG10(B)                                                 NMB01400
17*            M = M+1                                                       NMB01500
18*            MM = B                                                        NMB01600
19*            DO 40 I=1,M                                                   NMB01700
20*            NC = NC+1                                                     NMB01800
21*            K = MM/10**(M-I)                                              NMB01900
22*            MM = MM-K*10**(M-1)                                           NMB02000
23*         40 IM(NC) = K+48                                                 NMB02100
24*            K = 3                                                         NMB02200
25*         41 M = B                                                         NMB02300
26*            C = M                                                         NMB02400
27*            IF (B-C) 50,80,50                                             NMB02500
28*         50 NC = NC+1                                                     NMB02600
29*            IM(NC) = '      .'                                            NMB02700
30*            B = B-M                                                       NMB02800
31*            I = 0                                                         NMB02900
32*            B = B+1.0E-7                                                  NMB03000
33*         60 I = I+1                                                       NMB03100
34*            NC = NC+1                                                     NMB03200
35*            B = B*10.0                                                    NMB03300
36*            M = B                                                         NMB03400
37*            B = B-M                                                       NMB03500
38*            IM(NC) = M+48                                                 NMB03600
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```
39*          IF (I .LT. 6) GO TO 60                                          NMB03700
40*       70 IF (IM(NC) .GT. 48.AND.IM(NC) .LT. 58) GO TO 80                 NMB03800
41*          NC = NC-1                                                       NMB03900
42*          IF (NC .LE. 2) GO TO 80                                         NMB04000
43*          GO TO 70                                                        NMB04100
44*       80 K = 1                                                           NMB04200
45*          M = 0                                                           NMB04300
46*          DO 100 I=1,NC                                                   NMB04400
47*          M = M+1                                                         NMB04500
48*          IF (M .LT. 7) GO TO 90                                          NMB04600
49*          M = 1                                                           NMB04700
50*          K = K+1                                                         NMB04800
51*       90 CALL MSFLD(30,6,IM(I),IABS(6*(M-1)),NUM(K))                     NMB04900
52*      100 CONTINUE                                                        NMB05000
53*      110 CONTINUE                                                        NMB05100
54*          RETURN                                                          NMB05200
55*          END                                                             NMB05300
```

```
1*            SUBROUTINE HEDING, VERSION  5, REVISION 0
2*
3*            SUBROUTINE HEDING(KSW,KS,JSW,LSW)                          HED00100
4*      C     SET ALL PARAMETERS NEC TO BUILDING PAGE HEADING            HED00200
5*            DIMENSION KSW(1)                                           HED00300
6*            KSW(3) = 3*JSW-3                                           HED00400
7*            GO TO (10,40,50,60,70),KS                                  HED00500
8*         10 IF (KSW(1) .EQ. 0) GO TO 20                                HED00600
9*            KSW(4) = 18                                                HED00700
10*           GO TO 80                                                   HED00800
11*        20 IF (KSW(2) .EQ. 0) GO TO 30                                HED00900
12*           KSW(4) = 30                                                HED01000
13*           GO TO 80                                                   HED01100
14*        30 KSW(4) = 0                                                 HED01200
15*           IF (LSW .EQ. 1) KSW(4) = 24                                HED01300
16*           GO TO 80                                                   HED01400
17*        40 KSW(4) = 6                                                 HED01500
18*           GO TO 80                                                   HED01600
19*        50 KSW(4) = 12                                                HED01700
20*           GO TO 80                                                   HED01800
21*        60 KSW(4) = 36                                                HED01900
22*           GO TO 80                                                   HED02000
23*        70 KSW(4) = 42                                                HED02100
24*        80 RETURN                                                     HED02200
25*           END                                                        HED02300
```

```
1*              SUBROUTINE  MSFLD, VERSION  5, REVISION 0
2*
3*              SUBROUTINE MSFLD(I1,I2,IWRD,J1,JWRD)                                MSF00100
4*        C     THIS PROG EXTRACTS AN I2 BIT BYTE FROM IWRD STARTING AT BIT I1 ANDMSF00200
5*        C     STORES IT IN JWRD STARTING AT BIT J1. THE REMAINING BITS OF JWRD  MSF00300
6*        C     ARE UNCHANGED. I1 AND J1 ARE COUNTED RIGHT FROM THE SIGN BIT AND  MSF00400
7*        C     THE SIGN BIT IS BIT ZERO.                                         MSF00500
8*              FLD(J1,I2,JWRD) = FLD(I1,I2,IWRD)                                 MSF00600
9*              RETURN                                                            MSF00700
10*             END                                                               MSF00800
```

```
 1*            SUBROUTINE  INPTS, VERSION  5, REVISION 0
 2*
 3*            SUBROUTINE INPTS(KS,IB,NX,II,NY,D,T)                          INP00100
 4*            DIMENSION D(41,1),T(1)                                        INP00200
 5*            DO 10 I=1,NX                                                  INP00300
 6*            KOUT = 4*I-4+KS-IB                                            INP00400
 7*            CALL INTOUT(D,KOUT,NY,1,41,I)                                 INP00500
 8*         10 CONTINUE                                                      INP00600
 9*            IF (KS .LT. 5) GO TO 30                                       INP00700
10*            DO 20 I=1,NX                                                  INP00800
11*            KOUT = 4*I-2                                                  INP00900
12*            CALL INTOUT(T,KOUT,NY,1,1,1)                                  INP01000
13*            DO 20 J=1,NY                                                  INP01100
14*            TMP = 0.0                                                     INP01200
15*            IF (T(J) .LE. 0.0.OR.D(I,J) .LE. 0.0) GO TO 20                INP01300
16*            TMP = T(J)/D(I,J)                                             INP01400
17*         20 D(I,J) = TMP                                                  INP01500
18*         30 RETURN                                                        INP01600
19*            END                                                           INP01700
```

```
1*            SUBROUTINE INTOUT, VERSION 6,  REVISION 0
2*
3*            SUBROUTINE INTOUT(D,I,N,L,IDM,K)                          INT00100
4*            DIMENSION D(IDM,1)                                        INT00200
5*            INTEGER RECLTH                                            INT00300
6*            IF (ISP .NE. 0) GO TO 10                                  INT00400
7*            ISP = 1                                                   INT00500
8*            RECLTH = 41                                               INT00600
9*            DEFINE FILE 13(164,RECLTH,U,KOUK)                         INT00700
10*        10 CONTINUE                                                  INT00800
11*           KOUK = I                                                  INT00900
12*        60 FORMAT (1X,8I6)                                           INT01000
13*           GO TO (20,30),L                                           INT01100
14*        20 READ (13'KOUK) (D(K,J),J=1,N)                             INT01200
15*           GO TO 40                                                  INT01300
16*        30 WRITE (13'KOUK) (D(K,J),J=1,N)                            INT01400
17*        40 RETURN                                                    INT01500
18*           END                                                       INT01600
```

