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NASA PARTICIPATION IN THE 1980 PEPE/NEROS
PROJECT: DATA ARCHIVE

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SUMMARY

The NASA Langley Research Center conducted and/or coordinated a total of eight experimental air quality measurement systems during July and August 1980 as part of the EPA PEPE/NEROS field measurement program. Data from those efforts have been entered into an archive that may be accessed by other researchers. The data sets consist of airborne measurements of regional mixed layer heights and aerosol and ozone distributions as well as point measurements of meteorological parameters and ozone obtained during diurnal transitions in the planetary boundary layer. This report gives a discussion of each measurement system, a preliminary assessment of data quality, a description of the archive format for each data set, and a summary of several proposed scientific studies which will utilize these data.

INTRODUCTION

The comprehensive Persistent Elevated Pollution Episode/Northeast Regional Oxidant Study (PEPE/NEROS) Project consisted of a series of field measurements conducted by the Environmental Protection Agency (EPA) during July and August, 1980 (ref. 1). The purposes of the PEPE project mission were: to study the formation of plumes of air pollution around cities, industrial areas, and power plants; to track the plumes as they moved across the country; and, to measure chemical changes as the pollutants mixed with the atmosphere. The PEPE mission operations were based in Columbus, Ohio. The purposes of the NEROS study were to measure oxidant precursor concentrations and to provide a data base for validating EPA's regional oxidant air pollution model. The NEROS effort was concentrated in the Northeastern states and along the urban eastcoast corridor. The overall PEPE/NEROS study led researchers and scientific aircraft to virtually every state in the eastern United States.

The participation by the National Aeronautics and Space Administration (NASA) in the PEPE/NEROS project had two purposes: (1) to utilize NASA-developed remote sensing techniques to provide measurements for the determination of mixed layer height and ozone (O_3) profiles on a regional scale; and, (2) to provide an opportunity for further development, testing, and evaluation of several NASA "emerging" airborne remote sensing systems. Mesomet, Inc., with funding from NASA and EPA, also provided information on the character of hazy pollution episodes throughout the summer of 1980 by obtaining satellite imagery that was subsequently combined with overlays of analyzed conventional meteorological data.

An EPA/NASA interagency agreement provided for the timely exchange of all data gathered during the study. The NASA data sets were made available to the EPA and are also available to other researchers upon request. In this report we briefly describe each NASA-sponsored experiment and the associated archived data. Appendices to this report include experiment locations and dates, sample data sets, data file format information and sample files from each data set. Further details of data gathered by each experimenter and an interpretation of the data are available in data reports and/or published articles prepared by each experimenter and referenced herein.

NASA EXPERIMENT DESCRIPTIONS

An earlier report (ref. 2) described the operational aspects of the NASA participation in the PEPE/NEROS field study. Figure 1 summarizes the experiments and the dates for which data were archived. Three NASA aircraft were involved: a Queen Air from the Jet Propulsion Laboratory (JPL), an Electra from the Wallops Flight Center (WFC), and a Cessna 402 from Langley Research Center (LaRC). The Laser Absorption Spectrometer (LAS) was operated from the Queen Air, while the Ultraviolet Differential Absorption Lidar (UV-DIAL) and the High Spectral Resolution Lidar (HSRL) were operated from the Electra. The Cessna 402 provided in situ data principally for the purpose of continuing to assess the quality of the ozone and aerosol profiles (UV-DIAL and HSRL) and ozone column burdens (LAS) retrieved from the remote sensor measurements. The long range ($\sim$1000 km) capability of the Electra aircraft was used to greatest advantage in the regional scale aspects of both the PEPE and NEROS scenarios. The LAS missions were performed in the vicinity of Columbus, Ohio. Daily mission summaries are given in reference 2.

Several auxiliary, ground-based experiments were conducted during the field study. A microwave spectrometer from JPL and a tethered balloon system from LaRC were located at a rural site northeast of Columbus, Ohio (Croton, Ohio). A second, larger tethered balloon system was operated near Aberdeen, Maryland. A network of Volz 4-channel photometers was operated in the northeastern states by the University of Miami, and an 8-channel photometer recorded data at the Goddard Space Flight Center (GSFC) in Greenbelt, Maryland.

Table I summarizes the experimental efforts by NASA and is referred to in subsequent sections of this paper.

ULTRAVIOLET DIFFERENTIAL ABSORPTION LIDAR (UV-DIAL)

The differential absorption lidar (DIAL) technique was used to obtain vertical and horizontal distributions of tropospheric ozone and aerosol back-scatter (refs. 3 and 4). Fourteen missions were flown with the DIAL system on board the Electra. During those missions, a total of 42.5 hours of aerosol data (representing 100 percent of the mission requirements) and 32 hours of

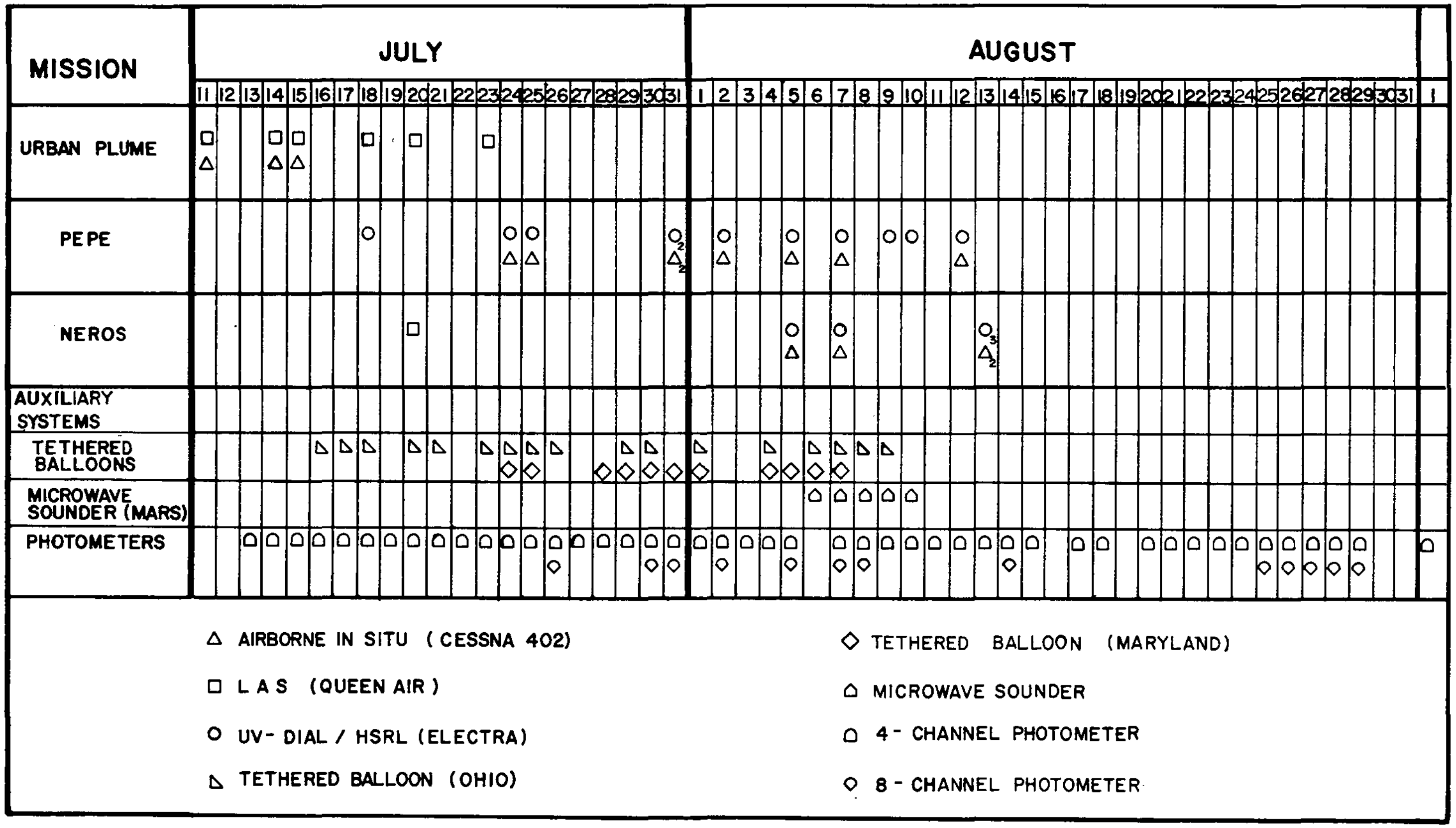


Figure 1. - Summary of experiments and dates for which data were archived. Subscripts on symbols denote multiple missions.