```
 1*            SUBROUTINE  BREAK, VERSION 6,  REVISION 0
 2*
 3*            SUBROUTINE BREAK(K,XO,YO)                                          BRK00100
 4*            COMMON /PARAMT/ TESTNO(12),        ISKIP(15),NXS,NYS,NZS,NDI,NCI,  BRK00200
 5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),      BRK00300
 6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),       BRK00400
 7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,      BRK00500
 8*           4XLRY,XLRZ,ZZL(40),IZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),  BRK00600
 9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),BRK00700
10*           6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)BRK00800
11*           7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                   BRK00900
12*            COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),BRK01000
13*           1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,STO1,     BRK01100
14*           2STO2,STO3,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,  BRK01200
15*           3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,     BRK01300
16*           4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,           BRK01400
17*           5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),        BRK01500
18*           6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,    BRK01600
19*           7NYSS,CDAMX(3)                                                      BRK01700
20*            DIMENSION CON(1),DOS(1),AVCON(1),PASSTM(1),ERFX(1)                 BRK01800
21*            EQUIVALENCE (CON,DEPN),(DOS,DEPN(1,2)),(AVCON,DEPN(1,3)),(PASSTM,DBRK01900
22*           1EPN(1,4)),(ERFX,ANG(10))                                           BRK02000
23*            REAL MPWR,L,LAT,LAMBDA                                             BRK02100
24*            INTEGER TESTNO                                                     BRK02200
25*      C     *** THIS SUBROUTINE CALCULATES DOSAGE,CONCENTRATION AND WASHOUT **BRK02300
26*      C     *** ON A GENERAL GRID WITHIN THE SECTOR DELPHI.                     BRK02400
27*      C     DETERMINE LOCATION OF RECEPTOR RELATIVE TO SOURCE AND WIND         BRK02500
28*      C     DIRECTION                                                          BRK02600
29*            SUMSX = 0.0                                                        BRK02700
30*            NSMSX = 0                                                          BRK02800
31*            CALL COORD(N,KK,X,Y,XO,YO,ASP,XS,1)                                BRK02900
32*            DOS(J) = 0.0                                                       BRK03000
33*            CON(J) = 0.0                                                       BRK03100
34*            IF (NBK .NE. 0.AND.IBOT .LE. KK.AND.KK .LE. ITOP) GO TO 135        BRK03200
35*            IS = 1                                                             BRK03300
36*            IF (N .EQ. 9) GO TO 310                                            BRK03400
37*      C                        CALCULATION OF MODELS 1,2,3                     BRK03500
38*        125 CALL SIGMA(X,KK,1)                                                 BRK03600
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39*           IF (SIGY) 130,130,126                                                  BRK03700
40*       126 IF (SIGZ .LT. 0.0 .AND. MODLS(KK) .EQ. 3) GO TO 130                    BRK03800
41*           LAT = Y/SIGY                                                           BRK03900
42*           LAT = -0.5*LAT*LAT                                                     BRK04000
43*           IF (LAT .LT. -60.0) GO TO 130                                          BRK04100
44*           LAT = EXP(LAT)                                                         BRK04200
45*           PEAKD = Q(KK)/(SQR2P*SIGY*UBAR(KK))                                    BRK04300
46*           IF (MODLS(KK) .EQ. 3) GO TO 20                                         BRK04400
47*           PEAKD = PEAKD/(Z(KK+1)-Z(KK))                                          BRK04500
48*           GO TO 21                                                               BRK04600
49*        20 PEAKD = PEAKD/(SQR2P*SIGZ)                                             BRK04700
50*        21 CONTINUE                                                               BRK04800
51*           VER = 0.0                                                              BRK04900
52*           VREF = 1.0                                                             BRK05000
53*           IF (MODLS(KK) .NE. 3) GO TO 70                                         BRK05100
54*           VREF = 0.0                                                             BRK05200
55*           TMPQ1 = -0.5/(SIGZ*SIGZ)                                               BRK05300
56*           A = H-ZZL(K)                                                           BRK05400
57*           B = H-Z(KK)-Z(KK)+ZZL(K)                                               BRK05500
58*           C = B*B                                                                BRK05600
59*           C = C*TMPQ1                                                            BRK05700
60*           A1 = Z(KK+1)-Z(KK)                                                     BRK05800
61*           IF (C .LT. -30.0) GO TO 70                                             BRK05900
62*           D = A*A                                                                BRK06000
63*           D = D*TMPQ1                                                            BRK06100
64*           IF (D .LT. -30.0) GO TO 50                                             BRK06200
65*           VER = EXP(D)                                                           BRK06300
66*        50 VER = VER+GAMMA(1)*EXP(C)                                              BRK06400
67*           C = 1.0                                                                BRK06500
68*           D = GAMMA(1)                                                           BRK06600
69*           E = D*D                                                                BRK06700
70*           AB = 0.0                                                               BRK06800
71*        60 AB = AB+2.0                                                            BRK06900
72*           TR = AB*A1                                                             BRK07000
73*           TLIM = TR-B                                                            BRK07100
74*           TLIM = TLIM*TLIM*TMPQ1                                                 BRK07200
75*           IF (TLIM .LT. -10.0) GO TO 70                                          BRK07300
76*           STO1 = TR+A                                                            BRK07400
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77*            ST02 = TR-A                                                                    BRK07500
78*            ST03 = TR+B                                                                    BRK07600
79*            VREF = VREF+C*EXP(TLIM)+D*(EXP(ST01*ST01*TMPQ1)+EXP(ST02*ST02*TMPQBRK07700
80*           11))+E*EXP(ST03*ST03*TMPQ1)                                                     BRK07800
81*            C = D                                                                          BRK07900
82*            D = E                                                                          BRK08000
83*            E = E*GAMMA(1)                                                                 BRK08100
84*            GO TO 60                                                                       BRK08200
85*         70 CONTINUE                                                                       BRK08300
86*            TMPQ1 = X/UBAR(KK)                                                             BRK08400
87*            DOS(J) = PEAKD*LAT*(VER+VREF)                                                  BRK08500
88*            IF (DECAY .GT. 0.0) DOS(J) = DOS(J)*EXP(-DECAY*TMPQ1)                          BRK08600
89*            IF (LAMBDA .LE. 0.0.OR.TIM1 .GE. TMPQ1) GO TO 127                              BRK08700
90*            IF (Z(KK) .GT. ZLIM) GO TO 127                                                 BRK08800
91*            AB = EXP(-LAMBDA*(TMPQ1-TIM1))                                                 BRK08900
92*            DOS(J) = DOS(J)*AB                                                             BRK09000
93*        127 CONTINUE                                                                       BRK09100
94*            ANG(1) = UBAR(KK)                                                              BRK09200
95*            SUMSX = SUMSX+SIGX                                                             BRK09300
96*            NSMSX = NSMSX+1                                                                BRK09400
97*            IF (SIGX) 129,129,128                                                          BRK09500
98*        128 CONTINUE                                                                       BRK09600
99*            CON(J) = DOS(J)*UBAR(KK)/(SQR2P*SIGX)                                          BRK09700
100*       129 CONTINUE                                                                       BRK09800
101*       130 IF (IS .EQ. 1) GO TO 310                                                       BRK09900
102*           GO TO 140                                                                      BRK10000
103*       135 IS = 0                                                                         BRK10100
104*           IF (N .NE. 9) GO TO 125                                                        BRK10200
105*     C     CALCULATION OF THE FULL TRANSITION MODEL, MODEL4                               BRK10300
106*       140 DO 200 M=IBOT,ITOP                                                             BRK10400
107*           CALL COORD(N,M,X,Y,XO,YO,ASP,XS,2)                                             BRK10500
108*           IF (N .EQ. 9) GO TO 200                                                        BRK10600
109*           CALL SIGMA(X,M,2)                                                              BRK10700
110*           ST01 = 1.414214*SIGZ                                                           BRK10800
111*           TMPQ1 = 1.0/ST01                                                               BRK10900
112*           IF (SIGYNK) 200,200,147                                                        BRK11000
113*       147 IF (SIGZ) 200,200,148                                                          BRK11100
114*       148 LAT = Y/SIGYNK                                                                 BRK11200
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115*            LAT = -0.5*LAT*LAT                                                  BRK11300
116*            IF (LAT .LT. -60.0) GO TO 200                                       BRK11400
117*            XBARX = EXP(LAT)                                                    BRK11500
118*            A = Z(M+1)-ZZL(K)                                                   BRK11600
119*            B = ZZL(K)-Z(M)                                                     BRK11700
120*            C = Z(M+1)+ZZL(K)-Z(IBOT)-Z(IBOT)                                   BRK11800
121*            D = Z(IBOT)+Z(IBOT)-Z(M)-ZZL(K)                                     BRK11900
122*            ERFX(1) = A*TMPQ1                                                   BRK12000
123*            ERFX(2) = B*TMPQ1                                                   BRK12100
124*            ERFX(3) = C*TMPQ1                                                   BRK12200
125*            ERFX(4) = D*TMPQ1                                                   BRK12300
126*            CALL ISO(1,4)                                                       BRK12400
127*            STO2 = ERFX(1)+ERFX(2)+GAMMA(1)*(ERFX(3)+ERFX(4))                   BRK12500
128*            S1 = 0.0                                                            BRK12600
129*            S3 = Z(ITOP+1)-Z(IBOT)                                              BRK12700
130*            E = 1.0                                                             BRK12800
131*            F = GAMMA(1)                                                        BRK12900
132*            G = F*F                                                             BRK13000
133*            IFL = 0                                                             BRK13100
134*        150 S1 = S1+2.0                                                         BRK13200
135*            S2 = S1*S3                                                          BRK13300
136*            ERFX(3) = (S2+D)*TMPQ1                                              BRK13400
137*            ERFX(4) = (C-S2)*TMPQ1                                              BRK13500
138*            IF (IFL .EQ. 0) GO TO 155                                           BRK13600
139*            IF (ERFX(3) .GT. 3.0 .AND. ERFX(4) .LT. -3.0) GO TO 185             BRK13700
140*        155 IFL = 1                                                             BRK13800
141*            ERFX(1) = (S2+B)*TMPQ1                                              BRK13900
142*            ERFX(2) = (A-S2)*TMPQ1                                              BRK14000
143*            CALL ISO(1,4)                                                       BRK14100
144*            STO2 = STO2+F*(ERFX(1)+ERFX(2))+E*(ERFX(3)+ERFX(4))                 BRK14200
145*            ERFX(1) = (S2+A)*TMPQ1                                              BRK14300
146*            ERFX(2) = (B-S2)*TMPQ1                                              BRK14400
147*            ERFX(3) = (S2+C)*TMPQ1                                              BRK14500
148*            ERFX(4) = (D-S2)*TMPQ1                                              BRK14600
149*            CALL ISO(1,4)                                                       BRK14700
150*            STO2 = STO2+F*(ERFX(1)+ERFX(2))+G*(ERFX(3)+ERFX(4))                 BRK14800
151*            E = F                                                               BRK14900
152*            F = G                                                               BRK15000
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153*            G = G*GAMMA(1)                                                          BRK15100
154*            GO TO 150                                                               BRK15200
155*          185 CONTINUE                                                              BRK15300
156*            STO3 = 1.0/(Z(M+1)-Z(M))                                                BRK15400
157*            XBARX = EXP(-.5*(Y/SIGYNK)**2)                                          BRK15500
158*          190 TMPQ2 = X/UBAR(JF)                                                    BRK15600
159*            S1 = (Q(M)*STO3 /(2.0*SQR2P*UBAR(JF)*SIGYNK))*XBARX*STO2                BRK15700
160*            IF (DECAY .GT. 0.0) S1 = S1*EXP(-DECAY*TMPQ2)                           BRK15800
161*            IF (LAMBDA .LE. 0.0.OR.TIM1.GE.TMPQ2+TAST(ILK-1)) GO TO 195             BRK15900
162*            IF (Z(M) .GT. ZLIM) GO TO 195                                           BRK16000
163*            S1 = S1*EXP(-LAMBDA*(TMPQ2+TAST(ILK-1)-TIM1))                           BRK16100
164*          195 CONTINUE                                                              BRK16200
165*            IF (SIGXNK) 210,210,211                                                 BRK16300
166*          210 S2 = 0.0                                                              BRK16400
167*            GO TO 212                                                               BRK16500
168*          211 CONTINUE                                                              BRK16600
169*            S2 = (S1*UBAR(JF)/(SQR2P*SIGXNK))                                       BRK16700
170*          212 CONTINUE                                                              BRK16800
171*            DOS(J) = DOS(J)+S1                                                      BRK16900
172*            CON(J) = CON(J)+S2                                                      BRK17000
173*            SUMSX = SUMSX+SIGXNK                                                    BRK17100
174*            NSMSX = NSMSX+1                                                         BRK17200
175*          200 CONTINUE                                                              BRK17300
176*            ANG(1) = UBAR(JF)                                                       BRK17400
177*          310 CONTINUE                                                              BRK17500
178*            ANG(2) = 0.0                                                            BRK17600
179*            IF (NSMSX .GT. 0) ANG(2) = SUMSX/FLOAT(NSMSX)                           BRK17700
180*            AVCON(J) = 0.0                                                          BRK17800
181*            PASSTM(J) = 0.0                                                         BRK17900
182*            IF (ANG(2) .LE. 0.0) GO TO 311                                          BRK18000
183*            IF (DOS(J) .LE. 0.0) GO TO 311                                          BRK18100
184*            ERFX(1) = 0.0                                                           BRK18200
185*            IF (ANG(2) .GT. 0.0) ERFX(1) = ANG(1)*TIMAV/(2.8284271*ANG(2))          BRK18300
186*            CALL ISO(1,1)                                                           BRK18400
187*            AVCON(J) = (DOS(J)/TIMAV)*ERFX(1)                                       BRK18500
188*            PASSTM(J) = 4.3*ANG(2)/ANG(1)                                           BRK18600
189*          311 CONTINUE                                                              BRK18700
190*            RETURN                                                                  BRK18800
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191*            END                                                  BRK18900
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1*            SUBROUTINE    SGP, VERSION  5, REVISION 0
2*
3*            SUBROUTINE SGP(ZH,N,SIG,IN,IZ,UBHK,X,IBB)                                SGP00100
4*            COMMON /PARAMT/ TESTNO(12),         ISKIP(15),NXS,NYS,NZS,NDI,NCI,       SGP00200
5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),G(15),            SGP00300
6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),             SGP00400
7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,            SGP00500
8*           4XLRY,XLRZ,ZZL(40),IZMOL(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),        SGP00600
9*           5TAST(05),UBOT(05),UTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),       SGP00700
10*          6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)       SGP00800
11*          7,THETAL(10),GAMMAP(20),NT1,TI(10),NPS,NAMCAS(12)                         SGP00900
12*            COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),      SGP01000
13*           1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,ST01,           SGP01100
14*           2ST02,ST03,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,        SGP01200
15*           3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,           SGP01300
16*           4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,                 SGP01400
17*           5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),              SGP01500
18*           6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,          SGP01600
19*           7NYSS,CDAMX(3)                                                            SGP01700
20*            DIMENSION DTHK(21)                                                       SGP01800
21*            EQUIVALENCE (DTHK,XAST)                                                  SGP01900
22*            INTEGER TESTNO                                                           SGP02000
23*            REAL MPWR,L,LAMBDA                                                       SGP02100
24*      C     SUBROUTINE SGP CALCULATES SIGENK AND SIGANK WITH OR WITHOUT              SGP02200
25*      C     DESTRUCT IN THE LAYER.                                                   SGP02300
26*            GO TO (4,44,64,68),IBB                                                   SGP02400
27*          4 S = 0.0                                                                  SGP02500
28*            MN = N-1                                                                 SGP02600
29*            HHNK = ZH                                                                SGP02700
30*            HHRK = 1.0                                                               SGP02800
31*            IF (N .EQ. 1) GO TO 5                                                    SGP02900
32*            HHRK = ZH                                                                SGP03000
33*            HHNK = Z(N+1)                                                            SGP03100
34*          5 SG3 = SIGEK(1)                                                           SGP03200
35*            IF (IN .EQ. 2) SG3 = SIGAP(1)                                            SGP03300
36*            IF (N .LE. 2) GO TO 30                                                   SGP03400
37*            DO 25 M=2,MN                                                             SGP03500
38*            IF (IN .EQ. 2) GO TO 10                                                  SGP03600
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39*            SG1 = SIGEK(M+1)                                                    SGP03700
40*            SG2 = SIGEK(M)                                                      SGP03800
41*            GO TO 20                                                            SGP03900
42*         10 SG1 = SIGAP(M+1)                                                    SGP04000
43*            SG2 = SIGAP(M)                                                      SGP04100
44*         20 S = S+(SG1+SG2)*(Z(M+1)-Z(M))*0.5                                   SGP04200
45*         25 CONTINUE                                                            SGP04300
46*         30 IF (IN .EQ. 2) GO TO 35                                             SGP04400
47*            SG1 = SIGEK(N+1)                                                    SGP04500
48*            SG2 = SIGEK(N)                                                      SGP04600
49*            PWR = QPWR                                                          SGP04700
50*            GO TO 40                                                            SGP04800
51*         35 SG1 = SIGAP(N+1)                                                    SGP04900
52*            SG2 = SIGAP(N)                                                      SGP05000
53*            PWR = MPWR                                                          SGP05100
54*         40 IF (N .EQ. 1) GO TO 42                                              SGP05200
55*            S = S+(ZH-Z(N))*(((SG1-SG2)/(Z(N+1)-Z(N)))*(ZH-Z(N))+SG2)*0.5       SGP05300
56*         42 SIG = (S+RB11(SG3,PWR,HHNK,ZRK))*RAD/HHRK                           SGP05400
57*            RETURN                                                              SGP05500
58*      C     ENTRY UBARS(ZH,N,IZ,UBHK)                                           SGP05600
59*      C     SUBROUTINE UBARS CALCULATES UBARNK, X NK, Y NK, CAP THETA (ANG)     SGP05700
60*         44 XBARX = 0.0                                                         SGP05800
61*            YBARY(IZ) = 0.0                                                     SGP05900
62*            VV = VS(II)                                                         SGP06000
63*            PWR = PPWR                                                          SGP06100
64*            IF (JF .EQ. 2) VV = VB(II)                                          SGP06200
65*            IF (N .EQ. 1) GO TO 50                                              SGP06300
66*            MN = N-1                                                            SGP06400
67*            DO 45 M=1,MN                                                        SGP06500
68*            S = DTHK(M+1)-DTHK(M)                                               SGP06600
69*            IF (S) 46,45,46                                                     SGP06700
70*         46 CONTINUE                                                            SGP06800
71*            S1 = SIN(DTHK(M+1))-SIN(DTHK(M))                                    SGP06900
72*            S2 = COS(DTHK(M+1))-COS(DTHK(M))                                    SGP07000
73*            S = UBAR(M)*(Z(M+1)-Z(M))/(VV*S)                                    SGP07100
74*            XBARX = XBARX+(S1*S)                                                SGP07200
75*            YBARY(IZ) = YBARY(IZ)+(S2*(-S))                                     SGP07300
76*         45 CONTINUE                                                            SGP07400
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 77*          50 TMPQ1 = 1.0/(Z(N+1)-Z(N))                                                    SGP07500
 78*             S = ((DTHK(N+1)-DTHK(N))*TMPQ1)*(ZH-Z(N))+DTHK(N)                            SGP07600
 79*             S1 = SIN(S)-SIN(DTHK(N))                                                    SGP07700
 80*             S2 = COS(S)-COS(DTHK(N))                                                    SGP07800
 81*             IF (N .EQ. 1) GO TO 52                                                      SGP07900
 82*             UBHK = ((UBARK(N+1)-UBARK(N))*TMPQ1)*0.5*(ZH-Z(N))+(0.5*UBARK(N))           SGP08000
 83*             GO TO 54                                                                    SGP08100
 84*          52 UBHK = RB11(UBARK(1),PWR,ZH,ZRK)                                            SGP08200
 85*          54 CONTINUE                                                                    SGP08300
 86*             S = DTHK(N+1)-DTHK(N)                                                       SGP08400
 87*             IF (S) 53,55,53                                                             SGP08500
 88*          53 S = UBHK/(VV*S*TMPQ1)                                                       SGP08600
 89*             XBARX = XBARX+(S1*S)                                                        SGP08700
 90*             YBARY(IZ) = YBARY(IZ)+(S2*(-S))                                             SGP08800
 91*          55 CONTINUE                                                                    SGP08900
 92*             IF (XBARX) 57,56,57                                                         SGP09000
 93*          56 IF (YBARY(IZ)) 57,58,57                                                     SGP09100
 94*          57 ANG(IZ) = ATAN2(YBARY(IZ),XBARX)                                            SGP09200
 95*             GO TO 60                                                                    SGP09300
 96*          58 ANG(IZ) = 0.0                                                               SGP09400
 97*          59 UBARNK(IZ) = UBHK                                                           SGP09500
 98*             SQBAR = 0.0                                                                 SGP09600
 99*             GO TO 62                                                                    SGP09700
100*          60 IF (XBARX) 61,59,61                                                         SGP09800
101*          61 SQBAR = SQRT(XBARX*XBARX+YBARY(IZ)*YBARY(IZ))                               SGP09900
102*             UBARNK(IZ) = SQBAR*VV/ZH                                                    SGP10000
103*          62 CONTINUE                                                                    SGP10100
104*             RETURN                                                                      SGP10200
105*       C     ENTRY DEPSO(X,N,IZ)                                                        SGP10300
106*       C     SUBROUTINE DEPSO CALCULATES ALL OF THE DEPOSITION EQUATION EXCEPT          SGP10400
107*       C     THE LATERAL TERM                                                           SGP10500
108*             64 ZF = ZZL(IZ)                                                             SGP10600
109*             VV = VS(II)                                                                 SGP10700
110*             GAMMB = GAMMA(II)                                                           SGP10800
111*             XXX = X                                                                     SGP10900
112*             PERK = PERC(II)                                                             SGP11000
113*             IF (JF .EQ. 1) GO TO 165                                                    SGP11100
114*             ZF = HB                                                                     SGP11200
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115*            VV = VB(II)                                                    SGP11300
116*            XXX = X+(SIGZO(N)/SIGENK(IZ))**(1.0/BETANK(IZ))                SGP11400
117*            PERK = PERCB(II)                                               SGP11500
118*          165 XKNK = 0.0                                                   SGP11600
119*            IF (GAMMB .GE. 1.0) GO TO 69                                   SGP11700
120*            S1 = 1.0/(SIGENK(IZ)*XXX**BETANK(IZ))                          SGP11800
121*            S2 = VV*XXX/UBARNK(IZ)                                         SGP11900
122*            S3 = -0.5*S1*S1                                                SGP12000
123*            S4 = BETANK(IZ)*(S2-ZF)-S2                                     SGP12100
124*            S2 = S2-ZF                                                     SGP12200
125*            B = 1.0                                                        SGP12300
126*            XKNK = -S4*EXP(S2*S2*S3)                                       SGP12400
127*            A = 0.0                                                        SGP12500
128*           65 A = A+2.0                                                    SGP12600
129*            S5 = A*Z(N+1)                                                  SGP12700
130*            S6 = S5-S2                                                     SGP12800
131*            S7 = S5+S2                                                     SGP12900
132*            S7 = S7*S7*S3                                                  SGP13000
133*            S6 = S6*S6*S3                                                  SGP13100
134*            IF (A .LE. 2.0) GO TO 66                                       SGP13200
135*            IF (S6 .LT. -10.0.AND.S7 .LT. -10.0) GO TO 67                  SGP13300
136*           66 S5 = S5*BETANK(IZ)                                           SGP13400
137*            XKNK = XKNK+B*((S5+S4)*EXP(S7)+GAMMB*(S5-S4)*EXP(S6))          SGP13500
138*            IF (GAMMB .LE. 0.0) GO TO 67                                   SGP13600
139*            B = B*GAMMB                                                    SGP13700
140*            GO TO 65                                                       SGP13800
141*           67 CONTINUE                                                     SGP13900
142*            XY = (SIGYO(N)/SIGANK(IZ))**(1.0/ALPHNK(IZ))                   SGP14000
143*            SIGYNK = SQRT((SIGANK(IZ)*(X+XY)**ALPHNK(IZ))**2+(SIGENK(IZ)*XXX**SGP14100
144*           1BETANK(IZ)*YBARY(IZ)/ZF)**2)                                   SGP14200
145*            IF (SIGYNK .LE. 0.0) GO TO 69                                  SGP14300
146*            DEP = Q(N)*PERK*(1.0-GAMMB)*S1*XKNK/(6.2831853*SIGYNK*FLOAT(NXCI)*SGP14400
147*           1XXX)                                                           SGP14500
148*           69 CONTINUE                                                     SGP14600
149*            RETURN                                                         SGP14700
150*      C     ENTRY BETAK(ZH,N,IZ)                                           SGP14800
151*      C     SUBROUTINE BETAK CALCULATES  BETA NK AND ALPHA NK              SGP14900
152*           68 S1 = 0.0                                                     SGP15000
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153*            S2 = 0.0                                                    SGP15100
154*            IF (N .EQ. 1) GO TO 90                                      SGP15200
155*            MN = N-1                                                    SGP15300
156*            DO 70 M=1,MN                                                SGP15400
157*            S1 = S1+BETA(M)*(Z(M+1)-Z(M))                               SGP15500
158*            S2 = S2+ALPHA(M)*(Z(M+1)-Z(M))                              SGP15600
159*         70 CONTINUE                                                    SGP15700
160*            TMPQ1 = 1.0/ZH                                              SGP15800
161*            TMPQ2 = ZH-Z(N)                                             SGP15900
162*            BETANK(IZ) = (S1+BETA(N)*TMPQ2)*TMPQ1                       SGP16000
163*            ALPHNK(IZ) = (S2+ALPHA(N)*TMPQ2)*TMPQ1                      SGP16100
164*            GO TO 95                                                    SGP16200
165*         90 BETANK(IZ) = BETA(N)                                        SGP16300
166*            ALPHNK(IZ) = ALPHA(N)                                       SGP16400
167*         95 CONTINUE                                                    SGP16500
168*            RETURN                                                      SGP16600
169*            END                                                         SGP16700
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1*            SUBROUTINE  WASHT, VERSION 6,  REVISION 0
2*
3*            SUBROUTINE WASHT                                                    WSH00100
4*            COMMON /PARAMT/ TESTNO(12),        ISKIP(15),NXS,NYS,NZS,NDI,NCI,  WSH00200
5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),       WSH00300
6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),        WSH00400
7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,       WSH00500
8*           4XLRY,XLRZ,ZZL(40),IZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),   WSH00600
9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),WSH00700
10*          6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)WSH00800
11*          7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                    WSH00900
12*           COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),WSH01000
13*          1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,ST01,      WSH01100
14*          2ST02,ST03,TKD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,   WSH01200
15*          3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,      WSH01300
16*          4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,            WSH01400
17*          5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),         WSH01500
18*          6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,     WSH01600
19*          7NYSS,CDAMA(3)                                                       WSH01700
20*           DIMENSION WASHOU(41,1)                                              WSH01800
21*           EQUIVALENCE (DEPN,WASHOU)                                           WSH01900
22*           EQUIVALENCE (ISW6,SIGENK),(A,SIGENK(2)),(B,SIGENK(3)),(C,SIGENK(4)WSH02000
23*          1),(D,SIGENK(5)),(E,SIGENK(6)),(G,SIGENK(7))                         WSH02100
24*           REAL MPWR,L,LAMBDA                                                  WSH02200
25*           INTEGER TESTNO                                                      WSH02300
26*     C     THIS SUBROUTINE CALCULATES PRECIPITATION DEPOSITION - MODEL 5       WSH02400
27*     C   * FOR OUTPUT IN MG/M**2 Q(KK) IS IN UNITS OF MILLIGRAMS.             WSH02500
28*     C   * FOR OUTPUT IN PH OF TIME DEPENDENT DEPOSITION Q(KK) IS IN UNITS    WSH02600
29*     C     OF  Q(KK)= ( Q(GRAMS)*(1/(RATE IN/HR))*(1/25.4)*(1/MOLE WT.)*      WSH02700
30*     C                  (1/DURATION HRS) )  THEN DEP IN PH = -LOG10(WASHOU).  WSH02800
31*     C   * FOR OUTPUT IN PH OF MAXIMUM DEP AT EACH POINT Q(KK) IS IN UNITS    WSH02900
32*     C     OF  Q(KK)= ( Q(GRAMS)*(1/(RATE IN/HR))*(1/25.4)*(1/MOLE WT.) )     WSH03000
33*     C         THEN DEP IN PH = -LOG10(WASHOU) WHERE DEP IN PH IS > 0 AND     WSH03100
34*     C         < OR = 14.                                                     WSH03200
35*     C     ALSO LAMBDA CAN BE CALCULATED BY -                                 WSH03300
36*     C         LAMBDA = 8.3E-5*((RATE IN/HR)*(2.54 CM/IN)*(10 MM/CM))**.567   WSH03400
37*     C                = 5.2E-4*(RATE MM/HR)**.567  IN UNITS OF (1/SEC)       WSH03500
38*           C = 1.0                                                             WSH03600
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59*            D = 1.0                                                                    WSH03700
40*            E = 1.0                                                                    WSH03800
41*            CALL COORD(N,KK,X,Y,XX(I),YY(J),ASP,XS,1)                                  WSH03900
42*            IF (NBK.NE.0.AND.IBOT.LE.KK.AND.KK.LE.ITOP) GO TO 20                       WSH04000
43*            IF (N .EQ. 9) GO TO 70                                                     WSH04100
44*         10 CALL SIGMA(X,KK,1)                                                         WSH04200
45*            A = UBAR(KK)                                                               WSH04300
46*            B = SIGY                                                                   WSH04400
47*            G = TIM1                                                                   WSH04500
48*            GO TO 30                                                                   WSH04600
49*         20 IF (N .NE. 9) GO TO 10                                                     WSH04700
50*            CALL COORD(N,KK,X,Y,XX(I),YY(J),ASP,XS,2)                                  WSH04800
51*            IF (N .EQ. 9) GO TO 70                                                     WSH04900
52*            CALL SIGMA(X,KK,2)                                                         WSH05000
53*            A = UBAR(JF)                                                               WSH05100
54*            B = SIGYNK                                                                 WSH05200
55*            G = TIM1-TAST(ILK-1)                                                       WSH05300
56*            SIGX = SIGXNK                                                              WSH05400
57*         30 IF (ISKIP(4) .NE. 0) GO TO 35                                              WSH05500
58*            IF (X/A .LT. G) GO TO 70                                                   WSH05600
59*         35 CONTINUE                                                                   WSH05700
60*            IF (B .LE. 0.0) GO TO 70                                                   WSH05800
61*            IF (G .LT. (X-2.15*SIGX)/A) GO TO 40                                       WSH05900
62*            IF (ISKIP(4) .EQ. 1) GO TO 40                                              WSH06000
63*             E = AMOD(YY(J),360.0)                                                     WSH06100
64*            IF (E .LT. 0.0) E = 360.0+E                                                WSH06200
65*            WRITE (6,80) XX(I),E                                                       WSH06300
66*         40 CONTINUE                                                                   WSH06400
67*         50 E = Y/B                                                                    WSH06500
68*            E = -0.5*E*E                                                               WSH06600
69*            IF (E .LT. -60.0) GO TO 70                                                 WSH06700
70*            E = EXP(E)                                                                 WSH06800
71*            IF (ISKIP(4) .EQ. 0) GO TO 55                                              WSH06900
72*      C     MAXIMUM DEP                                                              WSH07000
73*            C = EXP(-LAMBDA*2.15*SIGX/A)                                               WSH07100
74*      C     IF OUTPUT IN PH                                                          WSH07200
75*            IF (ISKIP(9) .NE. 0) C = C*837.209302*A/SIGX                               WSH07300
76*      C     837.209302*A/SIGX=1/DURATION=3600*UBAR/(4.3*SIGX)                        WSH07400
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77*            GO TO 60                                                                    WSH07500
78*         55 CONTINUE                                                                    WSH07600
79*      C     TIME DEPENDENT DEP                                                          WSH07700
80*            C = EXP(-LAMBDA*(X/A-G))                                                    WSH07800
81*         60 WASHOU(I,J) = WASHOU(I,J)+(LAMBDA*Q(KK)/(SQR2P*A*B))*C*E                    WSH07900
82*         70 RETURN                                                                      WSH08000
83*         80 FORMAT (1H0,36H *** PRECIPITATION DEPOSITION AT XX=,F10.3,5H, YY=,        WSH08100
84*           1F10.3,26H MAY BE OVER ESTIMATED ***/)                                    WSH08200
85*            END                                                                         WSH08300
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1*            SUBROUTINE  COORD, VERSION  5, REVISION 0
2*
3*            SUBROUTINE COORD(N,M,X,Y,XO,YO,ASP,XS,ICK)                                CRD00100
4*            COMMON /PARAMT/ TESTNO(12),        1SKIP(15),NXS,NYS,NZS,NDI,NCI,         CRD00200
5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),             CRD00300
6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),              CRD00400
7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,             CRD00500
8*           4XLRY,XLRZ,ZZL(40),IZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),         CRD00600
9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),CRD00700
10*          6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)CRD00800
11*          7,THETAL(10),GAMMAP(20),NT1,TI(10),NPS,NAMCAS(12)                          CRD00900
12*           COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),CRD01000
13*          1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,ST01,            CRD01100
14*          2ST02,ST03,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,         CRD01200
15*          3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,            CRD01300
16*          4NCCC,NDDD,NTT1,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,                  CRD01400
17*          5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),               CRD01500
18*          6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,           CRD01600
19*          7NYSS,CDAMX(3)                                                             CRD01700
20*           INTEGER TESTNO                                                            CRD01800
21*           REAL MPWR,L,LAMBDA                                                        CRD01900
22*     C      *****THIS SUBROUTINE TRANSLATES AND ROTATES THE FIXED INPUT *****CRD02000
23*     C      ***** COORDINATES RELATIVE TO A SYSTEM WITH POSITIVE X AXIS  ****CRD02100
24*     C      ***** ALONG THE WIND DIRECTION THETA.                               CRD02200
25*            N = 0                                                               CRD02300
26*            B = AMOD(YO,360.0)*RAD                                              CRD02400
27*            IF (ICK .EQ. 2) GO TO 10                                            CRD02500
28*            A = THETA(M)                                                        CRD02600
29*            GO TO 11                                                            CRD02700
30*         10 A = THETA(JF)                                                       CRD02800
31*         11 XP = XO*SIN(B)                                                      CRD02900
32*            YP = XO*COS(B)                                                      CRD03000
33*            A = A*RAD                                                           CRD03100
34*            B = COS(A)                                                          CRD03200
35*            A = SIN(A)                                                          CRD03300
36*            DY = DELY(M)*RAD                                                    CRD03400
37*            DX = DELX(M)*SIN(DY)                                                CRD03500
38*            DY = DELX(M)*COS(DY)                                                CRD03600
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39*          20 IF (ICK .EQ. 2) GO TO 50                                                    CRD03700
40*          21 X1 = XP-DX                                                                  CRD03800
41*             Y1 = YP-DY                                                                  CRD03900
42*             X = -X1*A-Y1*B                                                              CRD04000
43*             Y = X1*B-Y1*A                                                               CRD04100
44*             IF (X .LE. 0.0) GO TO 80                                                    CRD04200
45*             IF (KSW(2) .EQ. 0) GO TO 40                                                 CRD04300
46*             XS = SQRT(X1*X1+Y1*Y1)                                                      CRD04400
47*             ASP = 0.0                                                                   CRD04500
48*             IF (X1) 31,30,31                                                            CRD04600
49*          30 IF (Y1) 31,90,31                                                            CRD04700
50*          31 ASP = 1.5707963-ATAN2(Y1,X1)                                                CRD04800
51*             IF (ASP .LT. 0.0) ASP = ASP+6.2831853                                       CRD04900
52*             GO TO 90                                                                    CRD05000
53*          40 IF (NBK .EQ. 0) GO TO 90                                                    CRD05100
54*             IF (ICK .EQ. 2) GO TO 90                                                    CRD05200
55*             IF (KK .LT. IBOT.OR.KK .GT. ITOP) GO TO 90                                  CRD05300
56*             IF (XAST(M) .LE. 0.0) GO TO 80                                              CRD05400
57*             ASP = THETA(JF)*RAD                                                         CRD05500
58*          50 XS = (THETA(M)+180.0)*RAD                                                   CRD05600
59*             DX = DX+XAST(M)*SIN(XS)                                                     CRD05700
60*             DY = DY+XAST(M)*COS(XS)                                                     CRD05800
61*             IF (ICK .EQ. 2) GO TO 21                                                    CRD05900
62*             X1 = XP-DX                                                                  CRD06000
63*             Y1 = YP-DY                                                                  CRD06100
64*             XS = -X1*SIN(ASP)-Y1*COS(ASP)                                               CRD06200
65*             A = ABS(THETA(M)-THETA(JF))                                                 CRD06300
66*             IF (A .GE. 180.0) A = 360.0-A                                               CRD06400
67*             IF (A .GT. 45.0) GO TO 60                                                   CRD06500
68*             IF (XS .LE. 0.0) GO TO 90                                                   CRD06600
69*             GO TO 80                                                                    CRD06700
70*          60 CALL SIGMA(XAST(M),M,3)                                                     CRD06800
71*             ASP = A*RAD                                                                 CRD06900
72*             SIGY = 2.15*SQRT((SIGX*SIN(ASP))**2+(SIGY*COS(ASP))**2)                     CRD07000
73*             IF (A .GT. 90.0) GO TO 70                                                   CRD07100
74*             IF (X .GT. XAST(M)+SIGY) GO TO 80                                           CRD07200
75*             IF (XS .LE. 0.0) GO TO 90                                                   CRD07300
76*             IF (X .LT. XAST(M)) GO TO 90                                                CRD07400
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77*          GO TO 80                                                    CRD07500
78*       70 IF (X .LE. XAST(M)+SIGY) GO TO 90                           CRD07600
79*       80 N = 9                                                       CRD07700
80*       90 RETURN                                                      CRD07800
81*          END                                                         CRD07900
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 1*            SUBROUTINE  SIGMA, VERSION  5, REVISION 0
 2*
 3*            SUBROUTINE SIGMA(XP,M,MM)                                          SIG00100
 4*            COMMON /PARAMT/ TESTNO(12),        ISKIP(15),NXS,NYS,NZS,NDI,NCI,  SIG00200
 5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),      SIG00300
 6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),       SIG00400
 7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,      SIG00500
 8*           4XLRY,XLRZ,ZZL(40),ICMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),  SIG00600
 9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),SIG00700
10*           6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)SIG00800
11*           7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                  SIG00900
12*            COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),SIG01000
13*           1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,STO1,     SIG01100
14*           2STO2,STO3,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,  SIG01200
15*           3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,     SIG01300
16*           4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,           SIG01400
17*           5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),        SIG01500
18*           6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,    SIG01600
19*           7NYSS,CDAMX(3)                                                     SIG01700
20*            INTEGER TESTNO                                                    SIG01800
21*            REAL MPWR,L,LAMBDA                                                SIG01900
22*      C      ***** THIS SUBROUTINE CALCULATES THE STANDARD DEVIATIONS OF X,Y,ZSIG02000
23*            X = XP                                                            SIG02100
24*            IF (MM .EQ. 2) X = XAST(M)                                        SIG02200
25*            MMM = 1                                                           SIG02300
26*            SIGZ = 0.0                                                        SIG02400
27*            SIGY = 0.0                                                        SIG02500
28*            SIGX = 0.0                                                        SIG02600
29*            N = MODLS(M)                                                      SIG02700
30*            GO TO (40,20,30),N                                                SIG02800
31*         20 SIGY = SIGYO(M)                                                   SIG02900
32*            SIGX = SIGXO(M)                                                   SIG03000
33*            GO TO 220                                                         SIG03100
34*         30 B3 = SIGEP(M)                                                     SIG03200
35*            B4 = BETA(M)                                                      SIG03300
36*         40 A1 = 1.0                                                          SIG03400
37*            A2 = SIGYO(M)                                                     SIG03500
38*            A3 = SIGAP(M)                                                     SIG03600
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```
39*            A4 = ALPHA(M)                                                    SIG03700
40*            A5 = DELTHP(M)                                                   SIG03800
41*            A6 = SIGXO(M)                                                    SIG03900
42*            L = 0.0                                                          SIG04000
43*            IF (DELU(M) .LE. 0.0) GO TO 45                                   SIG04100
44*            L = 0.28*X*DELU(M)/UBAR(M)                                       SIG04200
45*         45 IF (MM .EQ. 1) GO TO 60                                          SIG04300
46*            N = 1                                                            SIG04400
47*            GO TO 60                                                         SIG04500
48*         50 T1 = (THETA(M)-THETA(JF))*RAD                                    SIG04600
49*            A1 = 1.0                                                         SIG04700
50*            T2 = SIN(T1)                                                     SIG04800
51*            T1 = COS(T1)                                                     SIG04900
52*            A2 = SQRT((SIGX*T2)**2+(SIGY*T1)**2)                             SIG05000
53*            A3 = SIGAP(JF)                                                   SIG05100
54*            A4 = ALPHA(JF)                                                   SIG05200
55*            A5 = DELTHP(JF)                                                  SIG05300
56*            A6 = SQRT((SIGX*T1)**2+(SIGY*T2)**2)                             SIG05400
57*            B3 = SIGEP(JF)                                                   SIG05500
58*            B4 = BETA(JF)                                                    SIG05600
59*            L = 0.0                                                          SIG05700
60*            IF (DELU(JF) .LE. 0.0) GO TO 60                                  SIG05800
61*            L = 0.28*X*DELU(JF)/UBAR(JF)                                     SIG05900
62*         60 IF (A4-1.0) 70,80,70                                             SIG06000
63*         70 A1 = 1.0/A4                                                      SIG06100
64*            IF (MMM .EQ. 2) GO TO 90                                         SIG06200
65*            IF (A2-A3*XRY) 80,80,90                                          SIG06300
66*         80 XY = A2/A3                                                       SIG06400
67*            GO TO 91                                                         SIG06500
68*         90 XY = A4*XRY*(A2/(A3*XRY))**A1+XRY*(1.0-A4)                       SIG06600
69*         91 IF (MMM .EQ. 1) XY = XY-XLRY                                     SIG06700
70*            IF (XY .LT. 0.0) XY = 0.0                                        SIG06800
71*            IF (A4-1.0) 110,100,110                                          SIG06900
72*        100 T1 = A3*(X+XY)                                                   SIG07000
73*            GO TO 120                                                        SIG07100
74*        110 T1 = (X+XY-XRY*(1.0-A4))/(XRY*A4)                                SIG07200
75*            IF (T1 .LE. 0.0) GO TO 125                                       SIG07300
76*            T1 = A3*XRY*T1**A4                                               SIG07400
```

```
     120 T2 = ABS(A5)*X*4.0589052E-3                                    SIG07500
         SIGY = SQRT(T1*T1+T2*T2)                                       SIG07600
     125 SIGX = SQRT(L*L*.05408329+A6*A6)                               SIG07700
         IF (N .EQ. 1) GO TO 220                                        SIG07800
         GO TO (150,130),MMM                                            SIG07900
     130 IF (B4-1.0) 140,131,140                                        SIG08000
     131 XZ = X                                                         SIG08100
         GO TO 190                                                      SIG08200
     140 T1 = X/XRZ                                                     SIG08300
         GO TO 210                                                      SIG08400
     150 IF (B4-1.0) 151,160,151                                        SIG08500
     151 B1 = 1.0/B4                                                    SIG08600
         IF (SIGZO(M)-B3*XRZ) 160,160,170                               SIG08700
     160 XZ = SIGZO(M)/B3-XLRZ                                          SIG08800
         GO TO 180                                                      SIG08900
     170 XZ = B4*XRZ*(SIGZO(M)/(B3*XRZ))**B1-XLRZ+XRZ*(1.0-B4)          SIG09000
     180 IF (XZ .LT. 0.0) XZ = 0.0                                      SIG09100
         XZ = X+XZ                                                      SIG09200
         IF (B4-1.0) 200,190,200                                        SIG09300
     190 SIGZ = B3*XZ                                                   SIG09400
         GO TO 220                                                      SIG09500
     200 T1 = (XZ-XRZ*(1.0-B4))/(B4*XRZ)                                SIG09600
         IF (T1 .LE. 0.0) GO TO 220                                     SIG09700
     210 SIGZ = B3*XRZ*T1**B4                                           SIG09800
     220 CONTINUE                                                       SIG09900
         IF (MM .NE. 2) GO TO 240                                       SIG10000
         IF (MMM .EQ. 2) GO TO 230                                      SIG10100
         N = 2                                                          SIG10200
         X = XP                                                         SIG10300
         MMM = 2                                                        SIG10400
         GO TO 50                                                       SIG10500
     230 SIGXNK = SIGX                                                  SIG10600
         SIGYNK = SIGY                                                  SIG10700
     240 RETURN                                                         SIG10800
         END                                                            SIG10900
```

```
1*            SUBROUTINE  TESTR, VERSION  5, REVISION 0
2*
3*             SUBROUTINE TESTR(KTK)                                                    TST00100
4*            COMMON /PARAMT/ TESTNO(12),        ISKIP(15),NXS,NYS,NZS,NDI,NCI,        TST00200
5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),G(15),            TST00300
6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),             TST00400
7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,            TST00500
8*           4XLRY,XLRZ,ZZL(40),ZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),         TST00600
9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),       TST00700
10*          6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)       TST00800
11*          7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                         TST00900
12*           COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),       TST01000
13*          1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,ST01,           TST01100
14*          2ST02,ST03,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,        TST01200
15*          3MPWR,II,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,           TST01300
16*          4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,                 TST01400
17*          5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),              TST01500
18*          6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,          TST01600
19*          7NYSS,CDAMX(3)                                                            TST01700
20*           INTEGER TESTNO                                                           TST01800
21*           REAL MPWR,L,LAMBDA                                                       TST01900
22*     C     THIS SUBROUTINE DETERMINES THE STRUCTURAL CHANGE IN LAYERS FOR           TST02000
23*     C     THE PULL TRANSITION MODEL                                                TST02100
24*           IF (NBK .EQ. 0) GO TO 100                                                TST02200
25*           IF (KTK .EQ. 0) GO TO 50                                                 TST02300
26*           IF (KK .GE. JBOT(ILK)) GO TO 50                                          TST02400
27*           IBOT = JBOT(ILK)                                                         TST02500
28*           ITOP = JTOP(ILK)                                                         TST02600
29*           GO TO 61                                                                 TST02700
30*        50 IF (KK .NE. JBOT(ILK)) GO TO 61                                          TST02800
31*           IBOT = KK                                                                TST02900
32*           ITOP = JTOP(ILK)                                                         TST03000
33*           DO 60 J=IBOT,ITOP                                                        TST03100
34*        60 XAST(J) = UBAR(J)*TAST(ILK)                                              TST03200
35*           ILK = ILK+1                                                              TST03300
36*        61 CONTINUE                                                                 TST03400
37*           KTK = 0                                                                  TST03500
38*       100 CONTINUE                                                                 TST03600
```

```
39*               RETURN                                        TST03700
40*               END                                           TST03800
```

```
 1*            SUBROUTINE    ISO, VERSION  5, REVISION 0
 2*
 3*            SUBROUTINE ISO(MR,MT)                                                    ISO00100
 4*            COMMON /PARAMT/ TESTNO(12),        ISKIP(15),NXS,NYS,NZS,NDI,NCI,        ISO00200
 5*           1NBK,NPTS,NVS,NVB,XX(41),YY(41),Z(16),DELX(15),DELY(15),Q(15),           ISO00300
 6*           2UBARK(16),SIGAK(16),SIGEK(16),SIGXO(15),SIGYO(15),SIGZO(15),            ISO00400
 7*           3ALPHA(20),BETA(20),ZRK,TIMAV,THETAK(16),TAUK,TAUOK,H,XRY,XRZ,           ISO00500
 8*           4XLRY,XLRZ,ZZL(40),IZMOD(15),DECAY,ZLIM,TIM1,LAMBDA,DI(10),CI(10),       ISO00600
 9*           5TAST(05),JBOT(05),JTOP(05),VS(20),PERC(20),ACCUR,VB(20),PERCB(20),      ISO00700
10*           6HB,ALPHL(05),BETL(05),TAUL,TAUOL,ZRL,UBARL(10),SIGAL(10),SIGEL(10)      ISO00800
11*           7,THETAL(10),GAMMAP(20),NTI,TI(10),NPS,NAMCAS(12)                        ISO00900
12*            COMMON /PARAMS/ UBAR(20),SIGAP(20),DELTHP(20),SIGEP(20),THETA(20),      ISO01000
13*           1DELU(20),VER,VREF,PEAKD,SIGZ,SIGY,SIGX,SQR2P,L,TH,I,J,KK,ST01,          ISO01100
14*           2ST02,ST03,TRD,ILK,RAD,NNZ,ITOP,IBOT,XAST(21),SIGXNK,JF,PPWR,QPWR,       ISO01200
15*           3MPWR,I1,DEP,XBARX,SQBAR,NXCI,LAT,SIGYNK,GAMMA(20),NCC,NDD,NTT,          ISO01300
16*           4NCCC,NDDD,NTTT,NSW2,MODLS(15),KSW(5),LINES,IM1,MDLS,NWD,                ISO01400
17*           5YSV(41),YBARY(41),UBARNK(41),BETANK(41),ALPHNK(41),ANG(42),             ISO01500
18*           6SIGENK(41),SIGANK(41),DEPN(41,41),RNG,AZM,IDATE(2),ITIME(2),YT,         ISO01600
19*           7NYSS,CDAMX(5)                                                           ISO01700
20*            DIMENSION ERFX(6)                                                       ISO01800
21*            EQUIVALENCE (ANG(10),ERFX)                                              ISO01900
22*            INTEGER TESTNO                                                          ISO02000
23*            REAL MPWR,L,LAMBDA                                                      ISO02100
24*            DOUBLE PRECISION A6,A7,A8,A9,A10,A11,DTX                                ISO02200
25*      C     THIS SUBROUTINE EVALUATES ERF(X)                                        ISO02300
26*            DATA A6,A7,A8,A9,A10,A11/.0705230784D0,.042282012 3D0,.0092705272D0ISO02400
27*           1,.0001520143D0,.0002765672D0,.0000430638D0/                             ISO02500
28*            DO 10 M=MR,MT                                                           ISO02600
29*            IN = 0                                                                  ISO02700
30*            IF (ERFX(M) .LT. 0.0) IN = 1                                            ISO02800
31*            ERFX(M) = ABS(ERFX(M))                                                  ISO02900
32*            IF (ERFX(M) .LT. 1.0E-10) GO TO 5                                       ISO03000
33*            IF (ERFX(M) .GT. 5.0) GO TO 6                                           ISO03100
34*            DTX = 1.0D0+ERFX(M)*(A6+ERFX(M)*(A7+ERFX(M)*(A8+ERFX(M)*(A9+ERFX(MISO03200
35*           1)*(A10+ERFX(M)*A11))))                                                  ISO03300
36*            ERFX(M) = 1.0D0-(1.0D0/DTX)**16                                         ISO03400
37*            GO TO 7                                                                 ISO03500
38*          5 ERFX(M) = 0.0                                                           ISO03600
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```
39*          GO TO 10                                                    IS003700
40*        6 ERFX(M) = 1.0                                               IS003800
41*        7 IF (IN .EQ. 1) ERFX(M) = -ERFX(M)                           IS003900
42*       10 CONTINUE                                                    IS004000
43*          RETURN                                                      IS004100
44*          END                                                         IS004200
```