TABLE I

NASA DATA ARCHIVE FOR PROJECT PEPE/NEROS

NASA Center/Contractor	Platform	Sensor(s)	Parameters	Averaging	Data Quantity	Comments
Langley Res. Cen. (LaRC) Drs. Browell and Shipley	Electra	UV-DIAL	-Time, LONG/LAT, ALT, ground speed, aerosol backscatter vertical profile -Ozone vertical profile -Mixing height	1 sec. 1 min. 5 min.	14 long range missions	A report contains photographs of 5 mins. of aerosol data at 15 min. intervals, along with plots of ozone profiles.
U. of Wisconsin Dr. Eloranta Mr. Sroga	Electra	HSRL	-Time, LONG/LAT, Aerosol layer heights -Aerosol backscatter profiles, Aerosol/Molecular scattering ratio profiles, light extinction profiles	5 min. 15 min.	11 long range missions 11 long range missions	The HSRL was operated at discrete times. Vertical resolution of archival data is 150 m.
Jet Propulsion Laboratory (JPL) Drs. Shumate and Grant	Queen Air	LAS	Vertically-integrated ozone burden	flight leg (15-30 km)	6 missions in Ohio	3 missions correlative with Cessna.
LaRC Dr. Gregory	Cessna 402	In-situ measurements	-Ozone, heated b_{scat} (Averages & standard deviations) -Alt., Temp., Dew point	Multiple spirals at a given site averaged 10 sec.	13 correlative missions 13 correlative missions	Vertical averaging in 150 m layers. Continuous profile.
LaRC Mr. Youngbluth	"Red Guppy" tethered balloon ($\sim 4m^3$)		Dry/wet T Altitude WS/WD Ozone	30 sec. sampling	200 hours of operation: 81 ascents & 81 descents	At Croton, OH, $Z \leq 900$ m.

TABLE I

(continued)

NASA Center/Contractor	Platform	Sensor(s)	Parameters	Averaging	Data Quantity	Comments
LaRC Mr. Youngbluth	"Great White" tethered balloon (100 m^3)		As for "Red Guppy"	5 sec. sampling	112 profiles	At Aberdeen, MD. Aerosol data may be archived later. $Z \leq 1500$ m.
JPL Dr. Gary	MARS	Microwave sounder	Vertical temp. profiles; Precipitable water vapor.	11 data pts. in each T profile	Sounding every 10 mins. during operation on 5 days	$Z \leq 2.31$ km for T.
U. of Miami Dr. Prospero	8 north-eastern U.S. sites incl. Croton, OH	Photometer/ Transmis-someter	4 channel data		Most every non-cloudy day	At 8 sites incl. Croton, OH
Goddard Space Flight Center (GSFC) Dr. Fraser			8 channel data			At 1 site (Aberdeen).

ozone data were accumulated (representing an average operating time of 75 percent during the missions). Table II summarizes the UV-DIAL missions flown and indicates the amount of data collected during each mission. Reference 2 gives a summary of each flight and reference 4 contains a more comprehensive description of the UV-DIAL operation during the PEPE/NEROS project and the data products produced from the project.

The lidar aerosol backscatter data has a vertical resolution of 15 m and a horizontal resolution of about 100 m (the resolution is derived from a laser repetition rate of 1 Hz and a nominal aircraft speed of 150 m/s). The near-field lidar return (range < 750 m) is not recorded due to difficulties in its interpretation. Depending upon the aircraft altitude, the altitude range for the lidar data was from 2400 to 4600 meters above ground level (mAGL) to the ground. Figure 2 shows an example of the aerosol data obtained by the UV-DIAL as the Electra was flown from Virginia to the Chesapeake Bay on July 24, 1980 at about 1500 EDT. This depiction is a composite of 600 laser shots; the brightness of the display is directly proportional to the strength of the aerosol backscattering (the bright line at the bottom is the ground). The difference between the aerosol distribution (and hence,structure) within and above the boundary layer over a land and a water regime are particularly evident. Optically thick clouds are present on the left side of the figure. The difference in the height of the mixed layer over the land and water is due to the difference in surface heat flux over land and water. Aerosols from the higher mixed layer over the land appear to have been advected into a stable layer over the water.

An example of the type of ozone data which were obtained during the PEPE/NEROS field program using the UV-DIAL system is shown in Figure 3. This profile consists of an average of 300 lidar measurements taken from an aircraft altitude of 3200 m. For comparison, a correlative in situ O_3 measurement taken at approximately the same time and location is also shown. From the figure it is clear that there is excellent agreement between the ozone DIAL measurements and the in situ measurements, both in the free troposphere and in the boundary layer. The horizontal bars on the lidar data represent the standard deviation for the 300 shot average ozone profile. Possible systematic errors are not included in those uncertainties. The horizontal bars for the in situ data are derived by grouping the data into 150 m altitude increments and calculating the average ozone concentration and standard deviation of ozone at each layer. This procedure explains the relatively large uncertainty at 1500 m in Figure 3.

The ozone data from the UV-DIAL returns for all missions are generally an average of 300 ozone profiles using a standard 210 m vertical resolution. The horizontal resolution of the reduced data is 6-9 km, depending upon the aircraft speed. The ozone profiles span an altitude range of typically 1.5 km, chosen to contain the top of the mixed layer when possible. Therefore, ozone profiles generally contain information about the ozone concentrations directly above and inside the mixed layer. Typical uncertainties of the UV-DIAL ozone measurements are $\pm$ 10 ppbv. The inclusion of information about the measured aerosol distribution and the wavelength dependence for aerosol scattering in the UV-DIAL ozone analysis allowed for the removal of systematic

TABLE II - SUMMARY OF UV DIAL PEPE/NEROS MISSIONS

			TOTAL HOURS OF UV DIAL OPERATION	
FLT DATE	FLT HRS(EDT)	FLT PATH	AEROSOL	OZONE
7-18-80	1019-1433	WAL-DAY-LEX-WAL	3 (100%)*	3 (100%)
7-24-80	1030-1523	WAL-PIT-LOU-WAL	3 1/4 (100%)	3 1/4 (100%)
7-25-80	0933-1410	WAL-WHE-MAN-CIN-WAL	3 1/4 (100%)	3 1/4 (100%)
7-31-80	1159-1613	WAL-ALEX-ATL-HART-NY-WAL	3 (100%)	3 (100%)
7-31-80	2122-0115	WAL-GORD-ROCH-ALB-WAL	2 3/4 (100%)	2 3/4 (100%)
8-02-80	0700-1211	WAL-WIL-OLD-CHAR-JAX-WIN-LARC	4 1/4 (100%)	2 1/2 (60%)
8-05-80	0925-1403	WAL-WIL-CHAR-HAR-NY-WAL	3 1/2 (100%)	1/2 (15%)
8-07-80	1716-2220	WAL-HAR-ALEX-PIT-WAL	3 3/4 (100%)	3 3/4 (100%)
8-09-80	0510-1120	WAL-CHAT-LEX-WAL	3 1/2 (100%)	- (0%)
8-10-80	0530-1050	WAL-MEMP-NASH-WAL	3 (100%)	3 (100%)
8-12-80	0610-1205	WAL-ATL-ACUT-TUN-NY-HAR-RICH-WASH-NOR-WAL	2 1/2 (100%)	2 1/2 (100%)
8-13-80	1056-1429	WAL-CIN-DAY-WHEL-MAN-WHEL-COL	2 3/4 (100%)	2 3/4 (100%)
8-13-80	1513-1840	COL-DAY-WHEL-FTWAY-COL	2 1/4 (100%)	1 1/2 (70%)
8-13-80	2105-2455	COL-ROD-PKB-COL-WAL	1 3/4 (100%)	1/4 (10%)
TOTALS	65 hrs/14 MISSIONS		42 1/2 (100%)	32 (75%)

*Percent of nominal mission data that was collected

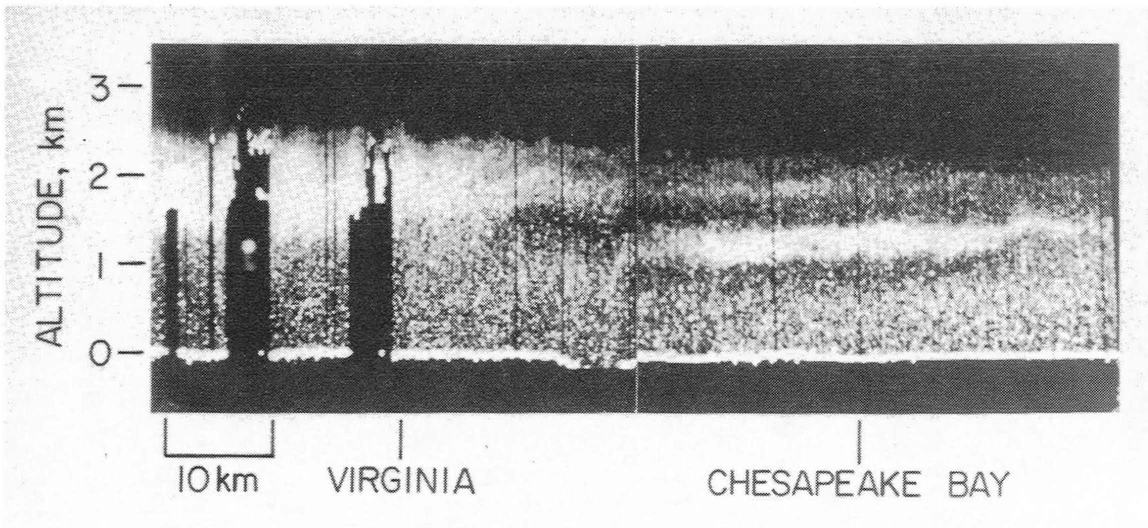


Figure 2. - Two-dimensional aerosol backscatter depiction obtained using the UV-DIAL system on July 24, 1980 at about 1500 EDT over Virginia and the Chesapeake Bay.