```
1*            SUBROUTINE    RB8, VERSION  5, REVISION 0
2*
3*            FUNCTION RB8(A,B,C)                                    RB800100
4*            RB8 = ALOG(A/B)*C                                      RB800200
5*            IF (RB8+1.0) 20,10,20                                  RB800300
6*         10 RB8 = -.99999999                                       RB800400
7*         20 RB8 = RB8+1.0                                          RB800500
8*            RETURN                                                 RB800600
9*            END                                                    RB800700
```

```
1*              SUBROUTINE   RB11, VERSION  5, REVISION 0
2*
3*              FUNCTION RB11(PARM,P,Z,ZRK)                                    RB100100
4*              RB11 = PARM*(Z**P-ZRK**P)/(P*(Z-ZRK)*ZRK**(P-1.0))             RB100200
5*              RETURN                                                         RB100300
6*              END                                                            RB100400
```

```
 1*            SUBROUTINE SPLINE, VERSION  5, REVISION 1
 2*
 3*            SUBROUTINE SPLINE(X,Y,A,B,C,D,N,IER)                                  SPL00100
 4*            DIMENSION X(1),Y(1),A(1),B(1),C(1),D(1)                               SPL00200
 5*            IER = 0                                                               SPL00300
 6*            C(1) = 0.0                                                            SPL00400
 7*            C(N) = 0.0                                                            SPL00500
 8*            Q = 1.07179677                                                        SPL00600
 9*      C     Q = 4.0*(2.0-SQRT(3.0))                                               SPL00700
10*            NP = N-1                                                              SPL00800
11*            DO 10 I=1,NP                                                          SPL00900
12*            A(I) = X(I+1)-X(I)                                                    SPL01000
13*            B(I) = (Y(I+1)-Y(I))/A(I)                                             SPL01100
14*            IF (I .LT. 2) GO TO 10                                                SPL01200
15*            C(I) = 2.0*(B(I)-B(I-1))/(A(I-1)+A(I))                                SPL01300
16*            D(I) = C(I)*1.5                                                       SPL01400
17*      C     D(I) = C(1)*3.0/2.0                                                   SPL01500
18*         10 CONTINUE                                                              SPL01600
19*            NTM = 0                                                               SPL01700
20*         20 XM = 0.0                                                              SPL01800
21*            DO 30 I=2,NP                                                          SPL01900
22*            YP = C(I+1)                                                           SPL02000
23*            YP = Q*(((YP-C(I-1))/(1.0+A(I)/A(I-1))-YP)*0.5-C(I)+D(I))             SPL02100
24*            IF (ABS(YP) .GT. XM) XM = ABS(YP)                                     SPL02200
25*            C(I) = C(I)+YP                                                        SPL02300
26*         30 CONTINUE                                                              SPL02400
27*            NTM = NTM+1                                                           SPL02500
28*            IF (NTM .LT. 80) GO TO 35                                             SPL02600
29*            IER = 1                                                               SPL02700
30*            GO TO 36                                                              SPL02800
31*         35 CONTINUE                                                              SPL02900
32*            IF (1.0E-3 .LE. XM) GO TO 20                                          SPL03000
33*         36 CONTINUE                                                              SPL03100
34*            DO 40 I=1,NP                                                          SPL03200
35*            A(I) = (C(I+1)-C(I))/A(I)                                             SPL03300
36*         40 CONTINUE                                                              SPL03400
37*            RETURN                                                                SPL03500
38*            END                                                                   SPL03600
```

```
1*          SUBROUTINE LLPLOT, VERSION 6,  REVISION 0
2*
3*          SUBROUTINE LLPLOT(YAR,XAR,N,TITLE,CRIT,NCRIT,NWD,VERTCL,NCV,ZBB,  LLP00100
4*         1ZIT)                                                              LLP00200
5*          COMMON /XYXYPT/ YP(41),XP(41),A(41),B(41),C(41),D(41),XI(41),YI(41LLP00300
6*         1),NUM(3),NC                                                       LLP00400
7*          COMMON /ILPLTS/ XMAX,XMIN,YMAX,YMIN,XLM1,YBM1,HT,CHARF,SCLX,SCLY, LLP00500
8*         1XSIZE1,YSIZE1                                                     LLP00600
9*          DIMENSION XAR(1),YAR(1),LINE(120),TITLE(1),CRIT(1),XF(1),YF(1),   LLP00700
10*        1FLDX(5),LEXP(3),VERTCL(1)                                         LLP00800
11*         COMMON /ILALPH/ LCRIT(10),IBLANK,ISTAR,IP1,IP2,IP3,HLABEL(5),NCH  LLP00900
12*         COMMON /PLTLLO/ ISW,XMAXJN,YMAXJN,XCIZE,YCIZE                      LLP01000
13*         DATA HLABEL/27HALONGWIND DISTANCE (METERS)/,NCH/27/                LLP01100
14*         DATA IBLANK/1H /,LCRIT/2HA=,2HB=,2HC=,2HD=,2HE=,2HF=,2HG=,2HH=,2HILLP01200
15*        1=,2HJ=/,ISTAR/1H*/                                                LLP01300
16*         EQUIVALENCE (FLDX,HLABEL),(LINE,B),(XF,XI),(YF,YI)                LLP01400
17*         EQUIVALENCE (XLM1,NND),(YBM1,NST),(HT,IPWRX),(CHARF,IPWRY),(SCLX,FLLP01500
18*        1II),(SCLY,II),(XSIZE1,IEXP),(YSIZE1,PWRY)                         LLP01600
19*         DATA LEXP/2H5-,2H2-,2H  /                                          LLP01700
20*      2010 FORMAT (7X,1H(,20(6H------),1H))                                 LLP01800
21*      2020 FORMAT (4X,3H10-,1H(,3(11(1H-),1H1,15(1H-),1HI,11(1H-),1HI),1H)/8XLLP01900
22*     1,3(11,39X),11/6X,3(2H10,11X,1H2,15X,1H5,10X),2H10/54X,5A6)             LLP02000
23*      2030 FORMAT (1X,A1,3X,A2,1H(,120A1,1H))                               LLP02100
24*      2040 FORMAT (1X,A1,3X,I2,1H(,120A1,1H))                               LLP02200
25*      2050 FORMAT (1X,A1,2X,4H10-(,120A1,1H))                               LLP02300
26*      2080 FORMAT (2(5(10X,A1,1H=,E10.3,1H,)/))                             LLP02400
27*      2090 FORMAT (86H0 ** NO PLOTS THIS CASE -- DOSAGE OR CONCENTRATION VALLLP02500
28*     1ES ARE PROBABLY OUT OF RANGE **//)                                    LLP02600
29*  C       FIND XMIN, XMAX, YMIN, YMAX                                       LLP02700
30*          YMAX = -1.E20                                                     LLP02800
31*          NND = N+1                                                         LLP02900
32*          NST = 0                                                           LLP03000
33*        5 NST = NST+1                                                       LLP03100
34*          IF (NST .GE. N) GO TO 500                                         LLP03200
35*          IF (XAR(NST) .LE. 0.0 .OR. YAR(NST) .LE. 0.0) GO TO 5             LLP03300
36*       10 NND = NND-1                                                       LLP03400
37*          IF (NND .LE. 1) GO TO 500                                         LLP03500
38*          IF (XAR(NND) .LE. 0.0 .OR. YAR(NND) .LE. 0.0) GO TO 10            LLP03600
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```
39*            IF (NND .LE. NST) GO TO 500                                    LLP03700
40*            DO 15 I=NST,NND                                                LLP03800
41*            IF (XAR(I) .LE. 0.0) GO TO 500                                 LLP03900
42*            XF(I) = XAR(I)                                                 LLP04000
43*            IF (ISW .NE. 2) XF(I) = ALOG10(XAR(I))                         LLP04100
44*            IF (YAR(I) .LE. 0.0) GO TO 14                                  LLP04200
45*            YF(I) = ALOG10(YAR(I))                                         LLP04300
46*            IF (YMAX .LT. YF(I)) YMAX = YF(I)                              LLP04400
47*            GO TO 15                                                       LLP04500
48*         14 YF(I) = -1.E20                                                 LLP04600
49*         15 CONTINUE                                                       LLP04700
50*            IPWRX = INT(XF(NST)+100.0)-100                                 LLP04800
51*            IPWRY = INT(YMAX+100.0)-102                                    LLP04900
52*            IF (IPWRX .LT. 2) IPWRX = 2                                    LLP05000
53*            PWRY = FLOAT(IPWRY)                                            LLP05100
54*      C     PRINT TITLE INFORMATION                                        LLP05200
55*            CALL PRTTTL(NWD,LINES,TITLE,-1.0,0.0,ZBB,ZTT)                  LLP05300
56*            WRITE (6,2010)                                                 LLP05400
57*      C     LOOP FOR 48 PRINTER LINES                                      LLP05500
58*            JK1 = 0                                                        LLP05600
59*            JK2 = 1                                                        LLP05700
60*            JT = 0                                                         LLP05800
61*            IST = (48-NCV)/2                                               LLP05900
62*            DO 220 I=1,48                                                  LLP06000
63*            IAI = LEXP(3)                                                  LLP06100
64*            IF (I .LT. IST) GO TO 17                                       LLP06200
65*            JT = JT+1                                                      LLP06300
66*            IF (JT .GT. NCV) GO TO 17                                      LLP06400
67*            JK1 = JK1+1                                                    LLP06500
68*            IF (JK1 .LT. 7) GO TO 16                                       LLP06600
69*            JK1 = 1                                                        LLP06700
70*            JK2 = JK2+1                                                    LLP06800
71*         16 CALL MSFLD(IABS(6*(JK1-1)),6,VERTCL(JK2),0,IAI)                LLP06900
72*         17 CONTINUE                                                       LLP07000
73*            II=48-I                                                        LLP07100
74*            FII = FLOAT(II)*0.0625                                         LLP07200
75*            IF (NCRIT) 60,60,20                                            LLP07300
76*         20 IF (NCRIT .EQ. 9) GO TO 60                                     LLP07400
```

```
77*            DO 40 KK=1,NCRIT                                                    LLP07500
78*            IF (CRIT(KK) .LE. 0.0) GO TO 40                                     LLP07600
79*            IF (ABS(ALOG10(CRIT(KK))-FII-PWRY) .GT. 0.031255) GO TO 40          LLP07700
80*            DO 30 LL=1,120                                                      LLP07800
81*         30 LINE(LL) = LCRIT(KK)                                                LLP07900
82*            GO TO 67                                                            LLP08000
83*         40 CONTINUE                                                            LLP08100
84*         60 DO 65 J=1,120                                                       LLP08200
85*         65 LINE(J) = IBLANK                                                    LLP08300
86*         67 DO 70 J=NST,NND                                                     LLP08400
87*            IF (ABS(YF(J)-FII-PWRY) .GT. 0.031255) GO TO 70                     LLP08500
88*            L = INT(XF(J)*40.0+0.5)-40*IPWRX                                    LLP08600
89*            IF (L .LT. 1 .OR. L .GT. 120) GO TO 70                              LLP08700
90*            LINE(L)=ISTAR                                                       LLP08800
91*         70 CONTINUE                                                            LLP08900
92*            IF (15-I) 90,80,90                                                  LLP09000
93*         80 IEXP=IPWRY+2                                                        LLP09100
94*            GO TO 130                                                           LLP09200
95*         90 IF (31-I) 110,100,110                                               LLP09300
96*        100 IEXP=IPWRY+1                                                        LLP09400
97*            GO TO 130                                                           LLP09500
98*        110 IF (47-I) 140,120,140                                               LLP09600
99*        120 IEXP=IPWRY                                                          LLP09700
100*       130 IF (I .GT. 1) WRITE (6,2040) IAI,IEXP,LINE                          LLP09800
101*           GO TO 220                                                           LLP09900
102*       140 IF (16-I) 150,170,150                                               LLP10000
103*       150 IF (32-I) 160,170,160                                               LLP10100
104*       160 IF (48-I) 175,170,175                                               LLP10200
105*       170 IF (I .EQ. 1) GO TO 220                                             LLP10300
106*           IF (I .EQ. 48) GO TO 171                                            LLP10400
107*           WRITE (6,2050) IAI,LINE                                             LLP10500
108*           GO TO 220                                                           LLP10600
109*       171 IP1 = IPWRX+1                                                       LLP10700
110*           IP2 = IPWRX+2                                                       LLP10800
111*           IP3 = IPWRX+3                                                       LLP10900
112*           WRITE (6,2020) IPWRX,IP1,IP2,IP3,FLDX                               LLP11000
113*           GO TO 220                                                           LLP11100
114*       175 IEXP = 3                                                            LLP11200
```

```
      IF (MOD(I,16) .NE. 5) GO TO 180                                          LLP11300
      IEXP = 1                                                                 LLP11400
      GO TO 190                                                                LLP11500
  180 IF (MOD(I,16) .EQ. 11) IEXP = 2                                          LLP11600
  190 IF (I .GT. 1) WRITE (6,2030) IAI,LEXP(IEXP),LINE                         LLP11700
  220 CONTINUE                                                                 LLP11800
      IF (NCRIT .GT. 0.AND.NCRIT .LT. 9) WRITE (6,2080) (LCRIT(I),CRIT(ILLP11900
     1),I=1,NCRIT)                                                             LLP12000
  370 RETURN                                                                   LLP12100
  500 WRITE(6,2090)                                                            LLP12200
      RETURN                                                                   LLP12300
      END                                                                      LLP12400
```

```
1*            SUBROUTINE ISSOPT, VERSION 6,  REVISION 0
2*
3*            SUBROUTINE ISSOPT(X,Y,NX,NY,FI,LEGEND,NCHAR,DP,NYS,XX,DR,II,IREC,YISS00100
4*           1T,ISW3,KLINE,NCV,JM,DECAY,LAMBDA,ZB,ZT)                          ISS00200
5*            COMMON /PLTISO/ SCL,XMAXIN,YMAXIN,XSIZE,YSIZE,RASTIN,JSW         ISS00300
6*            COMMON /BNDS/ XRIT,XLFT,YBOT,YTOP,XPL,YPL                        ISS00400
7*            DIMENSION X(1),Y(1),FI(1),DP(41,1),XX(1),DR(245,1),NPP(4),YY(1)  ISS00500
8*            DIMENSION TLABEL(3)                                              ISS00600
9*            DIMENSION LEGEND(1),KLINE(1)                                     ISS00700
10*           REAL LAMBDA                                                      ISS00800
11*           DIMENSION KB(4)                                                  ISS00900
12*           COMMON /XYXYPT/ YP(41),XP(41),A(41),B(41),C(41),D(41),XI(41),YI(41ISS01000
13*          1),NUM(3),NC                                                      ISS01100
14*           EQUIVALENCE (YP,YY)                                              ISS01200
15*           DATA XLM,YBM,XRM,YTM,DISP/62.,102.,24.,22.,3./                   ISS01400
16*           DATA RADI/57.295779/                                             ISS01500
17*           DATA TLABEL/17HDISTANCE (METERS)/,NCTH/17/                       ISS01600
18*           COMMON /ILPLTS/ XMAX,XMIN,YMAX,YMIN,XLM1,YBM1,HT,CHARF,SCLX,SCLY, ISS01700
19*          1XSIZE1,YSIZE1                                                    ISS01800
20*           COMMON /ILALPH/ LCRIT(10),IBLANK,ISTAR,IP1,IP2,IP3,HLABEL(5),NCH ISS01900
21*           DATA RAD/.017453293/                                             ISS02000
22*           XYTERP(A,B,C,D,E) = B-(D-E)*(B-A)/(D-C)                          ISS02100
23*           NWD = NCHAR/6                                                    ISS02200
24*           IF (ISW3 .EQ. 1) GO TO 50                                        ISS02300
25*           XLM1 = XLM                                                       ISS02400
26*           YBM1 = YBM                                                       ISS02500
27*           XRM1 = XRM                                                       ISS02600
28*           YTM1 = YTM                                                       ISS02700
29*           XSIZE1 = XSIZE                                                   ISS02800
30*           YSIZE1 = YSIZE                                                   ISS02900
31*           ISW = 1                                                          ISS03000
32*     C     DETERMINE MAX AND MIN FOR BOTH AXES                              ISS03100
33*           DO 10 I=1,NX                                                     ISS03200
34*           DO 10 J=1,NYS                                                    ISS03300
35*           DO 10 K=1,NY                                                     ISS03400
36*           IF (DP(I,J) .GT. FI(K)) GO TO 11                                 ISS03500
37*        10 CONTINUE                                                         ISS03600
38*           I1 = NCHAR/6+1                                                   ISS03700
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```
39*            PRINT 2004, (LEGEND(I),I=1,I1)                          ISS03800
40*            GO TO 800                                               ISS03900
41*         11 CONTINUE                                                ISS04000
42*            XMX = X(NX-2)                                           ISS04100
43*            IF (XMAXIN .GT. 0.0) XMX = XMAXIN                       ISS04200
44*            XMAX = 0.0                                              ISS04300
45*            XMIN = 0.0                                              ISS04400
46*            YMAX = 0.0                                              ISS04500
47*            YMIN = 0.0                                              ISS04600
48*            XI(1) = XMX*SIN(YT*RAD)                                 ISS04700
49*            YI(1) = XMX*COS(YT*RAD)                                 ISS04800
50*            YPL = 1.0E8                                             ISS04900
51*            DO 12 N=1,NY                                            ISS05000
52*         12 YPL = AMIN1(YPL,FI(N))                                  ISS05100
53*            I1 = 0                                                  ISS05200
54*            I2 = 0                                                  ISS05300
55*            DO 15 J=1,NYS                                           ISS05400
56*            DO 14 I=1,NX                                            ISS05500
57*            IF (DP(I,J) .LT. YPL) GO TO 14                          ISS05600
58*            IF (I1 .GT. 0) GO TO 13                                 ISS05700
59*            I1 = I                                                  ISS05800
60*         13 I2 = I                                                  ISS05900
61*         14 CONTINUE                                                ISS06000
62*            IF (I1 .GT. 0) GO TO 16                                 ISS06100
63*         15 CONTINUE                                                ISS06200
64*         16 J1 = J                                                  ISS06300
65*            I3 = 0                                                  ISS06400
66*            I4 = 0                                                  ISS06500
67*            DO 19 J=1,NYS                                           ISS06600
68*            DO 18 I=1,NX                                            ISS06700
69*            IF (DP(I,NYS-J+1) .LT. YPL) GO TO 18                    ISS06800
70*            IF (I3 .GT. 0) GO TO 17                                 ISS06900
71*            I3 = I                                                  ISS07000
72*         17 I4 = I                                                  ISS07100
73*         18 CONTINUE                                                ISS07200
74*            IF (I3 .GT. 0) GO TO 20                                 ISS07300
75*         19 CONTINUE                                                ISS07400
76*         20 J2 = NYS-J+1                                            ISS07500
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77*            IF (I1 .EQ. 0) I1 = 1                                    ISS07600
78*            IF (I2 .EQ. 0) I2 = NX-2                                 ISS07700
79*            IF (I3 .EQ. 0) I3 = 1                                    ISS07800
80*            IF (I4 .EQ. 0) I4 = NX-2                                 ISS07900
81*            IF (I2 .GT. NX-2) I2 = NX-2                              ISS08000
82*            IF (I4 .GT. NX-2) I4 = NX-2                              ISS08100
83*            Y1 = Y(J1)                                               ISS08200
84*            Y2 = Y(J2)                                               ISS08300
85*            IF (YMAXIN .LE. 0.0) GO TO 21                            ISS08400
86*            XPL = 1.0-YMAXIN/(2.0*XMX*XMX)                           ISS08500
87*            IF (XPL .GT. 1.0) XPL = 1.0                              ISS08600
88*            IF (XPL .LT. -1.0) XPL = -1.0                            ISS08700
89*            XPL = ACOS(XPL)*RADI                                     ISS08800
90*            Y1 = YT+0.5*XPL                                          ISS08900
91*            Y2 = YT-0.5*XPL                                          ISS09000
92*         21 XI(2) = X(I1)*SIN(Y1*RAD)                                ISS09100
93*            YI(2) = X(I1)*COS(Y1*RAD)                                ISS09200
94*            XI(3) = X(I3)*SIN(Y2*RAD)                                ISS09300
95*            YI(3) = X(I3)*COS(Y2*RAD)                                ISS09400
96*            XI(4) = X(I2)*SIN(Y1*RAD)                                ISS09500
97*            YI(4) = X(I2)*COS(Y1*RAD)                                ISS09600
98*            XI(5) = X(I4)*SIN(Y2*RAD)                                ISS09700
99*            YI(5) = X(I4)*COS(Y2*RAD)                                ISS09800
100*           DO 22 I=1,5                                              ISS09900
101*           XMAX = AMAX1(XMAX,XI(I))                                 ISS10000
102*           YMAX = AMAX1(YMAX,YI(I))                                 ISS10100
103*           XMIN = AMIN1(XMIN,XI(I))                                 ISS10200
104*        22 YMIN = AMIN1(YMIN,YI(I))                                 ISS10300
105*     C     DETERMINE PLOT SCALE                                     ISS10400
106*           IF (SCL .LE. 0.0) GO TO 23                               ISS10500
107*           SCLX = 12.0/(SCL*.3048)                                  ISS10600
108*           SCLX = SCLX*RASTIN                                       ISS10700
109*           SCLY = SCLX                                              ISS10800
110*           GO TO 24                                                 ISS10900
111*        23 SCLX = XSIZE1/(XMAX-XMIN)                                ISS11000
112*           SCLY = YSIZE1/(YMAX-YMIN)                                ISS11100
113*           SCLX = AMIN1(SCLX,SCLY)                                  ISS11200
114*           SCLY = SCLX                                              ISS11300
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115*          24 XPL = XSIZE1/SCLX                                                    ISS11400
116*             IF (XPL-XMAX+XMIN) 25,26,25                                          ISS11500
117*          25 XPL = (XPL-XMAX+XMIN)*0.5                                            ISS11600
118*             XMAX = XMAX + XPL                                                    ISS11700
119*             XMIN = XMIN-XPL                                                      ISS11800
120*          26 YPL = YSIZE1/SCLY                                                    ISS11900
121*             IF (YPL-YMAX+YMIN) 27,28,27                                          ISS12000
122*          27 YPL = (YPL-YMAX+YMIN)*0.5                                            ISS12100
123*             YMAX = YMAX+YPL                                                      ISS12200
124*             YMIN = YMIN-YPL                                                      ISS12300
125*          28 CONTINUE                                                             ISS12400
126*             HT = 12                                                              ISS12500
127*             CHARF = 8                                                            ISS12900
128*             CALL SETMIV(0,0,0,0)                                                 ISS13100
129*             CALL FRAMEV(0)                                                       ISS13200
130*             CALL IDPLOT(XSIZE1+XLM1+XRM1,YSIZE1+YTM1+YBM1)                       ISS13300
131*      C      DRAW AXES                                                            ISS13400
132*             CALL ILAXES(1,TLABEL,TLABEL,NCTH,NCTH,LEGEND,NCHAR)                  ISS13500
133*             XRIT = XMAX                                                          ISS13600
134*             XLFT = XMIN                                                          ISS13700
135*             YBOT = YMIN                                                          ISS13800
136*             YTOP = YMAX                                                          ISS13900
137*          50 CONTINUE                                                             ISS14000
138*             LINES = 57                                                           ISS14100
139*             RMN = 1.0E9                                                          ISS14200
140*             TMN = YT                                                             ISS14300
141*             DO 710 N=1,NY                                                        ISS14400
142*             IF (N .EQ. 1) GO TO 240                                              ISS14500
143*             DO 230 I=1,NX                                                        ISS14600
144*             KOUT = 4*I-4+IREC                                                    ISS14700
145*             CALL INTOUT(DP,KOUT,NYS,1,41,I)                                      ISS14800
146*         230 CONTINUE                                                             ISS14900
147*         240 CONTINUE                                                             ISS15000
148*             CALL NMBRS(FI(N),NUM,NC)                                             ISS15100
149*             DO 400 I=1,4                                                         ISS15200
150*         400 NPP(I) = 0                                                           ISS15300
151*             NP = 3                                                               ISS15400
152*             L = 0                                                                ISS15500
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153*            K = 1                                                                   ISS15600
154*      C     CALC POINTS WHERE ISOPLETHS CROSS AXES                                  ISS15700
155*            DO 470 I=1,NX                                                           ISS15800
156*            JB = 0                                                                  ISS15900
157*            DO 430 J=2,NYS                                                          ISS16000
158*            IF (DP(I,J-1) .LE. FI(N).AND.FI(N) .LE. DP(I,J)) GO TO 410              ISS16100
159*            IF (DP(I,J-1) .GE. FI(N).AND.FI(N) .GE. DP(I,J)) GO TO 410              ISS16200
160*            GO TO 430                                                               ISS16300
161*          410 JB = 1                                                                ISS16400
162*            L = L+1                                                                 ISS16500
163*            NP = NP+1                                                               ISS16600
164*            Y2 = Y(J)                                                               ISS16700
165*            IF (ABS(Y(J-1)-Y2) .LT. 180.0) GO TO 420                                ISS16800
166*            Y2 = 360.0-ABS(Y(J-1)-Y2)+Y(J-1)                                        ISS16900
167*          420 YY(NP) = XYTERP(Y(J-1),Y2,DP(I,J-1),DP(I,J),FI(N))                    ISS17000
168*            XX(NP) = X(I)                                                           ISS17100
169*            IF (NP .GE. 245) GO TO 475                                              ISS17200
170*          430 CONTINUE                                                              ISS17300
171*            IF (JB .EQ. 1) GO TO 440                                                ISS17400
172*            IF (L .EQ. 0) GO TO 440                                                 ISS17500
173*            NPP(K) = L                                                              ISS17600
174*            L = 0                                                                   ISS17700
175*            K = K+1                                                                 ISS17800
176*            IF (K .GT. 2) GO TO 475                                                 ISS17900
177*          440 IF (I .EQ. NX) GO TO 470                                              ISS18000
178*            DO 460 J=1,NYS                                                          ISS18100
179*            IF (DP(I,J) .LE. FI(N).AND.FI(N) .LE. DP(I+1,J)) GO TO 450              ISS18200
180*            IF (DP(I,J) .GE. FI(N).AND.FI(N) .GE. DP(I+1,J)) GO TO 450              ISS18300
181*            GO TO 460                                                               ISS18400
182*          450 L = L+1                                                               ISS18500
183*            NP = NP+1                                                               ISS18600
184*            XX(NP) = XYTERP(X(I),X(I+1),DP(I,J),DP(I+1,J),FI(N))                    ISS18700
185*            YY(NP) = Y(J)                                                           ISS18800
186*            IF (NP .GE. 245) GO TO 475                                              ISS18900
187*          460 CONTINUE                                                              ISS19000
188*          470 CONTINUE                                                              ISS19100
189*          475 CONTINUE                                                              ISS19200
190*            NP = NP-3                                                               ISS19300
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191*            NPP(K) = L                                                      ISS19400
192*          480 IF (NPP(K) .GT. 1) GO TO 490                                  ISS19500
193*            K = K-1                                                         ISS19600
194*            IF (K .LE. 0) GO TO 710                                         ISS19700
195*            GO TO 480                                                       ISS19800
196*          490 CONTINUE                                                      ISS19900
197*        C   DETERMINE IF CLOSED CURVE OR NO, KB(L)=0 IS YES, KB(L) NOT 0 IS NOISS20000
198*            IP1 = 3                                                         ISS20100
199*            KC = 0                                                          ISS20200
200*            DO 496 L=1,K                                                    ISS20300
201*            KB(L) = 0                                                       ISS20400
202*            MP = NPP(L)                                                     ISS20500
203*            J2 = 1                                                          ISS20600
204*            DO 495 I2=1,2                                                   ISS20700
205*            I = 0                                                           ISS20800
206*          491 I = I+1                                                       ISS20900
207*            IF (I .GT. MP) GO TO 495                                        ISS21000
208*            IF (YY(I+IP1)-Y(J2)) 491,492,491                                ISS21100
209*          492 X1 = 1.0E8                                                    ISS21200
210*            DO 493 J=1,MP                                                   ISS21300
211*            IF (J+IP1 .EQ. I+IP1) GO TO 493                                 ISS21400
212*            Y1 = ABS(Y(J2)-YY(J+IP1))                                       ISS21500
213*            IF (Y1 .GT. 180.0) Y1 = 360.0-Y1                                ISS21600
214*            IF (Y1 .GE. X1) GO TO 493                                       ISS21700
215*            X1 = Y1                                                         ISS21800
216*            J1 = J                                                          ISS21900
217*          493 CONTINUE                                                      ISS22000
218*            IF (XX(I+IP1) .GT. XX(J1+IP1)) GO TO 494                        ISS22100
219*            KC = KC+3                                                       ISS22200
220*            KB(L) = KB(L)+3                                                 ISS22300
221*            GO TO 491                                                       ISS22400
222*          494 KB(L) = KB(L)+1                                               ISS22500
223*            KC = KC+1                                                       ISS22600
224*            GO TO 491                                                       ISS22700
225*          495 J2 = NYS                                                      ISS22800
226*            IP1 = IP1+NPP(L)                                                ISS22900
227*          496 CONTINUE                                                      ISS23000
228*          497 IF (KC .EQ. 0) GO TO 503                                      ISS23100
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      J = 1                                                                    ISS23200
  498 IF (KB(J) .NE. 0) GO TO 499                                              ISS23300
C     FIRST CLOSED CURVE                                                       ISS23400
      IF (J+1 .GT. K) GO TO 503                                                ISS23500
      IF (KB(J+1) .EQ. 0) GO TO 502                                            ISS23600
C     CAN SECOND CURVE BE CLOSED                                               ISS23700
      IF (KB(J+1).EQ.4.OR.KB(J+1).EQ.5.OR.KB(J+1).EQ.7) KB(J+1) = 0            ISS23800
      GO TO 502                                                                ISS23900
  499 IF (J+1 .GT. K) GO TO 500                                                ISS24000
      IF (KB(J+1) .NE. 0) GO TO 501                                            ISS24100
C     SECOND CURVE CLOSED                                                      ISS24200
C     CAN FIRST CURVE BE CLOSED                                                ISS24300
  500 IF (KB(J).EQ.4.OR.KB(J).EQ.5.OR.KB(J).EQ.7) KB(J) = 0                    ISS24400
      IF (K .EQ. 1.AND.KB(1) .EQ. 6) KB(1) = 0                                 ISS24500
      GO TO 502                                                                ISS24600
C     CAN TWO CURVES BE JOINED INTO ONE CLOSED CURVE                           ISS24700
  501 IF (KB(J) .NE. 2.AND.KB(J) .NE. 4) GO TO 502                             ISS24800
      IF (KB(J+1) .NE. 6.AND.KB(J+1) .NE. 4) GO TO 502                         ISS24900
C     JOIN TWO CURVES INTO ONE CLOSED CURVE                                    ISS25000
      NPP(J) = NPP(J)+NPP(J+1)                                                 ISS25100
      KB(J) = 0                                                                ISS25200
      K = K-1                                                                  ISS25300
      J = J+1                                                                  ISS25400
      IF (J .GT. K) GO TO 503                                                  ISS25500
      KB(J) = KB(J+1)                                                          ISS25600
      NPP(J) = NPP(J+1)                                                        ISS25700
      IF (J+1 .GT. 3) GO TO 498                                                ISS25800
      KB(J+1) = KB(J+2)                                                        ISS25900
      NPP(J+1) = NPP(J+2)                                                      ISS26000
      GO TO 498                                                                ISS26100
  502 J = J+2                                                                  ISS26200
      IF (J .LE. K) GO TO 498                                                  ISS26300
  503 CONTINUE                                                                 ISS26400
      IP1 = 3                                                                  ISS26500
C     LOOP OVER SEPERATE CURVES OF SAME ISOPLETH                               ISS26600
      DO 700 L=1,K                                                             ISS26700
      NP = NPP(L)                                                              ISS26800
C     SHIFT POINTS TO START OF ARRAY                                           ISS26900
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267*            I = 0                                                                                    ISS27000
268*            DIF = 1.0E20                                                                             ISS27100
269*            DO 520 J=1,NP                                                                            ISS27200
270*            I = I+1                                                                                  ISS27300
271*            XX(I) = XX(J+IP1)                                                                        ISS27400
272*            YY(I) = YY(J+IP1)                                                                        ISS27500
273*            IF (XX(I) .GE. DIF) GO TO 520                                                            ISS27600
274*            DIF = XX(I)                                                                              ISS27700
275*            YRM = YY(I)                                                                              ISS27800
276*          520 CONTINUE                                                                               ISS27900
277*            IF (L .GT. 1.OR.KB(L) .NE. 0) GO TO 530                                                  ISS28000
278*            IF (DIF .LE. RMN) GO TO 525                                                              ISS28100
279*            NP = NP+1                                                                                ISS28200
280*            DIF = 0.75*RMN                                                                           ISS28300
281*            YRM = TMN                                                                                ISS28400
282*            XX(NP) = DIF                                                                             ISS28500
283*            YY(NP) = YRM                                                                             ISS28600
284*            GO TO 530                                                                                ISS28700
285*          525 RMN = DIF                                                                              ISS28800
286*            TMN = YRM                                                                                ISS28900
287*          530 CONTINUE                                                                               ISS29000
288*        C     DETERMINE CENTRAL POINT OF CURVE AND CONVERT POINTS TO SYSTEM                          ISS29100
289*        C     RELATIVE TO CENTRAL POINT                                                              ISS29200
290*            CALL CALCS(XX,YY,NP,RAD,RADI,XSHFT,YSHFT,0.0,0.0,0,KB(L),YT,X,NX)                        ISS29300
291*        C     FIND START POINT OF CURVE                                                              ISS29400
292*            YRM = YT                                                                                 ISS29500
293*            MP = 0                                                                                   ISS29600
294*            IF (KB(L) .NE. 0) GO TO 560                                                              ISS29700
295*            YRM = YT+180.0                                                                           ISS29800
296*        C     DETERMINE FIRST POINT OF CLOSED CURVE                                                  ISS29900
297*          550 IF (YRM .LE. YY(NP)) GO TO 551                                                         ISS30000
298*            YRM = YRM-360.0                                                                          ISS30100
299*            GO TO 550                                                                                ISS30200
300*          551 IF (YRM .GE. YY(1)) GO TO 552                                                          ISS30300
301*            YRM = YRM+360.0                                                                          ISS30400
302*            GO TO 551                                                                                ISS30500
303*          552 X1 = YRM+180.0                                                                         ISS30600
304*            DO 553 I=1,NP                                                                            ISS30700
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305*            IF (YY(I) .LT. YRM) GO TO 553                          ISS30800
306*            MP = I-1                                               ISS30900
307*            GO TO 555                                              ISS31000
308*          553 CONTINUE                                             ISS31100
309*          554 X1 = YRM-180.0                                       ISS31200
310*          555 CONTINUE                                             ISS31300
311*            GO TO 570                                              ISS31400
312*          560 CONTINUE                                             ISS31500
313*        C     DETERMINE FIRST POINT OF OPENED CURVE                ISS31600
314*            DIF = -1.0E9                                           ISS31700
315*            DO 561 I=2,NP                                          ISS31800
316*            Y1 = ABS(YY(I)-YY(I-1))                                ISS31900
317*            IF (Y1 .GT. 180.0) Y1 = 360.0-Y1                       ISS32000
318*            IF (Y1 .LT. DIF) GO TO 561                             ISS32100
319*            DIF = Y1                                               ISS32200
320*            MP = I-1                                               ISS32300
321*          561 CONTINUE                                             ISS32400
322*            Y1 = ABS(YY(NP)-YY(1))                                 ISS32500
323*            IF (Y1 .GT. 180.0) Y1 = 360.0-Y1                       ISS32600
324*            IF (Y1 .LT. DIF) GO TO 570                             ISS32700
325*            MP = 0                                                 ISS32800
326*          570 CONTINUE                                             ISS32900
327*            IF (MP .LE. 0) GO TO 594                               ISS33000
328*            DO 572 J=1,MP                                          ISS33100
329*            XPL = XX(1)                                            ISS33200
330*            YPL = YY(1)                                            ISS33300
331*            DO 571 I=2,NP                                          ISS33400
332*            XX(I-1) = XX(I)                                        ISS33500
333*          571 YY(I-1) = YY(I)                                      ISS33600
334*            XX(NP) = XPL                                           ISS33700
335*            YY(NP) = YPL                                           ISS33800
336*          572 CONTINUE                                             ISS33900
337*        C     MAKE SURE IN ASCENDING ORDER                         ISS34000
338*            Y1 = YY(1)                                             ISS34100
339*            DO 593 I=2,NP                                          ISS34200
340*            DIF = ABS(YY(I)-Y1)                                    ISS34300
341*            IF (DIF .GT. 180.0) DIF = 360.0-DIF                    ISS34400
342*            Y1 = YY(I)                                             ISS34500
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343*        593 YY(I) = YY(I-1)+DIF                                                    ISS34600
344*        594 CONTINUE                                                               ISS34700
345*            IF (KB(L) .NE. 0) GO TO 595                                            ISS34800
346*            NP = NP+1                                                              ISS34900
347*            XX(NP) = XX(1)                                                         ISS35000
348*            DIF = ABS(YY(1)-YY(NP-1))                                              ISS35100
349*            IF (DIF .GT. 180.0) DIF = 360.0-DIF                                    ISS35200
350*            YY(NP) = YY(NP-1)+DIF                                                  ISS35300
351*        595 CONTINUE                                                               ISS35400
352*            IF (NP .GT. 245) NP = 245                                              ISS35500
353*            IF (KB(L) .NE. 0) X1 = 0.5*(YY(1)+YY(NP))                              ISS35600
354*            NPI = NP                                                               ISS35700
355*            IER = 1                                                                ISS35800
356*            DO 600 I =1,NP                                                         ISS35900
357*        600 XX(I) = ALOG(XX(I))                                                    ISS36000
358*            IF (NP .LT. 6) GO TO 650                                               ISS36100
359*            IF (JSW .NE. 0) GO TO 650                                              ISS36200
360*        C   CALC SPLINE COEFFICIENTS WITH RANGE AS AMPLITUDE AND ANGLE AS THE      ISS36300
361*        C   ABSCISSA                                                               ISS36400
362*            CALL SPLINE(YY,XX,DR,DR(1,2),DR(1,3),DR(1,4),NP,IER)                   ISS36500
363*            IF (IER .EQ. 1) GO TO 650                                              ISS36600
364*            XPL = (YY(NP)-YY(1))/200.0                                             ISS36700
365*            XPL2 = XPL*0.1                                                         ISS36800
366*            XP1 = XPL                                                              ISS36900
367*            J = 0                                                                  ISS37000
368*            M = 1                                                                  ISS37100
369*            YPL = YY(1)-XP1                                                        ISS37200
370*        631 YPL = YPL+XP1                                                          ISS37300
371*            IF (YPL .LE. X1-2.0*XPL) GO TO 632                                     ISS37400
372*            XP1 = XPL2                                                             ISS37500
373*            IF (YPL .GE. X1+2.0*XPL) XP1 = XPL                                     ISS37600
374*        632 IF (YPL .LT. YY(M+1)) GO TO 634                                        ISS37700
375*        633 M = M+1                                                                ISS37800
376*            IF (M .GE. NP) GO TO 670                                               ISS37900
377*            IF (YPL .GE. YY(M+1)) GO TO 633                                        ISS38000
378*        634 Y1 = YPL-YY(M)                                                         ISS38100
379*        C   CALC RANGE AT YPL                                                      ISS38200
380*            Y1 = XX(M)+Y1*(DR(M,2)+(YPL-YY(M+1))*(2.*DR(M,3)+DR(M+1,3)+DR(M,1)) ISS38300
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```
381*            1*Y1)*.16666667)                                                ISS38400
382*             J = J+1                                                        ISS38500
383*             DR(J,5) = EXP(Y1)                                              ISS38600
384*             DR(J,6) = YPL                                                  ISS38700
385*             IF (J .GE. 244) GO TO 670                                      ISS38800
386*             GO TO 631                                                      ISS38900
387*         650 DO 660 M=1,NP                                                  ISS39000
388*             DR(M,5) = EXP(XX(M))                                           ISS39100
389*         660 DR(M,6) = YY(M)                                                ISS39200
390*             NPI = NP                                                       ISS39300
391*         670 MP = 1                                                         ISS39400
392*             IF (IER .EQ. 0) NP = J                                         ISS39500
393*             DO 675 I=1,NPI                                                 ISS39600
394*         675 XX(I) = EXP(XX(I))                                             ISS39700
395*             IF (KB(L) .NE. 0) GO TO 680                                    ISS39800
396*             NP = NP+1                                                      ISS39900
397*             DR(NP,5) = DR(1,5)                                             ISS40000
398*             DR(NP,6) = DR(1,6)                                             ISS40100
399*         680 CONTINUE                                                       ISS40200
400*     C       CONVERT PLOT POINTS BACK TO SYSTEM RELATIVE TO LAUNCH SITE     ISS40300
401*             CALL CALCS(DR(1,5),DR(1,6),NP,RAD,RADI,X1,Y1,XSHFT,YSHFT,2,KB(L), ISS40400
402*            1YT,X,NX)                                                       ISS40500
403*     C       PLOT CURVE                                                     ISS40600
404*     .       IF (ISW3 .EQ. 2) GO TO 694                                     ISS40700
405*             M = NPI                                                        ISS40800
406*     C       CONVERT PRINT POINTS BACK TO SYSTEM RELATIVE TO LAUNCH SITE    ISS40900
407*             CALL CALCS(XX,YY,M,RAD,RADI,X1,Y1,XSHFT,YSHFT,1,KB(L),YT,X,NX) ISS41000
408*             IF (LINES .GT. 52) GO TO 686                                   ISS41100
409*             WRITE (6,2000) FI(N),(KLINE(J),J=1,NCV)                        ISS41200
410*             WRITE (6,2003)                                                 ISS41300
411*             LINES = LINES+3                                                ISS41400
412*             GO TO 687                                                      ISS41500
413*         686 LINES = 57                                                     ISS41600
414*         687 CONTINUE                                                       ISS41700
415*             M1 = -5                                                        ISS41800
416*         688 M1 = M1+6                                                      ISS41900
417*             IF (M1 .GT. M) GO TO 692                                       ISS42000
418*             M2 = M1+5                                                      ISS42100
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419*            IF (M2 .GT. M) M2 = M                                          ISS42200
420*            LINES = LINES+1                                                ISS42300
421*            IF (LINES .LT. 57) GO TO 691                                   ISS42400
422*            IF (JM .GT. 1) GO TO 689                                       ISS42500
423*            CALL PRTTTL(NWD,LINES,LEGEND,0.0,0.0,ZB,ZT)                    ISS42600
424*            GO TO 690                                                      ISS42700
425*        689 CALL PRTTTL(NWD,LINES,LEGEND,DECAY,LAMBDA,ZB,ZT)               ISS42800
426*        690 WRITE (6,2000) FI(N),(KLINE(J),J=1,NCV)                        ISS42900
427*            WRITE (6,2001)                                                 ISS43000
428*            LINES = LINES+7                                                ISS43100
429*        691 WRITE (6,2002) (XX(J),YY(J),J=M1,M2)                           ISS43200
430*            GO TO 688                                                      ISS43300
431*        692 CONTINUE                                                       ISS43400
432*        694 CONTINUE                                                       ISS43500
433*            IF (ISW3 .EQ. 1) GO TO 695                                     ISS43600
434*      C     PLOT CURVE                                                     ISS43700
435*            CALL ILPLOT(DR(MP,5),DR(MP,6),NP,1,DR)                         ISS43800
436*        695 CONTINUE                                                       ISS43900
437*            IP1 = IP1+NPP(L)                                               ISS44000
438*        700 CONTINUE                                                       ISS44100
439*        710 CONTINUE                                                       ISS44200
440*            IF (ISW3 .EQ. 1) GO TO 800                                     ISS44300
441*            XPL = -XMIN*SCLX+XLM1-0.5*HT                                   ISS44400
442*            YPL = -YMIN*SCLY+YBM1-0.5*HT                                   ISS44500
443*            CALL PRINTV(1,1H*,IFIX(XPL),IFIX(YPL))                         ISS44700
444*        800 CONTINUE                                                       ISS44900
445*            RETURN                                                         ISS45000
446*       2000 FORMAT (1H0,40X,22H*-*-* ISOPLETH LEVEL =,F9.3,2H, ,9A6)       ISS45100
447*       2001 FORMAT(1H0,6(19H  RANGE    AZIMUTH )/1X,6(19H (METERS)  BEARING )/ISS45200
448*           11X,6(10X,9H(DEGREES))/1X,19(6H------))                         ISS45300
449*       2002 FORMAT (1X,6(F10.3,F8.3,1X))                                   ISS45400
450*       2003 FORMAT ()                                                      ISS45500
451*       2004 FORMAT ('0 *** ISOPLETHS OUT OF RANGE FOR ',16A6/(1X,21A6))    ISS45600
452*            END                                                            ISS45700
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 1*            SUBROUTINE LSSOPT, VERSION  5, REVISION 3
 2*
 3*            SUBROUTINE LSSOPT(X,Y,NX,NY,FI,VLABEL,LEGEND,NCV,NCHAR)                LSS00100
 4*      C     IS ISW = 2 LOG-LOG, IF ISW = 1 LINEAR                                  LSS00200
 5*            COMMON /PLTLLO/ ISW,XMAXJN,YMAXJN,XCIZE,YCIZE                          LSS00300
 6*            COMMON /BNDS/ XRIT,XLFT,YBOT,YTOP,XPL,YPL                              LSS00400
 7*            DIMENSION X(1),Y(1),FI(1)                                              LSS00500
 8*            COMMON /ILALPH/LCRIT(10),IBLANK,ISTAR,IP1,IP2,IP3,HLABEL(5),NCH        LSS00600
 9*            COMMON /XYXYPT/ YP(41),XP(41),A(41),B(41),C(41),D(41),XI(41),YI(41LSS00700
10*           1),NUM(3),NC                                                           LSS00800
11*            COMMON /ILPLTS/ XMAX,XMIN,YMAX,YMIN,XLM1,YBM1,HT,CHARF,SCLX,SCLY,      LSS00900
12*           1XSIZE1,YSIZE1                                                         LSS01000
13*            DATA DISP,XLN,YBN,XRN,YTN/3.0,62.,102.,24.,22./                        LSS01200
14*            XLM1 = XLN                                                             LSS01300
15*            YBM1 = YBN                                                             LSS01400
16*            XRM1 = XRN                                                             LSS01500
17*            YTM1 = YTN                                                             LSS01600
18*            XSIZE1 = XCIZE                                                         LSS01700
19*            YSIZE1 = YCIZE                                                         LSS01800
20*      C     DETERMINE MAX AND MIN FOR BOTH AXES                                    LSS01900
21*            Y1 = 0.0                                                               LSS02000
22*            J1 = 0                                                                 LSS02100
23*            J2 = 0                                                                 LSS02200
24*            Y2 = 1.0E20                                                            LSS02300
25*            J3 = 0                                                                 LSS02400
26*            DO 50 I=1,NX                                                           LSS02500
27*            IF (Y(I) .LE. 0.0) GO TO 40                                            LSS02600
28*            IF (J1 .GT. 0) GO TO 30                                                LSS02700
29*            J1 = I                                                                 LSS02800
30*            GO TO 31                                                               LSS02900
31*         30 J2 = I                                                                 LSS03000
32*         31 IF (Y(I) .GT. Y1) Y1 = Y(I)                                           LSS03100
33*            IF (Y(I) .LT. Y2) Y2 = Y(I)                                            LSS03200
34*            GO TO 50                                                               LSS03300
35*         40 J3 = 1                                                                 LSS03400
36*         50 CONTINUE                                                              LSS03500
37*            IF (ISW .EQ. 2) GO TO 60                                               LSS03600
38*            IF (J3 .EQ. 1) Y2 = 0.0                                                LSS03700
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```
39*            J1 = 1                                                                LSS03800
40*            J2 = NX                                                               LSS03900
41*            CALL MAXMIN(XMAXJN,X(J1),XMAX,XMIN,X(J2),X(J1),1)                     LSS04000
42*            CALL MAXMIN(YMAXJN,Y2,YMAX,YMIN,Y1,Y2,1)                              LSS04100
43*            GO TO 80                                                              LSS04200
44*         60 IF (Y1 .LE. 0.0) GO TO 230                                            LSS04300
45*         61 IF (X(J1) .GT. 0.0) GO TO 70                                          LSS04400
46*            J1 = J1+1                                                             LSS04500
47*            GO TO 61                                                              LSS04600
48*         70 XPL = 10.0**X(J1)                                                     LSS04700
49*            YPL = 10.0**X(J2)                                                     LSS04800
50*            CALL MAXMIN(XMAXJN,XPL,XMAX,XMIN,YPL,XPL,2)                           LSS04900
51*            CALL MAXMIN(YMAXJN,Y2,YMAX,YMIN,Y1,Y2,2)                              LSS05000
52*         80 CONTINUE                                                              LSS05100
53*      C     DETERMINE PLOT SCALE                                                  LSS05200
54*         90 IF (ISW .EQ. 2) GO TO 100                                             LSS05300
55*            SCLX = XSIZE1/(XMAX-XMIN)                                             LSS05400
56*            SCLY = YSIZE1/(YMAX-YMIN)                                             LSS05500
57*            GO TO 110                                                             LSS05600
58*        100 SCLX = XSIZE1/(ALOG10(XMAX)-ALOG10(XMIN))                             LSS05700
59*            SCLY = YSIZE1/(ALOG10(YMAX)-ALOG10(YMIN))                             LSS05800
60*        110 CONTINUE                                                              LSS05900
61*            IF (ISW .EQ. 2) GO TO 115                                             LSS06000
62*            XLFT = XMIN                                                           LSS06100
63*            XRIT = XMAX                                                           LSS06200
64*            YTOP = YMAX                                                           LSS06300
65*            YBOT = YMIN                                                           LSS06400
66*            GO TO 116                                                             LSS06500
67*        115 CONTINUE                                                              LSS06600
68*            XLFT = ALOG10(XMIN)                                                   LSS06700
69*            XRIT = ALOG10(XMAX)                                                   LSS06800
70*            YTOP = ALOG10(YMAX)                                                   LSS06900
71*            YBOT = ALOG10(YMIN)                                                   LSS07000
72*        116 CONTINUE                                                              LSS07100
73*            CALL SETMIV(0,0,0,0)                                                  LSS07200