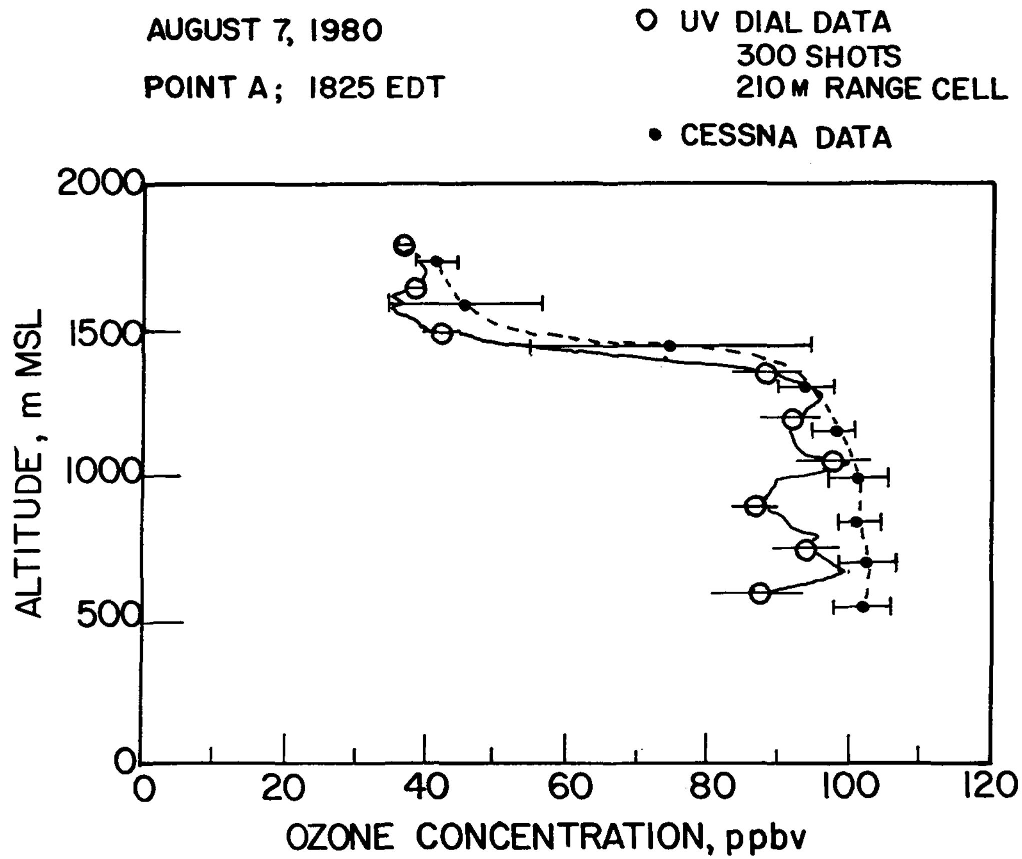


Figure 3. - Ozone profile obtained by the UV-DIAL system and compared with in situ measurements. Point A is located at 39°59'N latitude and 75°27'W longitude.

ozone concentration errors which could be as much as ± 20 ppbv in cases of large vertical gradients in the aerosol backscatter profiles. It is expected that all of the ozone data for selected missions will be in the archive by mid-1982.

An important aspect of the UV-DIAL measurement program was the occasional intercomparison between the UV-DIAL Cessna and in situ profiles of aerosol scattering, temperature, and ozone concentrations. The ten such intercomparisons imparted an increased understanding of and confidence in the remotely sensed data. The in situ data have also been archived and are described briefly in a later section of this report.

Mixing height data (averaged over about 1 minute) with an estimated accuracy of ± 50 m above ground level (AGL) were obtained for aerosol profiles. These mixing height data were tabulated at 5 minute intervals along the flight paths. Mixing heights were given in units of meters above ground level and meters above mean sea level (mMSL). Terrain elevations (mMSL) were obtained from average terrain altitudes shown on sectional aeronautical charts (that were used to analyze the Electra flight patterns). In regions of mountainous or uneven terrain, the terrain altitude estimates are less certain and are so noted in the archived mixing height data. A comparison between the UV-DIAL mixing height (depth measurements) and the in situ-derived values is given in Table III along with mean aerosol layer heights obtained by the HSRL. The mean absolute difference for nine mixing height comparisons was 7 percent while the maximum difference was 21 percent. It should be noted that the Cessna data represent point measurements and the natural horizontal variability in the mixed height can account for most of the differences between the two measurements. Further, in many cases the lidar data actually provide a more accurate determination of the top of the mixed layer because the remnants of the mixing process are directly "seen" by the lidar.

A report containing aerosol displays similar to Figure 2 is being prepared. All 1 Hz aerosol data is included in reference 4. Each display contains 5 minutes of aerosol data. Ozone profiles corrected for aerosol scattering errors are also included for selected Electra missions. Computer tapes of 1 Hz aerosol data and the 300 shot ozone profiles will also be made available. Drs. Edward Browell and Scott Shipley (LaRC) are the investigators responsible for the UV-DIAL data set. Sample mixing height data are described in Appendix A of this report.

The UV-DIAL data set will be useful for characterizing the air quality of the regional scale air masses encountered during the PEPE/NEROS experiment and should be useful in studying the synoptic-scale ozone production and transport. Inhomogeneities in both the horizontal and vertical ozone and aerosol distributions can be examined with the data— important information for initializing and validating air quality models. Because backscattering from aerosols was measured simultaneously at three wavelengths, the UV-DIAL and HSRL data sets will also be useful for studying wavelength dependent aerosol properties in the boundary layer.

TABLE III - INTERCOMPARISON OF MEAN AEROSOL LAYER HEIGHTS MEASURED BY THE HSRL WITH THE MIXED HEIGHTS MEASURED BY THE UV-DIAL AND IN SITU PLATFORMS

Date	Time (EDT)	UV-DIAL Mixed Height (mMSL)	In Situ Mixed Height (mMSL)	HSRL Mean Aerosol Layer Height (mMSL)
7/24/80	1355	1690 ± 300[1]	1400[2]	----
			2500[3]	
7/25/80	1112	1514 ± 100	1750	----
	1245	1429 ± 150	1350[3]	----
		1969 ± 150[4]	1915	
7/31/80	1355	1538 ± 120	1500	1832 ± 54
8/07/80	1830	1574 ± 30	1500	----
8/12/80	1130	700 ± 150	2100[5]	760 ± 15
			3000[5]	
8/13/80	1250	2074 ± 150	2000	2202 ± 63
	1620	2527 ± 80	2150	----

[1] Maximum altitude of observation below strong inversion

[2] Weak inversion

[3] Strong inversion

[4] Higher (elevated) layer

[5] No data recorded below 1500 mMSL

HIGH SPECTRAL RESOLUTION LIDAR (HSRL)

The HSRL system was developed by researchers at the University of Wisconsin under NASA contract for the remote measurement of optical properties of the atmosphere. The extinction cross-section, aerosol-to-molecular backscatter ratio and the backscatter-to-extinction ratio are measured without assumptions regarding aerosol scattering characteristics. The HSRL is both eyesafe and capable of daylight operation at a wavelength of 467.8 nm. It has been operated both on the Electra aircraft and on the ground.

The HSRL measurements are useful because the high spectral resolution of its two-channel receiver system permits distinction between backscatter from aerosols and backscatter from molecules. Since the HSRL is a lidar instrument, optical depth profiles (or visibility profiles) and estimates of the heights of aerosol layers were obtained with a vertical resolution and accuracy similar to that for the UV-DIAL instrument. Details of the HSRL instrument and the derivation of parameters from its measurements are given in reference 5.

During PEPE/NEROS, 11 Electra data flights were conducted with the HSRL on board, and approximately 18.5 hours of data were recorded, 7 hours of which were simultaneous with the UV-DIAL data. Times of the HSRL operation are given in Table IV.

The HSRL data have been displayed in a format similar to Figure 2. Aerosol layer heights (AGL) were tabulated from those pictures and they have been included in the archive. Tabulations of the profiles of the aerosol optical properties will be submitted to the archive at a later date. The aerosol layer heights that were submitted to the archive were obtained at two minute intervals and are generally accurate to within 150 m.

A preliminary sample of the expected aerosol profile data is given in Figure 4. Height profiles of molecular and aerosol backscatter cross sections obtained with the HSRL on August 7, 1980 are shown. In Figure 4a the triangles represent the known molecular backscatter cross section for a summer, midlatitude atmospheric model. The squares show the measured molecular return normalized to the model at an altitude of 2.2 km. The atmospheric extinction is obtained directly from the difference between the two molecular profiles with increasing range from the aircraft. The squares in Figure 4b show the measured aerosol return before correction for the atmospheric extinction; the triangles give the aerosol backscatter cross section corrected for the two-way extinction obtained from the molecular profiles in Figure 4a.

From the data such as those in Figure 4, the total volume extinction cross section (aerosol and molecular), β , can be determined as a function of altitude. Occasionally, it was possible to compare the HSRL β-profile with the β_{scat} profiles obtained with the integrating nephelometer on the Cessna aircraft. A preliminary intercomparison between the HSRL volume extinction cross section derived from the data in Figure 4 and the in situ β_{scat} profile is shown in Figure 5. Although the comparison is excellent, no error bar has been placed on the HSRL values because several sources of uncertainty are still being quantified. Because the nephelometer intake tube

TABLE IV - SUMMARY OF HSRL MISSIONS

FLT DATE	FLT HOURS(EDT)	FLT PATH	HOURS OF HSRL OPERATION
7/24/80	1030-1523	WAL-PIT-LOU-WAL	1202-1242
7/25/80	0933-1410	WAL-WHE-MAN-CIN-WAL	1332-1356
7/31/80	1159-1613	WAL-ALEX-ATL-HART-NY-WAL	1352-1610
7/31/80	2122-0115	WAL-GORD-ROCH-ALB-WAL	2226-0106
8/2/80	0700-1211	WAL-WIL-OLD-CHAR-JAX-WIN-WAL	0902-0918
8/5/80	0925-1403	WAL-WIL-CHAR-HAR-NY-WAL	1050-1238
8/7/80	1716-2220	WAL-HAR-ALEX-PIT-WAL	1838-2110
8/9/80	0510-1120	WAL-CHAT-LEX-WAL	0712-1040
8/12/80	0610-1205	WAL-ATL-ACUT-TUN-NY-HAR-RICH-WASH-NOR-WAL	1034-1143
8/13/80	1056-1429	WAL-CIN-DAY-WHEL-MAN-WHEL-COL	1210-1416
8/13/80	2105-2455	COL-ROD-PKB-COL-WAL	2216-2346

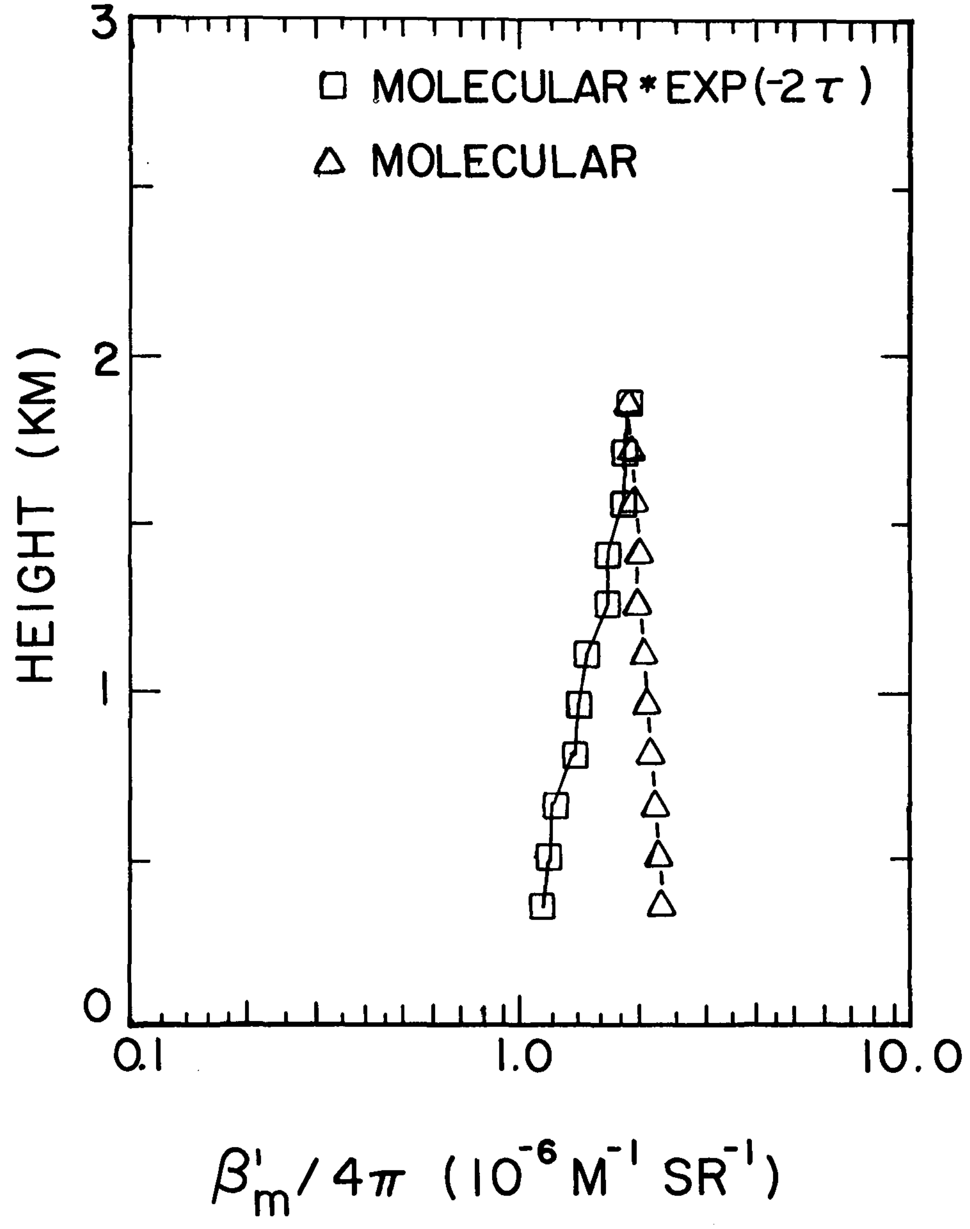
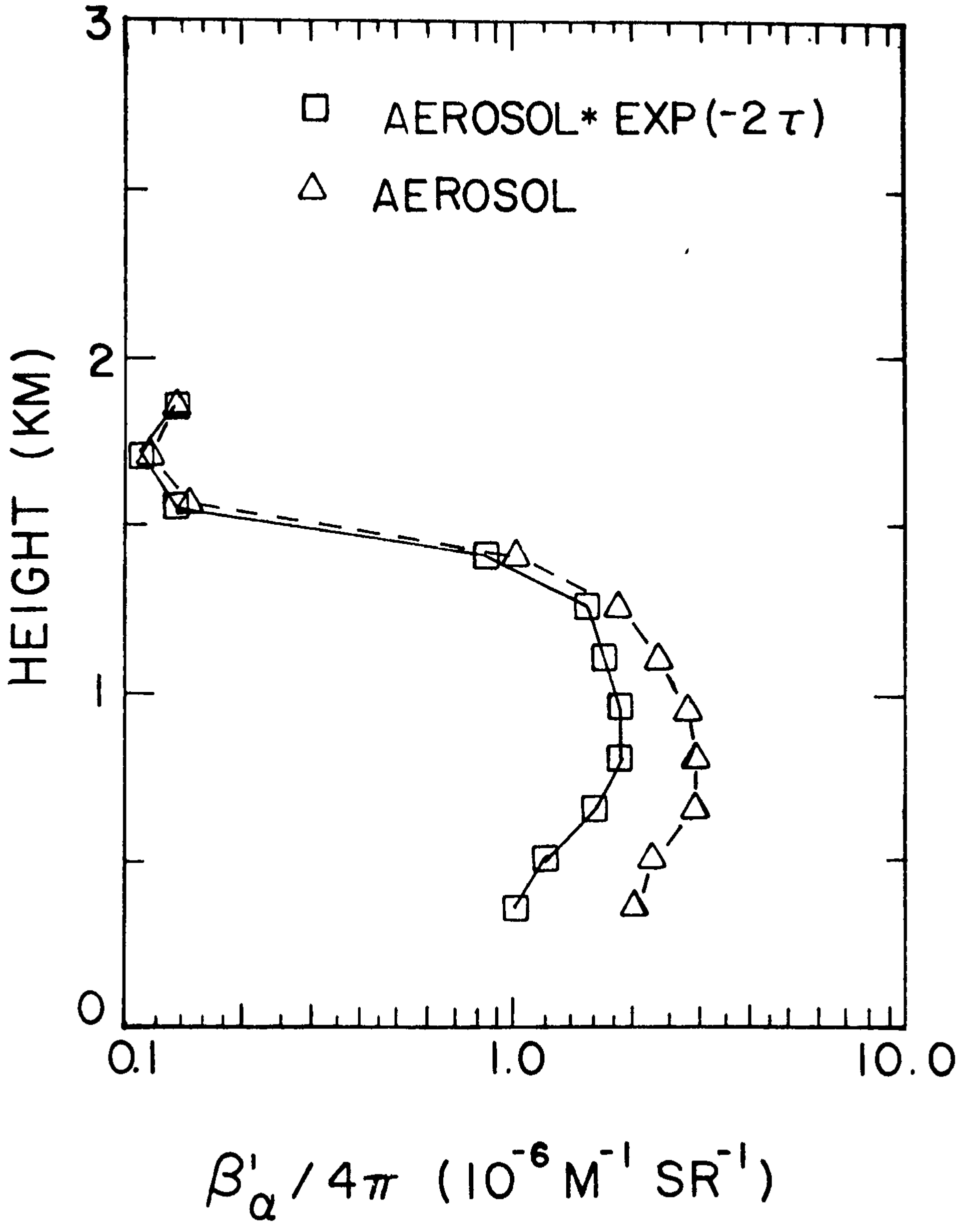