74*            CALL FRAMEV(0)                                                        LSS07300
75*            HI = 12                                                               LSS07500
76*            CHARF = 8                                                             LSS07900
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      C                                                                 LSS08100
      C     DRAW AXES                                                   LSS08200
            CALL ILAXES(ISW,VLABEL,HLABEL,NCV,NCH,LEGEND,NCHAR)         LSS08300
      C                                                                 LSS08400
      C     PLOT CURVE                                                  LSS08500
            NC = J2-J1+1                                                LSS08600
            IF (NC .LE. 0) GO TO 220                                    LSS08700
            IF (ISW .NE. 2) GO TO 121                                   LSS08800
            DO 120 I=J1,J2                                              LSS08900
            Y(I) = ALOG10(Y(I))                                         LSS09000
        120 CONTINUE                                                    LSS09100
        121 CONTINUE                                                    LSS09200
            IF (NC .LT. 3) GO TO 125                                    LSS09300
            CALL SPLINE(X(J1),Y(J1),A,B,C,D,NC,IER)                     LSS09400
            IF (IER .EQ. 1) GO TO 125                                   LSS09500
            DX = (X(J2)-X(J1))/82.0                                     LSS09600
            XPL = X(J1)-DX                                              LSS09700
            N = 0                                                       LSS09800
            I = 1                                                       LSS09900
        123 XPL = XPL+DX                                                LSS10000
            IF (XPL .LT. X(J1+I)) GO TO 124                             LSS10100
            I = I+1                                                     LSS10200
        124 IF (I+J1 .GT. J2.OR.N .GE. 82) GO TO 127                    LSS10300
            N = N+1                                                     LSS10400
            YPL = XPL-X(J1+I-1)                                         LSS10500
            YP(N) = Y(J1+I-1)+YPL*(B(I)+(XPL-X(J1+I))*(2.0*C(I)+C(I+1)+A(I)*  LSS10600
           1YPL)*.1666667)                                              LSS10700
            XI(N) = XPL                                                 LSS10800
            GO TO 123                                                   LSS10900
        125 DO 126 I=1,NC                                               LSS11000
            XI(I) = X(J1+I-1)                                           LSS11100
        126 YP(I) = Y(J1+I-1)                                           LSS11200
            N = NC                                                      LSS11300
        127 CONTINUE                                                    LSS11400
            CALL ILPLOT(XI,YP,N,2,A)                                    LSS11500
            IF (NY .EQ. 0.OR.NY .EQ. 9) GO TO 220                       LSS11600
            XINC = 8                                                    LSS11800
            IF (ISW .EQ. 2) YMIN = ALOG10(YMIN)                         LSS11900
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115*            DO 210 I=1,NY                                                   LSS12000
116*            IF (ISW .EQ. 2) GO TO 130                                       LSS12100
117*            YS = (FI(I)-YMIN)*SCLY+YBM1                                     LSS12200
118*            GO TO 131                                                       LSS12300
119*        130 YS = (ALOG10(FI(I))-YMIN)*SCLY+YBM1                             LSS12400
120*        131 IF (YS .LT. YBM1) GO TO 210                                     LSS12500
121*            IF (YS .GT. YBM1+YSIZE1) GO TO 210                              LSS12600
122*            CALL NMBRS(FI(I),NUM,NC)                                        LSS12700
123*            X1 = XLM1-XINC                                                  LSS12800
124*            X2 = XLM1+XSIZE1-FLOAT(NC)*CHARF-DISP                           LSS12900
125*            IB = 2                                                          LSS13000
126*            XPL = XLM1                                                      LSS13100
127*        140 X1 = X1+XINC                                                    LSS13200
128*            IF (X1 .GE. X2) X1 = X2                                         LSS13300
129*            IF (IB .EQ. 3) GO TO 150                                        LSS13400
130*            CALL LINE2V(IFIX(XPL),IFIX(YS),IFIX(X1-XPL),0)                  LSS13700
131*        150 IF (X1 .GE. X2) GO TO 170                                       LSS13800
132*            XPL = X1                                                        LSS13900
133*            IF (IB .EQ. 2) GO TO 160                                        LSS14000
134*            IB = 2                                                          LSS14100
135*            GO TO 140                                                       LSS14200
136*        160 IB = 3                                                          LSS14300
137*            GO TO 140                                                       LSS14400
138*        170 CALL PRINTV(NC,NUM,IFIX(X2+XINC),IFIX(YS-4.0))                  LSS14600
139*        210 CONTINUE                                                        LSS14700
140*        220 CONTINUE                                                        LSS14800
141*        230 RETURN                                                          LSS14900
142*            END                                                             LSS15000
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1*            SUBROUTINE ILAXES, VERSION  5, REVISION 3
2*
3*            SUBROUTINE ILAXES(ISW,VLABEL,HLABEL,NCV,NCH,LEGEND,NCHAR)          ILA00100
4*            COMMON /ILPLTS/ XMAX,XMIN,YMAX,YMIN,XLM1,YBM1,HT,CHARF,SCLX,SCLY,  ILA00200
5*           1XSIZE1,YSIZE1                                                      ILA00300
6*            DIMENSION NUM(3),LEGEND(1),VLABEL(1),HLABEL(1)                     ILA00400
7*      C     ISW = 1 LINEAR AXES                                                ILA00500
8*      C     ISW = 2 LOG-LOG AXES                                               ILA00600
9*            DATA TIC1/8.0/,TIC2/4.0/,DISP/3.0/                                 ILA00800
10*           DATA XINCMN/14.6/                                                  ILA01000
11*           IF (ISW .NE. 2) GO TO 40                                           ILA01100
12*           XST = ALOG10(XMIN)                                                 ILA01200
13*           XINC = 1.0                                                         ILA01300
14*           K = XST                                                            ILA01400
15*           XP = K                                                             ILA01500
16*           IF (XST-XP) 20,60,20                                               ILA01600
17*        20 IF (XST) 21,21,30                                                  ILA01700
18*        21 K = K-1                                                            ILA01800
19*           GO TO 60                                                           ILA01900
20*        30 K = K+1                                                            ILA02000
21*           GO TO 60                                                           ILA02100
22*        40 CONTINUE                                                           ILA02200
23*     C     DETERMINE INCREMENT BETWEEN MINOR TIC MARKS                        ILA02300
24*           XINC = (XMAX-XMIN)/(XSIZE1*10.0)                                   ILA02400
25*           IF (XINC*SCLX .LT. XINCMN) XINC = XINCMN/SCLX                      ILA02500
26*           J = ALOG10(XINC)                                                   ILA02600
27*           K = XINC*10.0**(-J)                                                ILA02700
28*           XINC = K*10**J                                                     ILA02800
29*           XST = 0.0                                                          ILA02900
30*        50 IF (XST .LE. XMIN) GO TO 60                                        ILA03000
31*           XST = XST-10.0*XINC                                                ILA03100
32*           GO TO 50                                                           ILA03200
33*        60 CONTINUE                                                           ILA03300
34*           CALL LINE2V(IFIX(XLM1),IFIX(YBM1),0,IFIX(YSIZE1))                  ILA03900
35*           CALL LINE2V(IFIX(XLM1),IFIX(YBM1+YSIZE1),IFIX(XSIZE1),0)           ILA04000
36*           CALL LINE2V(IFIX(XLM1+XSIZE1),IFIX(YBM1+YSIZE1),0,-IFIX(YSIZE1))   ILA04100
37*           CALL LINE2V(IFIX(XLM1+XSIZE1),IFIX(YBM1),-IFIX(XSIZE1),0)          ILA04200
38*     C     PLOT AND LABEL X AXES                                              ILA04300
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      YP = YBM1                                                          ILA04400
      J = 1                                                              ILA04500
      DO 150 I=1,2                                                       ILA04600
      IF (ISW .EQ. 2) GO TO 70                                           ILA04700
      X = XST-XINC                                                       ILA04800
      GO TO 80                                                           ILA04900
   70 L = K -1                                                           ILA05000
      X = 9.0                                                            ILA05100
   80 IB = 9                                                             ILA05200
   90 X = X+XINC                                                         ILA05300
      IB = IB+1                                                          ILA05400
      IF (IB .LE. 10) GO TO 95                                           ILA05500
      IB = 1                                                             ILA05600
      IF (ISW .NE. 2) GO TO 95                                           ILA05700
      IB = 2                                                             ILA05800
      L = L+1                                                            ILA05900
      X = 2.0                                                            ILA06000
   95 CONTINUE                                                           ILA06100
      IF (ISW .EQ. 2) GO TO 100                                          ILA06200
      XP = (X-XMIN)*SCLX+XLM1                                            ILA06300
      GO TO 105                                                          ILA06400
  100 XP = (ALOG10(X*10.0**L)-XST)*SCLX+XLM1                             ILA06500
  105 IF (XP .LT. XLM1) GO TO 90                                         ILA06600
      IF (XP .GT. XLM1+XSIZE1) GO TO 140                                 ILA06700
  110 CONTINUE                                                           ILA06800
      IF (IB .LT. 10) GO TO 130                                          ILA07100
      CALL LINE2V(IFIX(XP),IFIX(YP),0,IFIX(TIC1)*J)                      ILA07300
      IF (ISW .EQ. 2) GO TO 120                                          ILA07400
      IB = 0                                                             ILA07500
      IF (J .LT. 0) GO TO 140                                            ILA07600
      CALL NMBRS(X,NUM,NCHT)                                             ILA07700
      CALL PRINTV(NCHT,NUM,IFIX(XP-.5*FLOAT(NCHT)*CHARF),IFIX(YP-HT-DISPILA07900
     1))                                                                 ILA08000
      GO TO 140                                                          ILA08100
  120 X = L+1                                                            ILA08200
      IB = 1                                                             ILA08300
      IF (J .LT. 0) GO TO 125                                            ILA08400
      CALL PRINTV(2,'10',IFIX(XP-2.0*CHARF),IFIX(YP-HT-3.0*DISP))        ILA08700
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77*           CALL LABLV(X,IFIX(XP),IFIX(YP-HT-DISP),2,1,2)                    ILA08800
78*       125 CONTINUE                                                         ILA08900
79*           X = 1.0                                                          ILA09000
80*           L = L+1                                                          ILA09100
81*           GO TO 140                                                        ILA09200
82*       130 CALL LINE2V(IFIX(XP),IFIX(YP),0,IFIX(TIC2)*J)                    ILA09400
83*       140 CONTINUE                                                         ILA09500
84*           IF (XP .LT. XLM1+XSIZE1) GO TO 90                                ILA09600
85*           YP = YBM1+YSIZE1                                                 ILA09700
86*           J = -1                                                           ILA09800
87*       150 CONTINUE                                                         ILA09900
88*     C     PLOT AND LABEL Y AXES                                            ILA10000
89*           IF (ISW .NE. 2) GO TO 154                                        ILA10100
90*           XST = ALOG10(YMIN)                                               ILA10200
91*           XINC = 1.0                                                       ILA10300
92*           K = XST                                                          ILA10400
93*           XP = K                                                           ILA10500
94*           IF (XST-XP) 151,156,151                                          ILA10600
95*       151 IF (XST) 152,152,153                                             ILA10700
96*       152 K = K-1                                                          ILA10800
97*           GO TO 156                                                        ILA10900
98*       153 K = K+1                                                          ILA11000
99*           GO TO 156                                                        ILA11100
100*      154 XINC = (YMAX-YMIN)/(YSIZE1*10.0)                                 ILA11200
101*          IF (XINC*SCLY .LT. XINCMN) XINC = XINCMN/SCLY                    ILA11300
102*          J = ALOG10(XINC)                                                 ILA11400
103*          K = XINC*10.0**(-J)                                              ILA11500
104*          XINC = K*10**J                                                   ILA11600
105*          XST = 0.0                                                        ILA11700
106*      155 IF (XST .LE. YMIN) GO TO 156                                     ILA11800
107*          XST = XST-XINC*10.0                                              ILA11900
108*          GO TO 155                                                        ILA12000
109*      156 CONTINUE                                                         ILA12100
110*          XP = XLM1                                                        ILA12200
111*          XD = 5.0                                                         ILA12300
112*          IF (ISW .EQ. 2) XD = 4.0                                         ILA12400
113*          XD = XP-XD*CHARF-DISP                                            ILA12500
114*          J = 1                                                            ILA12600
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```
115*            DO 250 I=1,2                                                    ILA12700
116*            IF (ISW .EQ. 2) GO TO 160                                       ILA12800
117*            X = XST-XINC                                                    ILA12900
118*            GO TO 170                                                       ILA13000
119*        160 L = K-1                                                         ILA13100
120*            X = 9.0                                                         ILA13200
121*        170 IB = 9                                                          ILA13300
122*        180 X = X+XINC                                                      ILA13400
123*            IB = IB+1                                                       ILA13500
124*            IF (IB .LE. 10) GO TO 185                                       ILA13600
125*            IB = 1                                                          ILA13700
126*            IF (ISW .NE. 2) GO TO 185                                       ILA13800
127*            IB = 2                                                          ILA13900
128*            L = L+1                                                         ILA14000
129*            X = 2.0                                                         ILA14100
130*        185 CONTINUE                                                        ILA14200
131*            IF (ISW .EQ. 2) GO TO 190                                       ILA14300
132*            YP = (X-YMIN)*SCLY+YBM1                                         ILA14400
133*            GO TO 200                                                       ILA14500
134*        190 YP = (ALOG10(X*10.0**L)-XST)*SCLY+YBM1                          ILA14600
135*        200 IF (YP .LT. YBM1) GO TO 180                                     ILA14700
136*            IF (YP .GT. YBM1+YSIZE1) GO TO 240                              ILA14800
137*        210 CONTINUE                                                        ILA14900
138*            IF (IB .LT. 10) GO TO 230                                       ILA15200
139*            CALL LINE2V(IFIX(XP),IFIX(YP),IFIX(TIC1)*J,0)                   ILA15400
140*            IF (ISW .EQ. 2) GO TO 220                                       ILA15500
141*            IB = 0                                                          ILA15600
142*            IF (J .LT. 0) GO TO 240                                         ILA15700
143*            CALL NMBRS(X,NUM,NCHT)                                          ILA15800
144*            XF = XP-FLOAT(NCHT)*CHARF-DISP                                  ILA15900
145*            CALL PRINTV(NCHT,NUM,IFIX(XF),IFIX(YP-.5*HT))                   ILA16100
146*            IF (XF .LT. XD) XD = XF                                         ILA16200
147*            GO TO 240                                                       ILA16300
148*        220 X = L+1                                                         ILA16400
149*            IB = 1                                                          ILA16500
150*            IF (J .LT. 0) GO TO 225                                         ILA16600
151*            CALL PRINTV(2,'10',IFIX(XP-4.0*CHARF-DISP),IFIX(YP-.5*HT))      ILA16900
152*            CALL LABLV(X,IFIX(XP-2.0*CHARF-DISP),IFIX(YP+DISP),2,1,2)       ILA17000
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153*          225 CONTINUE                                                          ILA17100
154*              X = 1.0                                                           ILA17200
155*              L = L+1                                                           ILA17300
156*              GO TO 240                                                         ILA17400
157*          230 CALL LINE2V(IFIX(XP),IFIX(YP),IFIX(TIC2)*J,0)                     ILA17600
158*          240 CONTINUE                                                          ILA17700
159*              IF (YP .LT. YBM1+YSIZE1) GO TO 180                                ILA17800
160*              XP = XLM1+XSIZE1                                                  ILA17900
161*              J = -1                                                            ILA18000
162*          250 CONTINUE                                                          ILA18100
163*        C     DRAW VERTICAL AXIS LABEL                                          ILA18200
164*              XP = XD-DISP-CHARF                                                ILA18300
165*              YP = (YSIZE1+FLOAT(NCV)*(HT+DISP))*0.5+YBM1                       ILA18500
166*              CALL APRNTV(0,-IFIX(HT+DISP),NCV,VLABEL,IFIX(XP),IFIX(YP))        ILA18700
167*        C     DRAW HORIZONTAL AXIS LABEL                                        ILA18800
168*              XP = (XSIZE1-FLOAT(NCH)*CHARF)*0.5+XLM1                           ILA18900
169*              YP = YBM1-2.0*(2.5*DISP+HT)                                       ILA19000
170*              CALL PRINTV(NCH,HLABEL,IFIX(XP),IFIX(YP))                         ILA19200
171*        C     DRAW LEGEND FOR PLOT                                              ILA19300
172*              XP = (XSIZE1-90.0*CHARF)*0.5+XLM1                                 ILA19400
173*              YP = YP-HT+DISP                                                   ILA19600
174*              J = -89                                                           ILA19700
175*          260 YP = YP-(HT+DISP)                                                 ILA19800
176*              J = J+90                                                          ILA19900
177*              K = J+89                                                          ILA20000
178*              IF (K .GT. NCHAR) K = NCHAR                                       ILA20100
179*              I = (J/6)+1                                                       ILA20200
180*              CALL PRINTV(K-J+1,LEGEND(I),IFIX(XP),IFIX(YP))                    ILA20400
181*              IF (K .LT. NCHAR) GO TO 260                                       ILA20500
182*              RETURN                                                            ILA20600
183*              END                                                               ILA20700
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```
1*            SUBROUTINE ILPLOT, VERSION  5, REVISION 3
2*
3*            SUBROUTINE ILPLOT(X,Y,N,ISW,IJ)                                   ILP00100
4*      C     THIS SUBROUTINE PLOTS AND LABELS CURVES                           ILP00200
5*            COMMON /BNDS/ XRIT,XLFT,YBOT,YTOP,XPL,YPL                         ILP00300
6*            COMMON /ILPLTS/ XMAX,XMIN,YMAX,YMIN,XLM1,YBM1,HT,CHARF,SCLX,SCLY, ILP00400
7*           1XSIZE1,YSIZE1                                                     ILP00500
8*            DIMENSION X(1),Y(1),IJ(1)                                         ILP00600
9*            COMMON /XYXYPT/ YP(41),XP(41),A(41),B(41),C(41),D(41),XI(41),YI(41ILP00700
10*          1),NUM(3),NC                                                       ILP00800
11*           IFLG = 0                                                          ILP00900
12*           JFLG = 0                                                          ILP01000
13*           DO 100 I=1,N                                                      ILP01100
14*           X1 = X(I)                                                         ILP01200
15*           Y1 = Y(I)                                                         ILP01300
16*           IF (XLFT .LE. X1.AND.X1 .LE. XRIT) GO TO 20                       ILP01400
17*           GO TO 30                                                          ILP01500
18*        20 IF (YBOT .LE. Y1.AND.Y1 .LE. YTOP) GO TO 60                       ILP01600
19*        30 IF (JFLG .EQ. 0) GO TO 50                                         ILP01700
20*     C     LAST POINT WAS OUT, THIS POINT IS OUT                             ILP01800
21*        40 IJ(I) = 3                                                         ILP01900
22*           GO TO 90                                                          ILP02000
23*        50 JFLG = 1                                                          ILP02100
24*           IF (I .EQ. 1) GO TO 40                                            ILP02200
25*     C     THIS POINT OUT LAST POINT IN                                      ILP02300
26*     C     INTERP FOR PLOT POINT                                             ILP02400
27*           CALL BOUNDS(X1,Y1,XLST,YLST)                                      ILP02500
28*           ITAG = 1                                                          ILP02600
29*           GO TO 80                                                          ILP02700
30*        60 IF (JFLG .EQ. 0) GO TO 70                                         ILP02800
31*     C     THIS POINT IN LAST POINT OUT                                      ILP02900
32*           JFLG = 0                                                          ILP03000
33*           CALL BOUNDS(XLST,YLST,X1,Y1)                                      ILP03100
34*           IJ(I-1) = 0                                                       ILP03200
35*           X(I-1) = (XPL-XLFT)*SCLX+XLM1                                     ILP03300
36*           Y(I-1) = (YPL-YBOT)*SCLY+YBM1                                     ILP03400
37*        70 XPL = X1                                                          ILP03500
38*           YPL = Y1                                                          ILP03600
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39*              ITAG = 2                                                    ILP03700
40*           80 X(I) = (XPL-XLFT)*SCLX+XLM1                                 ILP03800
41*              Y(I) = (YPL-YBOT)*SCLY+YBM1                                 ILP03900
42*              IJ(I) = ITAG                                                ILP04000
43*           90 XLST = X1                                                   ILP04100
44*              YLST = Y1                                                   ILP04200
45*          100 CONTINUE                                                    ILP04300
46*              IF (ISW .EQ. 2) GO TO 160                                   ILP04400
47*        C     IJ = 0 CURVE ENTERS GRAPH - FIRST POINT                     ILP04500
48*        C     IJ = 1 CURVE LEAVES GRAPH - LAST POINT                      ILP04600
49*        C     IJ = 2 CURVE CONTINUES WITHIN GRAPH                         ILP04700
50*        C     IJ = 3 CURVE OUTSIDE OF GRAPH DO NOT PLOT                   ILP04800
51*        C                                                                 ILP04900
52*        C     FIND POINTS FOR ISOPLETH LABELS                             ILP05000
53*        C     FIND ALL POINTS WHERE CURVE LEAVES GRAPH                    ILP05100
54*              M = 0                                                       ILP05200
55*              DO 110 I=1,N                                                ILP05300
56*              IF (IJ(I) .NE. 1) GO TO 110                                 ILP05400
57*              M = M+1                                                     ILP05500
58*              B(M) = X(I)                                                 ILP05600
59*              C(M) = Y(I)+.02                                             ILP05700
60*          110 CONTINUE                                                    ILP05800
61*        C     FIND ALL POINTS WHERE CURVE ENTERS GRAPH                    ILP05900
62*              DO 120 I=1,N                                                ILP06000
63*              IF (IJ(I) .NE. 0) GO TO 120                                 ILP06100
64*              M = M+1                                                     ILP06200
65*              B(M) = X(I)                                                 ILP06300
66*              C(M) = Y(I)+.02                                             ILP06400
67*          120 CONTINUE                                                    ILP06500
68*              L = N/2                                                     ILP06600
69*              IF (IJ(L) .EQ. 2) GO TO 130                                 ILP06700
70*              L = 1                                                       ILP06800
71*              IF (IJ(L) .EQ. 2) GO TO 130                                 ILP06900
72*              L = N/4                                                     ILP07000
73*              IF (IJ(L) .EQ. 2) GO TO 130                                 ILP07100
74*              L = 3*N/4                                                   ILP07200
75*              IF (IJ(L) .NE. 2) GO TO 140                                 ILP07300
76*          130 M = M+1                                                     ILP07400
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77*                B(M) = X(L)                                                    ILP07500
78*                C(M) = Y(L)+.02                                                ILP07600
79*              140 CONTINUE                                                     ILP07700
80*          C       PLOT LABELS                                                 ILP07800
81*                  XPL = -XLFT*SCLX+XLM1                                       ILP07900
82*                  YPL = -YBOT*SCLY+YBM1                                       ILP08000
83*                  DO 150 I=1,M                                                ILP08100
84*                  IF (ABS(XPL-B(I)) .GT. 0.2) GO TO 145                       ILP08200
85*                  IF (ABS(YPL-C(I)) .LE. 0.2) GO TO 150                       ILP08300
86*              145 CONTINUE                                                    ILP08400
87*                  CALL PRINTV(NC,NUM,IFIX(B(I)),IFIX(C(I)))                   ILP08600
88*              150 CONTINUE                                                    ILP08700
89*              160 CONTINUE                                                    ILP08800
90*          C       PLOT THE CURVE                                              ILP08900
91*                  IF (IJ(1) .NE. 3) IJ(1) = 0                                 ILP09000
92*                  N = N-1                                                     ILP09100
93*                  DO 170 I=1,N                                                ILP09200
94*                  IF (IJ(I+1) .EQ. 3) GO TO 170                               ILP09300
95*                  IF (IJ(I+1) .EQ. 0) GO TO 170                               ILP09400
96*                  CALL LINE2V(IFIX(X(I)),IFIX(Y(I)),IFIX(X(I+1)-X(I)),IFIX(Y(I+1)-Y(ILP09500
97*                 1I)))                                                        ILP09600
98*              170 CONTINUE                                                    ILP10000
99*              180 CONTINUE                                                    ILP10100
100*                 RETURN                                                      ILP10200
101*                 END                                                         ILP10300
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```
1*            SUBROUTINE  CALCS, VERSION  5, REVISION 3
2*
3*            SUBROUTINE CALCS(XX,YY,NP,RAD,RADI,XSHFT,YSHFT,X1,Y1,LLSW,KB,YT,X,CAL00100
4*           1NX)                                                              CAL00200
5*            DIMENSION XX(1),YY(1),XSH(2),X(1)                                CAL00300
6*            IF (LLSW .NE. 0) GO TO 10                                        CAL00400
7*            IF (KB .NE. 0) GO TO 260                                         CAL00500
8*            DO 200 I=1,NP                                                    CAL00600
9*            IF (XX(I) .LT. 100.0) GO TO 210                                  CAL00700
10*       200 CONTINUE                                                         CAL00800
11*           GO TO 260                                                        CAL00900
12*       210 X2 = 1.0E10                                                      CAL01000
13*           DO 220 I=1,NP                                                    CAL01100
14*           Y2 = ABS(YY(I)-YT)                                               CAL01200
15*           IF (Y2 .GT. 180.0) Y2 = 360.0-Y2                                 CAL01300
16*           IF (Y2 .GE. X2) GO TO 220                                        CAL01400
17*           X2 = Y2                                                          CAL01500
18*           J = I                                                            CAL01600
19*       220 CONTINUE                                                         CAL01700
20*           X2 = XX(1)                                                       CAL01800
21*           Y2 = YY(1)                                                       CAL01900
22*           XX(1) = XX(J)                                                    CAL02000
23*           YY(1) = YY(J)                                                    CAL02100
24*           XX(J) = X2                                                       CAL02200
25*           YY(J) = Y2                                                       CAL02300
26*           I = 1                                                            CAL02400
27*       230 I = I+1                                                          CAL02500
28*           IF (I .GT. NP) GO TO 260                                         CAL02600
29*           IF (XX(I) .GE. 100.0) GO TO 230                                  CAL02700
30*           I = I+1                                                          CAL02800
31*           IF (I .GT. NP) GO TO 250                                         CAL02900
32*           DO 240 K=I,NP                                                    CAL03000
33*           YY(K-1) = YY(K)                                                  CAL03100
34*       240 XX(K-1) = XX(K)                                                  CAL03200
35*           I = I-2                                                          CAL03300
36*       250 NP = NP-1                                                        CAL03400
37*           GO TO 230                                                        CAL03500
38*       260 CONTINUE                                                         CAL03600
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C     DETERMINE CENTER OF FUNCTION                                              CAL03700
      XSHFT = -1.0E10                                                           CAL03800
      YSHFT = -1.0E10                                                           CAL03900
      X2 = 1.0E10                                                               CAL04000
      Y2 = 1.0E10                                                               CAL04100
      DO 4 I=1,NP                                                               CAL04200
      XSHFT = AMAX1(XSHFT,XX(I))                                                CAL04300
      YSHFT = AMAX1(YSHFT,YY(I))                                                CAL04400
      X2 = AMIN1(X2,XX(I))                                                      CAL04500
      Y2 = AMIN1(Y2,YY(I))                                                      CAL04600
    4 CONTINUE                                                                  CAL04700
      XSHFT = 0.5*(XSHFT+X2)                                                    CAL04800
      YSHFT = 0.5*(YSHFT+Y2)                                                    CAL04900
      IF (KB .NE. 0) GO TO 9                                                    CAL05000
      XSHFT = 0.2*XSHFT+0.8*X2                                                  CAL05100
      DIF2 = -1.0                                                               CAL05200
      DIF3 = 0.0                                                                CAL05300
      DO 350 L=1,NX                                                             CAL05400
      DO 300 K=1,NP                                                             CAL05500
      IF (XX(K)-X(L)) 300,310,300                                               CAL05600
  300 CONTINUE                                                                  CAL05700
      GO TO 350                                                                 CAL05800
  310 Y2 = YY(K)                                                                CAL05900
      K = K+1                                                                   CAL06000
      IF (K .GE. NP) GO TO 350                                                  CAL06100
      DO 320 J=K,NP                                                             CAL06200
      IF (XX(J)-X(L)) 320,330,320                                               CAL06300
  320 CONTINUE                                                                  CAL06400
      GO TO 350                                                                 CAL06500
  330 DIF1 = DIF2                                                               CAL06600
      DIF2 = DIF3                                                               CAL06700
      DIF3 = ABS(YY(J)-Y2)                                                      CAL06800
      IF (DIF3 .GT. 180.0) DIF3 = 360.0-DIF3                                    CAL06900
      IF (DIF1 .LE. DIF2.OR.DIF2 .GE. DIF3) GO TO 340                           CAL07000
      YSHFT = X2                                                                CAL07100
      GO TO 360                                                                 CAL07200
  340 CONTINUE                                                                  CAL07300
      X2 = 0.5*(YY(J)+Y2)                                                       CAL07400
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77*       350 CONTINUE                                                    CAL07500
78*           GO TO 9                                                     CAL07600
79*       360 CONTINUE                                                    CAL07700
80*           DO 5 J=2,NP                                                 CAL07800
81*           DO 5 I=2,NP                                                 CAL07900
82*           IF (XX(I) .GE. XX(I-1)) GO TO 5                             CAL08000
83*           X2 = XX(I)                                                  CAL08100
84*           Y2 = YY(I)                                                  CAL08200
85*           XX(I) = XX(I-1)                                             CAL08300
86*           YY(I) = YY(I-1)                                             CAL08400
87*           XX(I-1) = X2                                                CAL08500
88*           YY(I-1) = Y2                                                CAL08600
89*         5 CONTINUE                                                    CAL08700
90*           DO 8 J=1,2                                                  CAL08800
91*           XSH(J) = 0.0                                                CAL08900
92*           DIF2 = -2.0                                                 CAL09000
93*           DIF3 = -1.0                                                 CAL09100
94*           DO 7 I=1,NP                                                 CAL09200
95*           IF (J .EQ. 1.AND.YY(I) .LE. YSHFT) GO TO 7                  CAL09300
96*           IF (J .EQ. 2.AND.YY(I) .GE. YSHFT) GO TO 7                  CAL09400
97*           DIF1 = DIF2                                                 CAL09500
98*           DIF2 = DIF3                                                 CAL09600
99*           DIF3 = ABS(YY(I)-YSHFT)                                     CAL09700
100*          DIF3 = RAD*DIF3*XX(I)                                       CAL09800
101*          IF (DIF1 .LE. DIF2.OR.DIF2 .GE. DIF3) GO TO 7               CAL09900
102*          XSH(J) = XX(I-1)                                            CAL10000
103*          GO TO 8                                                     CAL10100
104*        7 CONTINUE                                                    CAL10200
105*        8 CONTINUE                                                    CAL10300
106*          IF (XSH(1) .LE. 0.0.OR.XSH(2) .LE. 0.0) GO TO 9             CAL10400
107*          XSH(1) = AMAX1(XSH(1),XSH(2))                               CAL10500
108*          XSHFT = XSH(1)                                              CAL10600
109*        9 CONTINUE                                                    CAL10700
110*          Y2 = YSHFT*RAD                                              CAL10800
111*          YSHFT = XSHFT*COS(Y2)                                       CAL10900
112*          XSHFT = XSHFT*SIN(Y2)                                       CAL11000
113*       10 CONTINUE                                                    CAL11100
114*    C     CONVERT TO RECTANGULAR                                      CAL11200
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115*            DO 11 I=1,NP                                                    CAL11300
116*            Y2 = YY(I)*RAD                                                  CAL11400
117*            YY(I) = XX(I)*COS(Y2)+Y1                                        CAL11500
118*            XX(I) = XX(I)*SIN(Y2)+X1                                        CAL11600
119*         11 CONTINUE                                                        CAL11700
120*            IF (LLSW .EQ. 2) GO TO 101                                      CAL11800
121*            DO 20 I=1,NP                                                    CAL11900
122*            IF (LLSW .EQ. 1) GO TO 17                                       CAL12000
123*      C     CONVERT POINTS TO SYSTEM RELATIVE TO CENTER OF ELLIPSE          CAL12100
124*            XX(I) = XX(I)-XSHFT                                             CAL12200
125*            YY(I) = YY(I)-YSHFT                                             CAL12300
126*         17 CONTINUE                                                        CAL12400
127*      C     BACK TO POLAR                                                   CAL12500
128*            IF (XX(I)) 19,18,19                                             CAL12600
129*         18 IF (YY(I)) 19,20,19                                             CAL12700
130*         19 YPL = 90.0-ATAN2(YY(I),XX(I))*RADI                              CAL12800
131*            IF (YPL .LT. 0.0) YPL = YPL+360.0                               CAL12900
132*            XX(I) = SQRT(XX(I)*XX(I)+YY(I)*YY(I))                           CAL13000
133*            YY(I) = YPL                                                     CAL13100
134*            IF (LLSW .EQ. 1) YY(I) = AMOD(YPL,360.0)                        CAL13200
135*         20 CONTINUE                                                        CAL13300
136*            IF (LLSW .EQ. 1) GO TO 101                                      CAL13400
137*      C     SORT POINTS INTO ASCENDING ORDER OF ANGLE                       CAL13500
138*            DO 30 M=2,NP                                                    CAL13600
139*            DO 30 I=2,NP                                                    CAL13700
140*            IF (YY(I) .GE. YY(I-1)) GO TO 30                                CAL13800
141*            YPL = YY(I)                                                     CAL13900
142*            YY(I) = YY(I-1)                                                 CAL14000
143*            YY(I-1) = YPL                                                   CAL14100
144*            YPL = XX(I)                                                     CAL14200
145*            XX(I) = XX(I-1)                                                 CAL14300
146*            XX(I-1) = YPL                                                   CAL14400
147*         30 CONTINUE                                                        CAL14500
148*      C     ELIMINATE UNWANTED POINTS                                       CAL14600
149*            I = 1                                                           CAL14700
150*         32 I = I +1                                                        CAL14800
151*            IF (I .GT. NP) GO TO 35                                         CAL14900
152*            IF (YY(I)-YY(I-1) .GE. 1.0) GO TO 32                            CAL15000
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153*            I = I +1                                                                CAL15100
154*            IF ( I .GT. NP) GO TO 34                                                CAL15200
155*            DO 33 J=I,NP                                                            CAL15300
156*            YY(J-1) = YY(J)                                                         CAL15400
157*         33 XX(J-1) = XX(J)                                                         CAL15500
158*            I = I-2                                                                 CAL15600
159*         34 NP = NP-1                                                               CAL15700
160*            GO TO 32                                                                CAL15800
161*         35 CONTINUE                                                                CAL15900
162*            IF (KB .NE. 0) GO TO 101                                                CAL16000
163*      C     ELIMINATE ANY POINTS THAT ARE HIDDEN FROM DIRECT SIGHT FROM CENTER      CAL16100
164*            J = 0                                                                   CAL16200
165*         40 J = J+1                                                                 CAL16300
166*            IF (J .GE. NP-1) GO TO 50                                               CAL16400
167*            J1 = J + 1                                                              CAL16500
168*            J2 = J1+9                                                               CAL16600
169*            IF (J2 .GT. NP) J2 = NP                                                 CAL16700
170*         41 IF (ABS(YY(J)-YY(J2)) .LE. 10.0) GO TO 42                               CAL16800
171*            J2 = J2-1                                                               CAL16900
172*            GO TO 41                                                                CAL17000
173*         42 IF (J2 .LT. J1) GO TO 40                                                CAL17100
174*            Y2 = YY(J)*RAD                                                          CAL17200
175*            X2 = XX(J)*SIN(Y2)                                                      CAL17300
176*            Y2 = XX(J)*COS(Y2)                                                      CAL17400
177*            XT = 1.0E20                                                             CAL17500
178*            M = J1                                                                  CAL17600
179*            DO 45 I=J1,J2                                                           CAL17700
180*            TH2 = YY(I)*RAD                                                         CAL17800
181*            TH1 = XX(I)*SIN(TH2)                                                    CAL17900
182*            TH2 = XX(I)*COS(TH2)                                                    CAL18000
183*            XP = (X2-TH1)**2+(Y2-TH2)**2                                            CAL18100
184*            IF (XP .GE. XT) GO TO 45                                                CAL18200
185*            XT = XP                                                                 CAL18300
186*            M = I                                                                   CAL18400
187*         45 CONTINUE                                                                CAL18500
188*            IF (M .EQ. J1) GO TO 40                                                 CAL18600
189*            TH1 = XX(J1)                                                            CAL18700
190*            TH2 = YY(J1)                                                            CAL18800
```