Figure 4(a)

Figure 4. - Height profiles of molecular and aerosol backscatter cross sections obtained with the HSRL between 1838 and 1851 EDT on August 7, 1980. (a) The triangles are the calculated molecular profile and the squares are the measured molecular return. (b) The triangles show the measured aerosol return corrected for attenuation and the squares show the measured aerosol return.



3
2
1
0
HEIGHT (KM)
AEROSOL* EXP(-2 τ)
AEROSOL
0.1
1.0
10.0
β'α / 4π (10^-6 M^-1 SR^-1)

Figure 4(b)

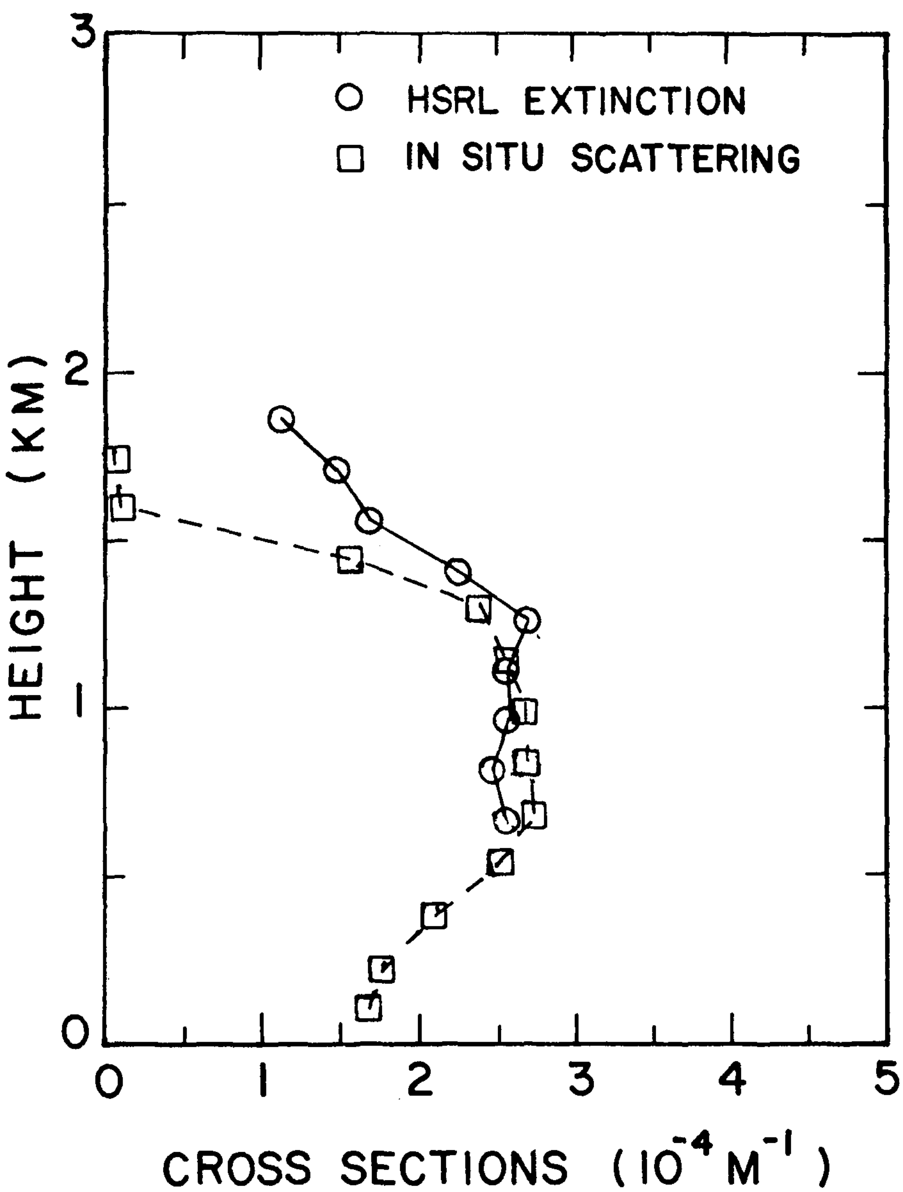


Figure 5. - Comparison of HSRL and nephelometer values of aerosol extinction.

was heated, the evaporation of mass from potentially water bearing aerosols must be accounted for. Such effects must be kept in mind when interpreting the accuracy of the HSRL data by this kind of intercomparison. The HSRL aerosol extinction profile can also be integrated to obtain an estimate of column turbidity (at 467.8 nm) beneath the (airborne) HSRL. Such turbidities can be compared with turbidity estimates from the ground-based photometer network.

Estimates of the mixing heights obtained from the HSRL and UV-DIAL data sets were intercompared to determine the consistency of the data analysis methods as well as their agreement with the mixing heights derived from the Cessna data. The results of several intercomparisons are summarized in Table III and, in general, they are within the uncertainties of the measurements.

Dr. Edwin Eloranta (University of Wisconsin) is the investigator responsible for the HSRL data set. Sample aerosol layer data are described in Appendix B to this report. The HSRL data set should yield new information on the large-scale properties of the aerosols during the PEPE experiment. When combined with data from additional airborne instruments, the HSRL data may also provide information on the physical and chemical processes of aerosol formation and growth. The aerosol extinction profiles will be useful for judging the contribution of elevated haze layers to the radiance levels from hazy air masses observed with satellite imagery. When HSRL backscatter data is combined with aerosol backscatter from the multiwavelength UV-DIAL instrument, it should also be possible to extract information on the wavelength dependence of aerosol scattering in the visible wavelength region.

LASER ABSORPTION SPECTROMETER (LAS)

The Laser Absorption Spectrometer was used to obtain remote measurements of column ozone between an airborne platform and the Earth's surface (ref. 6). The JPL Queen Air aircraft, which carried the LAS, was operated in and around Columbus, Ohio and flew at an altitude of about 1 km. The LAS was operated, when weather permitted, from July 11 to July 23, and a total of 13 hours of data were gathered (see Table V). Six separate missions were flown resulting in O_3 data over 9 horizontal traverses. Reference 2 gives a summary of each flight.

The LAS contains two carbon dioxide (CO_2) lasers in the 9.5 μm spectral region— one centered on a strong absorption line of O_3 and the other in a region of reduced absorption. Ozone column content is determined using Beer's Law for an absorbing medium and by considering the ratio of the laser power backscattered from the ground at the two wavelengths. The two return signals are measured using heterodyne detection techniques. The ozone column amount was obtained from the LAS data with an uncertainty of up to $\pm$ 25 ppb-km and with a horizontal resolution of about 1 km. The majority of the uncertainty is from differential backscatter from the ground at the two wavelengths rather than from instrument considerations. Studies are currently underway

TABLE V - OPERATING TIMES FOR LASER ABSORPTION SPECTROMETER

DATE	TIME OF OPERATION (EDT)
7/11/80	1015-1145
7/14/80	0930-1230
	1400-1600
7/15/80	1015-1145
7/18/80	1230-1400
7/18/80	1420-1500
7/20/80	0900-1100
7/20/80	1320-1350
7/23/80	1420-1440

to determine whether the backscatter uncertainty can be reduced by selecting a different wavelength pair. The data submitted to the archive represent one-hour average ozone concentrations obtained by averaging O_3 from several successive traverses along a single leg of the flight path. Each traverse was on the order of 15-30 km in length. Measured ozone burdens varied from 36 ppbv-km on the morning of July 23 to 113 ppbv-km on the afternoon of July 20. The LAS did not operate during cloudy conditions.

Because the LAS data contain several sources of uncertainty, efforts were made to characterize the ozone profile in the boundary layer and to compare the profiles with the in situ data. Such data comparisons were conducted on July 11, 14, and 15. The in situ data from the Cessna 402 were archived for those dates and they are discussed in a later section. Table VI summarizes each flight leg of the three comparison flights. The $\pm\sigma$ values for the LAS represent the variations in total column ozone along the flight leg. Because the σ-values are approximately equal to the absolute uncertainty in the LAS measurements, the LAS fluctuations may not be indicative of changes in atmospheric O_3. The in situ O_3, on the other hand, is accurate to 10 percent, and the uncertainty in the integrated in situ O_3 may be even less. The Cessna data indicate that atmospheric horizontal variations in column ozone along the given flight legs were actually less than 10 percent. Prior to the start of the PEPE/NEROS experiments, the mission of the LAS was to help define the urban ozone plume from Columbus, Ohio. Qualitatively this goal was met, but the associated data uncertainties cause the LAS O_3 results to be of limited value for more detailed studies. An understanding of the sensor capabilities has been improved significantly by the LAS participation in this field study. A description of the data set submitted to the PEPE/NEROS data archive is found in Appendix C. A detailed summary of the LAS performance is available (ref. 7); Drs. Michael S. Shumate and William B. Grant of JPL are the individuals responsible for the data.

AIRBORNE IN SITU MEASUREMENTS

A Cessna 402 aircraft was chartered and outfitted by personnel at NASA LaRC for in situ air quality measurements. The primary aircraft measurements were O_3 (chemiluminescent technique), β_{scat} (heated nephelometer), T (resistance probe), dewpoint T_{dp} (cooled mirror technique), and flight parameters such as altitude, heading, airspeed, and time. All instrumentation was calibrated using approved EPA and National Bureau of Standards (NBS) procedures. The ozone and β_{scat} instruments were audited on July 12, were within acceptable limits, and were generally accurate to with 10 percent (absolute based on calibration) with a repeatability of 2 to 3 percent.

Data were archived from missions flown on July 11, 14 and 15 in support of the LAS activity (3 missions) and from missions on July 24 to August 13 for comparisons with UV-DIAL and HSRL data (10 missions) (see Table I). A total of 20 hours of sampling was conducted (see Table VII), 4 hours in conjunction with the LAS and 16 hours with the UV-DIAL and HSRL sensors. Data were obtained along short flight legs (20 to 40 km) or at fixed locations (vertical spiral data) and at altitudes ranging from 150 m to 2500 m. To perform comparisons, missions were flown coincident in both time and location with the

TABLE VI COMPARISON OF LAS WITH IN SITU OZONE CONCENTRATIONS

DATE	LAS $\bar{O}_3 \pm \sigma$, ppbv	IN SITU $\bar{O}_3 \pm \sigma$, ppbv
July 11	69 ± 18	77 ± 5
July 14	74 ± 16	83 ± 5
July 15	67 ± 21	63 ± 5

TABLE VII - FLIGHT DATA FOR NASA CESSNA 402 IN SITU MEASUREMENT FLIGHTS

DATE	DATA LOCATION, VOR RADIAL/KM	DATA TIME (EDT)	CORRELATION TYPE	REMOTE SENSOR PARTICIPATING IN COORELATION
July 11	York VOR 360/123.3 York VOR 360/103.7	1040 to 1200	30-km flight leg	LAS
July 14	Appleton 270/74.0 Appleton 270/88.8	1440 to 1540	15-km flight leg	LAS
July 15	Appleton 240/72.2 Appleton 240/94.4	0950 to 1030	22-km flight leg	LAS
July 23	Appleton 267/74.0 Appleton 267/37.0	1020 to 1110	37-km flight leg	LAS
July 24	Newcomb 0/0 Henderson 90/ 3.7	1200 to 1400	Point (2)	UV DIAL + HSRL
July 25	Mansfield 101/38.8 Henderson 90/3.7	1120 to 1310	Point (2)	UV DIAL + HSRL
July 31	Kenton 270/61.1 Kenton 292/14.8	1320 to 1430	26-km flight leg	UV DIAL + HSRL
July 31	Harcum 103/27.7 Harcum 296/27.7	2100 to 2210	28-km flight leg	UV DIAL + HSRL
Aug. 2	Franklin 260/33.3 Franklin 80/25.9	1200 to 1320	33-km flight leg	UV DIAL + HSRL
Aug. 5	Franklin 197/57.4 Franklin 197/14.8	0930 to 1110	43-km flight leg	UV DIAL + HSRL

TABLE VII

(continued)

DATE	DATA LOCATION, VOR RADIAL/KM	DATA TIME (EDT)	CORRELATION TYPE	REMOTE SENSOR PARTICIPATING IN CORRELATION
Aug. 6	Franklin 280/7.4 Franklin 280/62.9	1240 to 1400	55-km flight leg	UV DIAL + HSRL (Flight canceled)
Aug. 7	Snow Hill 170/7.4 Snow Hill 350/29.6	1740 to 1850	37-km flight leg	UV DIAL + HSRL
Aug. 9	Cape Chas. 40/38.8	1030 to 1100	Point	UV DIAL + HSRL
Aug. 12	Coefield 52/18.5 Coefield 232/18.5	1030 to 1220	37-km flight leg	UV DIAL + HSRL
Aug. 13	Rosewood 203/7.4 Rosewood 203/37.0	1210 to 1330	27-km flight leg	UV DIAL + HSRL
Aug. 13	Rosewood 137/124.0 Rosewood 137/87.0	1620 to 1700	37-km flight leg	UV DIAL + HSRL

Electra and Queen Air missions. Repeated traverses of flight legs were performed with altitude spirals at various locations along a flight leg. Details of the correlative missions with the UV-DIAL/HSRL appear in reference 8 and with the LAS in reference 9.

An example of data obtained during an aircraft spiral is shown in Figure 6 for August 7, 1980, near Snow Hill, Maryland at about 1800 hours local time. A sharp temperature inversion marks the top of the mixed layer at about 1500 m. Above this level β_{scat}, O_3 and T_{dp} decreased rapidly. Within the mixed layer all three parameters were fairly uniform. The time response of the instruments was adequate for resolving small-scale features in the data. When repeated horizontal traverses and/or vertical spirals at the endpoints and midpoint of a traverse yielded similar measurements, it was assumed that data measured along the traverse was fairly uniform. Mean values and standard deviations of ozone and β_{scat} spiral measurements were obtained over altitude increments of 150 m. Archived data for temperature and dew point were obtained from a single spiral and were averaged over smaller altitude increments so that the mixing layer height could be accurately determined.

Separate data sets were generated for the correlative experiments with the LAS and UV-DIAL/HSRL. An assessment of the quality of the UV-DIAL and HSRL data from comparisons with the airborne in situ data is given in references 4 and 5, and a comparison of the UV-DIAL with the in situ ozone data for August 7 (during the field study) is shown in Figure 3. The β_{scat} profile for August 7 is used in Figure 5. Comparisons of the LAS with the in situ ozone data obtained just prior to the PEPE/NEROS study (see Table VI) gave ozone values that were within 13 percent (ref. 9).

Sample data sets for the in situ missions on July 14 and July 31 are given in Appendix D. Dr. Gerald Gregory and Mr. David McDougal of NASA Langley are the investigators responsible for the airborne in situ data.