```
191*            XX(J1) = XX(M)                                                  CAL18900
192*            YY(J1) = YY(M)                                                  CAL19000
193*            XX(M) = TH1                                                     CAL19100
194*            YY(M) = TH2                                                     CAL19200
195*            GO TO 40                                                        CAL19300
196*         50 CONTINUE                                                        CAL19400
197*            J = 1                                                           CAL19500
198*         55 J = J+1                                                         CAL19600
199*            IF (J .GT. NP) GO TO 70                                         CAL19700
200*            IF (YY(J) .GT. YY(J-1)) GO TO 55                                CAL19800
201*            J1 = J+1                                                        CAL19900
202*            IF (J1 .GT. NP) GO TO 65                                        CAL20000
203*            DO 60 I=J1,NP                                                   CAL20100
204*            XX(I-1) = XX(I)                                                 CAL20200
205*         60 YY(I-1) = YY(I)                                                 CAL20300
206*            J = J-1                                                         CAL20400
207*         65 NP = NP-1                                                       CAL20500
208*            GO TO 55                                                        CAL20600
209*         70 CONTINUE                                                        CAL20700
210*        101 RETURN                                                          CAL20800
211*            END                                                             CAL20900
```

```
1*          SUBROUTINE FSTPLT, VERSION  5, REVISION 3
2*
3*          SUBROUTINE FSTPLT(A,B,C,I,J,K,D,E,F,V1,V2,V3,N1,N2,N3,XP)          FST00100
4*          DIMENSION I(1),J(1),K(1),LSTK(2),V1(1),V2(1),V3(1)                FST00200
5*          DATA MTRS/6HMETERS/                                               FST00300
6*          IF (K(1) .EQ. LSTK(1).AND.K(2) .EQ. LSTK(2)) GO TO 40             FST00400
7*          CALL SETMIV(0,0,0,0)                                              FST00500
8*          CALL FRAMEV(0)                                                    FST00600
9*          CALL PRINTV(72,1,200,800)                                         FST00700
10*         CALL PRINTV(37,37HADJUSTED CLOUD STABILIZATION HEIGHT =,200,750)  FST00800
11*         CALL LABLV(A,504,750,7,1,4)                                       FST00900
12*         CALL PRINTV(6,MTRS,568,750)                                       FST01000
13*         CALL PRINTV(7,7HRANGE =,200,725)                                  FST01100
14*         CALL LABLV(B,272,725,7,1,5)                                       FST01200
15*         CALL PRINTV(6,MTRS,336,725)                                       FST01300
16*         CALL PRINTV(17,17HAZIMUTH BEARING =,200,700)                      FST01400
17*         CALL LABLV(C,352,700,6,1,3)                                       FST01500
18*         CALL PRINTV(7,7HDEGREES,416,700)                                  FST01600
19*         CALL PRINTV(8,8HRUN DATE,200,650)                                 FST01700
20*         CALL PRINTV(8,J,288,650)                                          FST01800
21*         CALL PRINTV(8,8HRUN TIME,400,650)                                 FST01900
22*         CALL PRINTV(8,K,488,650)                                          FST02000
23*         IDY = 625                                                         FST03800
24*         IF (N1 .LT. 0) GO TO 10                                           FST03900
25*         IDY = IDY-25                                                      FST04100
26*         CALL PRINTV(7,7HMAXIMUM,200,IDY)                                  FST04200
27*         CALL PRINTV(N1,V1,264,IDY)                                        FST04300
28*         CALL LABLV(D,264+8*(N1+1),IDY,-6,1,0)                             FST04400
29*      10 IF (N2 .LT. 0) GO TO 20                                           FST04800
30*         IDY = IDY-25                                                      FST05000
31*         CALL PRINTV(7,7HMAXIMUM,200,IDY)                                  FST05100
32*         CALL PRINTV(N2,V2,264,IDY)                                        FST05200
33*         CALL LABLV(E,264+8*(N2+1),IDY,-6,1,0)                             FST05300
34*      20 IF (N3 .LT. 0) GO TO 30                                           FST05700
35*         IDY = IDY-25                                                      FST05900
36*         CALL PRINTV(7,7HMAXIMUM,200,IDY)                                  FST06000
37*         CALL LABLV(XP,264,IDY,4,1,2)                                      FST06100
38*         CALL PRINTV(6,6HMINUTE,304,IDY)                                   FST06200
```