TETHERED BALLOON SYSTEMS

Researchers at NASA Langley operated two tethered balloon systems during PEPE/NEROS. A small "red guppy" system was located at Croton, northeast of Columbus, Ohio (40°12'N; 82°42'W), and it carried instruments to measure wet bulb and air temperature, wind speed and direction, and ozone concentrations. A much larger "great White" balloon system was located at Aberdeen Proving Ground, Maryland (39°27'N; 76°7'W). Data were obtained from both ascents and descents and also at fixed altitudes. The small balloon with a volume of 4 m^3 attained an altitude of 900 m, while the 100 m^3 large balloon was operated to a maximum altitude of 1500 m. Because of updrafts and cross-winds, the altitudes for ascents were not as uniformly spaced as those for descents; more control of the tether was gained on descent. The ascent/descent rates were approximately 30-45 m/min. for both balloons. A description of the tethered balloon system is available in reference 10, and the operations during PEPE/NEROS are described in reference 11.

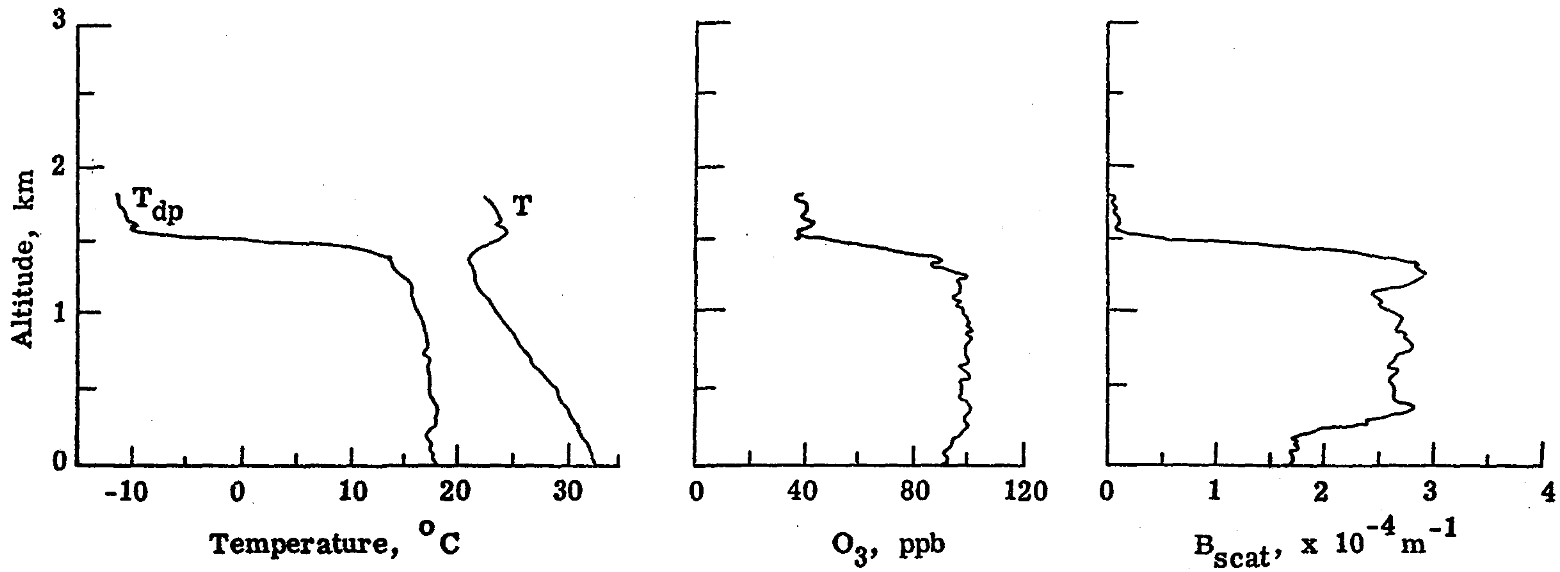
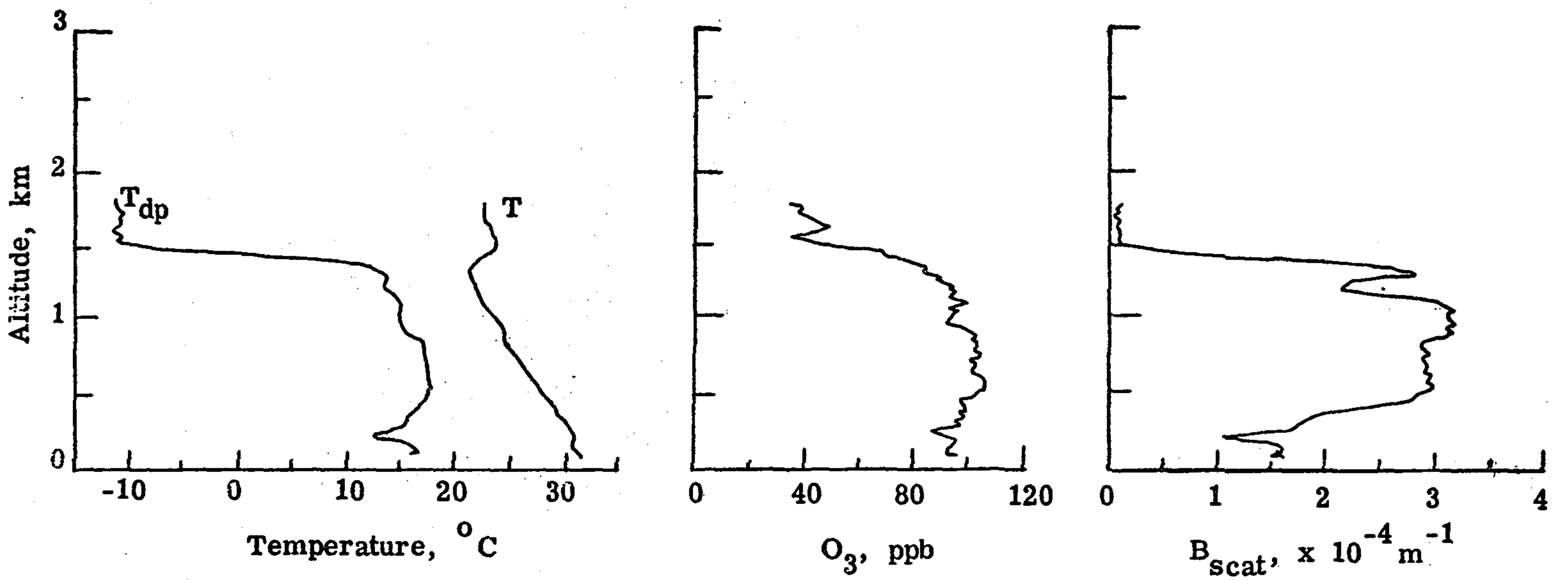


Figure 6(a)

Figure 6.- In situ aircraft spiral data obtained near Snow Hill, MD on August 7, 1980 at about 1800 EDT. (a) Descent leg A to B data. (b) Spiral data at A.



3
2
1
0
Altitude, km
T_{dp}
T
-10
0
10
20
30
Temperature, °C
0
40
80
120
O_3, ppb
0
1
2
3
4
B_{scat}, x 10^{-4} m^{-1}

Figure 6(b)

The small balloon measured profiles at Croton, Ohio from July 16 to August 9 (see Figure 1). In general, when data were acceptable on both ascent and descent, both profiles were included as a single data set. A total of 81 data sets were prepared and entered into the archive. The large balloon measured data at the Aberdeen site from July 24 to Aug. 7 - a total of 112 profiles. Because of the longer time delays between ascents and descents, ascent and descent profiles from the large balloon were entered into the archive as separate data sets.

The tethered balloon systems are useful for boundary layer studies, because they can gather several profiles of species and meteorological parameters in a relatively short period of time. Data from all sensors are measured and transmitted simultaneously with real time readout capability for assessing instrument status. Sensor characteristics are given in Table VIII; the sampling time is every 30 seconds for the small balloon and every 5 seconds for the large balloon.

Figure 7 shows a sequence of temperature and relative humidity profiles for July 21 at Croton, Ohio. Figure 8 defines the variation of O_3 and wind speed for the same date and location. Additional details about the archived data are available in Appendix E. Mr. Otto Youngbluth of NASA LaRC is the investigator responsible for the tethered balloon data.

The tethered balloon data should be particularly useful for characterizing ozone in and studying the boundary layer during transition periods. The character of the nocturnal mixed layer and the occurrence of low level nocturnal jets are evident in some of the data. Because the tethered balloons were co-located with other fixed field measurement activities, it should be possible to combine all the measurements to gain a more complete understanding of boundary layer processes. Fluxes of heat, momentum and ozone can be derived from the data sets, but care must be exercised in interpreting the results, because each entire profile was not obtained instantaneously. The tethered balloon data set should be also useful for initializing regional oxidant models.