```
39*            CALL PRINTV(N3,V3,352,IDY)                                FST06300
40*            CALL LABLV(F,352+8*(N3+1),IDY,-6,1,0)                     FST06400
41*         30 CONTINUE                                                  FST07000
42*            LSTK(1) = K(1)                                            FST07200
43*            LSTK(2) = K(2)                                            FST07300
44*         40 RETURN                                                    FST07400
45*            END                                                       FST07500
```

```
1*            SUBROUTINE MAXMIN, VERSION  5, REVISION 1
2*
3*            SUBROUTINE MAXMIN(A,B,C,D,E,F,ISW)                                  MAX00100
4*      C     THIS SUBROUTINE DETERMINES MAX & MIN FOR PLOTTING FUNCTION VS.      MAX00200
5*      C     DISTANCE A,B ARE INPUT MAX AND MIN, C AND D ARE CALC MAX AND MIN    MAX00300
6*      C     DETERMINE MAX AND MIN                                               MAX00400
7*            IF (ISW .EQ. 2) GO TO 10                                            MAX00500
8*            IF (A .GT. 0.0) GO TO 80                                            MAX00600
9*      C     LINEAR SCALING                                                      MAX00700
10*           C = E                                                               MAX00800
11*           D = F                                                               MAX00900
12*           GO TO 90                                                            MAX01000
13*        10 CONTINUE                                                            MAX01100
14*           XX = 4.0                                                            MAX01200
15*           IF (A .GT. 0.0) XX = A                                              MAX01300
16*     C     LOG-LOG SCALING                                                     MAX01400
17*           C = ALOG10(E)                                                       MAX01500
18*           K = C                                                               MAX01600
19*           X = K                                                               MAX01700
20*           IF (X-C) 20,30,20                                                   MAX01800
21*        20 K = K+1                                                             MAX01900
22*        30 C = 10.0**K                                                         MAX02000
23*           D = 1.0                                                             MAX02100
24*           IF (F .LE. 0.0) GO TO 40                                            MAX02200
25*           D = F                                                               MAX02300
26*        40 D = ALOG10(D)                                                       MAX02400
27*           J = D                                                               MAX02500
28*           X = J                                                               MAX02600
29*           IF (X-D) 50,60,50                                                   MAX02700
30*        50 IF (D .LT. 0.0) J = J-1                                             MAX02800
31*        60 IF (FLOAT(K-J) .LE. XX) GO TO 70                                    MAX02900
32*           J = J+1                                                             MAX03000
33*           GO TO 60                                                            MAX03100
34*        70 D = 10.0**J                                                         MAX03200
35*           GO TO 90                                                            MAX03300
36*        80 C = A                                                               MAX03400
37*           D = B                                                               MAX03500
38*        90 RETURN                                                              MAX03600
```

```
      END                                                          MAX03700
```

```
      SUBROUTINE BOUNDS, VERSION  5, REVISION 1
C
      SUBROUTINE BOUNDS(X1,Y1,XLST,YLST)                                BND00100
C     CONFINE PLOT POINTS INSIDE OF AXES                                BND00200
      COMMON /BNDS/ XRIT,XLFT,YBOT,YTOP,XPL,YPL                         BND00300
      A = (YLST-Y1)/(XLST-X1)                                           BND00400
      B = Y1-A*X1                                                       BND00500
      IF (X1 .GT. XRIT) GO TO 90                                        BND00600
      IF (X1 .LT. XLFT) GO TO 60                                        BND00700
      IF (Y1 .LT. YBOT) GO TO 20                                        BND00800
      YPL = YTOP                                                        BND00900
   10 XPL = (YPL-B)/A                                                   BND01000
      GO TO 110                                                         BND01100
   20 IF (X1 .GT. XRIT) GO TO 50                                        BND01200
      IF (X1 .LT. XLFT) GO TO 30                                        BND01300
      YPL = YBOT                                                        BND01400
      GO TO 10                                                          BND01500
C     LOWER LEFT HAND CORNER ASSUME CROSSES XLFT                        BND01600
   30 XPL = XLFT                                                        BND01700
   40 YPL = A*XPL+B                                                     BND01800
      IF (YPL .GE. YBOT) GO TO 110                                      BND01900
C     WRONG CROSSES YBOT                                                BND02000
      YPL = YBOT                                                        BND02100
      GO TO 10                                                          BND02200
C     LOWER RIGHT HAND CORNER ASSUME CROSSES XRIT                       BND02300
   50 XPL = XRIT                                                        BND02400
      GO TO 40                                                          BND02500
   60 IF (Y1 .GT. YTOP) GO TO 70                                        BND02600
      IF (Y1 .LT. YBOT) GO TO 30                                        BND02700
      XPL = XLFT                                                        BND02800
      GO TO 40                                                          BND02900
C     UPPER LEFT HAND CORNER ASSUME CROSSES XLFT                        BND03000
   70 XPL = XLFT                                                        BND03100
   80 YPL = A*XPL+B                                                     BND03200
      IF (YPL .LE. YTOP) GO TO 110                                      BND03300
C     WRONG CROSSES YTOP                                                BND03400
      YPL = YTOP                                                        BND03500
      GO TO 10                                                          BND03600
```

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39*          90 IF (Y1 .LT. YBOT) GO TO 50                                  BND03700
40*             IF (Y1 .GT. YTOP) GO TO 100                                 BND03800
41*             XPL = XRIT                                                  BND03900
42*             GO TO 40                                                    BND04000
43*       C     UPPER RIGHT HAND CORNER ASSUME CROSSES XRIT                 BND04100
44*         100 XPL = XRIT                                                  BND04200
45*             GO TO 80                                                    BND04300
46*         110 RETURN                                                      BND04400
47*             END                                                         BND04500
```

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16. ABSTRACT

This report provides users' instructions for Version 6 of the NASA/MSFC Cloud-Rise Preprocessor and Multilayer Diffusion Computer Programs. These programs are for use by NASA in predicting concentrations and dosages downwind from normal and abnormal launches of rocket vehicles. Version 6 of these programs differs from Version 5, described in NASA CR-2631, and now incorporates: (1) the latest data for the heat content and chemistry of rocket exhaust clouds, (2) provision for the automated calculation of surface water pH due to deposition of HCl from precipitation scavenging, (3) provision for automated calculation of concentration and dosage parameters at any level within the vertical bounds for which meteorological inputs have been specified, and (4) provision for execution of multiple cases of meteorological data. In addition, some calculation procedures, such as the procedures used to automatically calculate wind direction shear in a layer, have been updated.

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