MICROWAVE ATMOSPHERIC REMOTE SENSOR (MARS) SYSTEM

A mobile Microwave Atmospheric Remote Sensor (MARS) system from the Jet Propulsion Laboratory (JPL) was operated at the Croton, Ohio site and was co-located with the tethered balloon system and several other air-quality monitoring vans. The MARS system is a passive microwave radiometer mounted on the roof of a van and was used to infer vertical temperature profiles in the tropospheric boundary layer and zenith integrated water vapor contents. Retrieved temperature profiles possess an altitude resolution that decreases from approximately 50 m near the surface to about 1 km at an altitude of 2.3 km. The precision of temperature measurements is about 0.4 to 0.1 K, and the absolute calibration accuracy is about 1 to 2 K. The high precision of the data allow one to investigate changes in the shape of the temperature profile with time. The MARS system was operated from August 6 to 10, and

TABLE VIII - SENSOR CHARACTERISTICS OF TETHERED BALLOONS

		SENSOR CHARACTERISTICS				
MEASUREMENT	LARGE BALLOON	ACCURACY	PRECISION	SMALL BALLOON	ACCURACY	PRECISION
Air Temperature	Aspirated Thinistor	± 0.1°C	± 0.05°C	Aspirated Thermistor	± 1°C	± 0.5°C
Wet-Bulb Temperature	Wicked Thinistor	± 0.1°C	5-10% RH	Wicked Thermistor	± 1°C	5-10% RH
Ozone	Electrochemical Cell	± 10%	<± 5 ppbv	Electrochemical Cell	10%	<± 5 ppbv
Wind Speed*	Cup Anemometer	± 0.25 m/s	± 0.5 m/s	Cup Anemometer	± 1 m/s	± 0.25 m/s
Wind Direction*	Potentiometric Compass	5%	± 5°	Potentiometric Compass	5%	± 5°
Altitude	Digiquartz	± 1.5 m	± 0.5 m	Piezoelectric	± 20 m	± 8 m

*Time-shared measurements

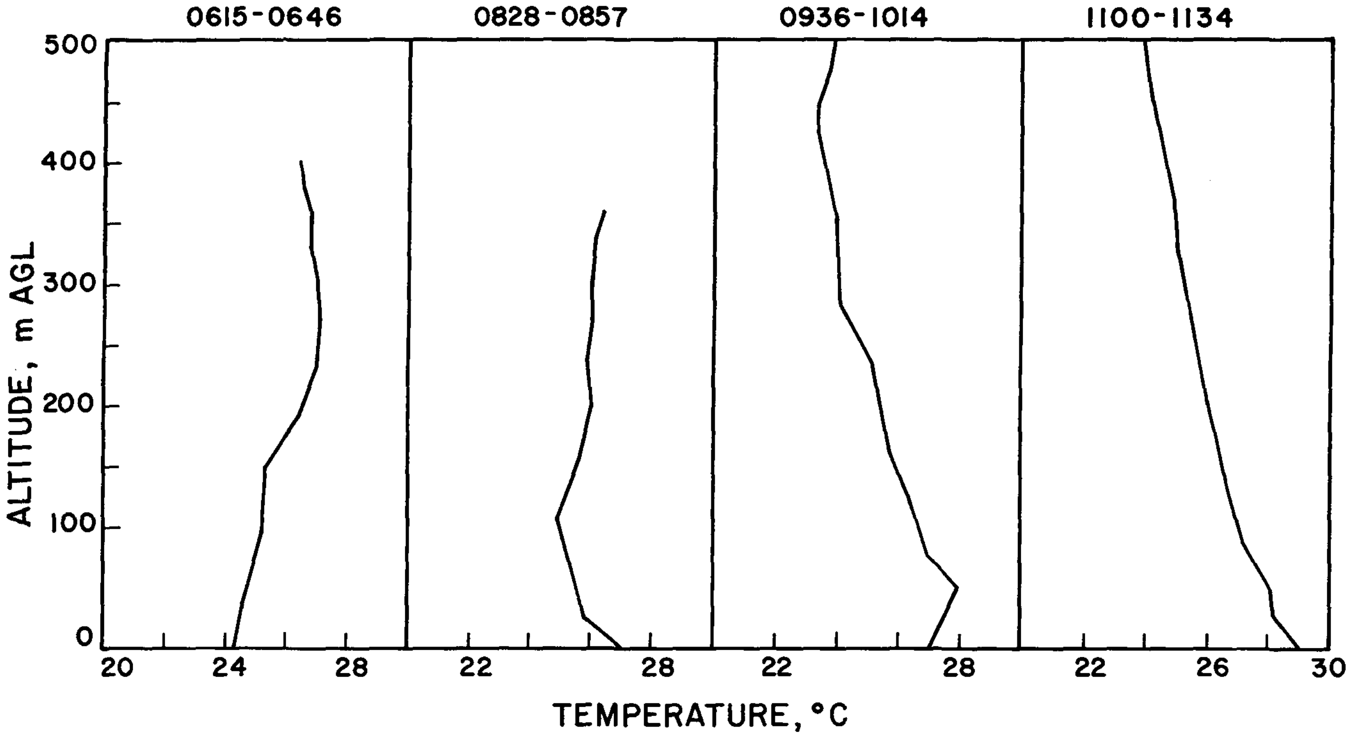


Figure 7(a)

Figure 7. - Temperature and relative humidity profiles measured by small tethered balloon on July 21, 1980. (a) Temperature. (b) Relative Humidity.

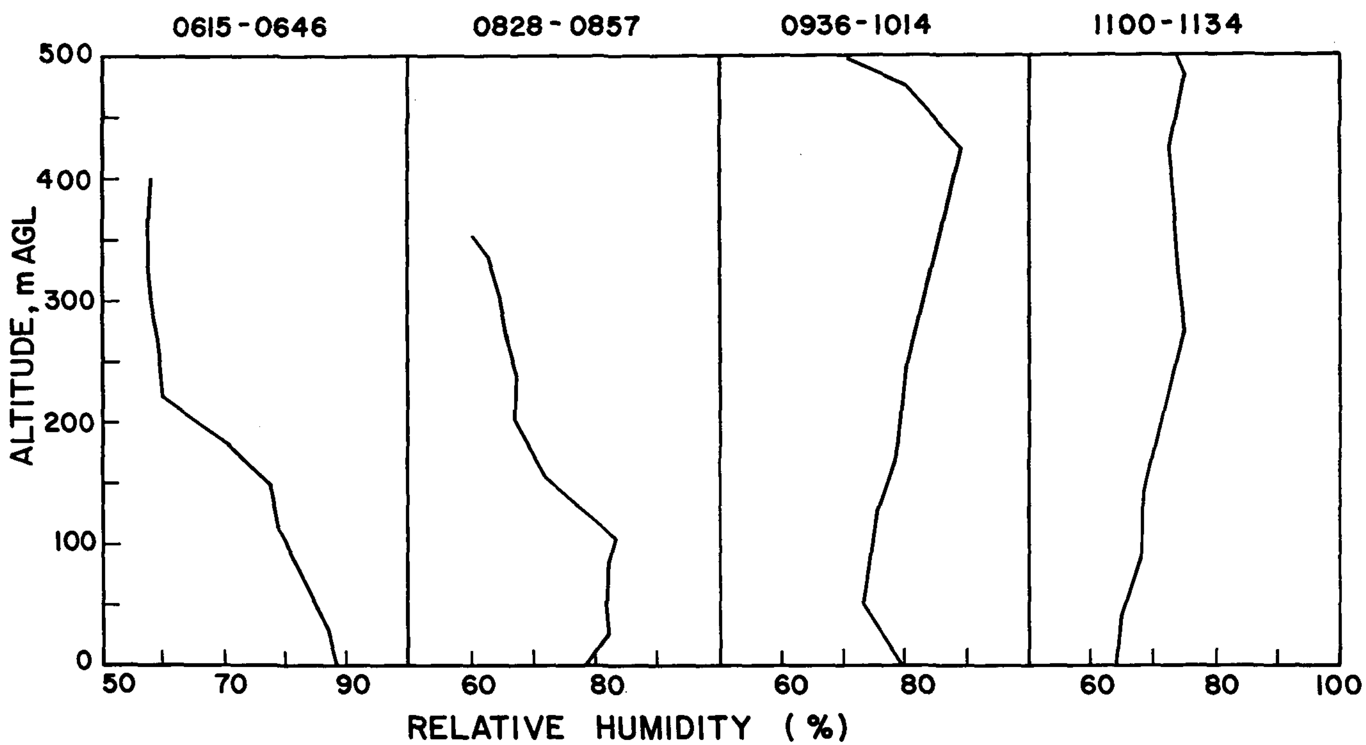

0615-0646
0828-0857
0936-1014
1100-1134
500
400
300
200
100
0
ALTITUDE, m AGL
50
70
90
60
80
60
80
60
80
100
RELATIVE HUMIDITY (%)

Figure 7(b)

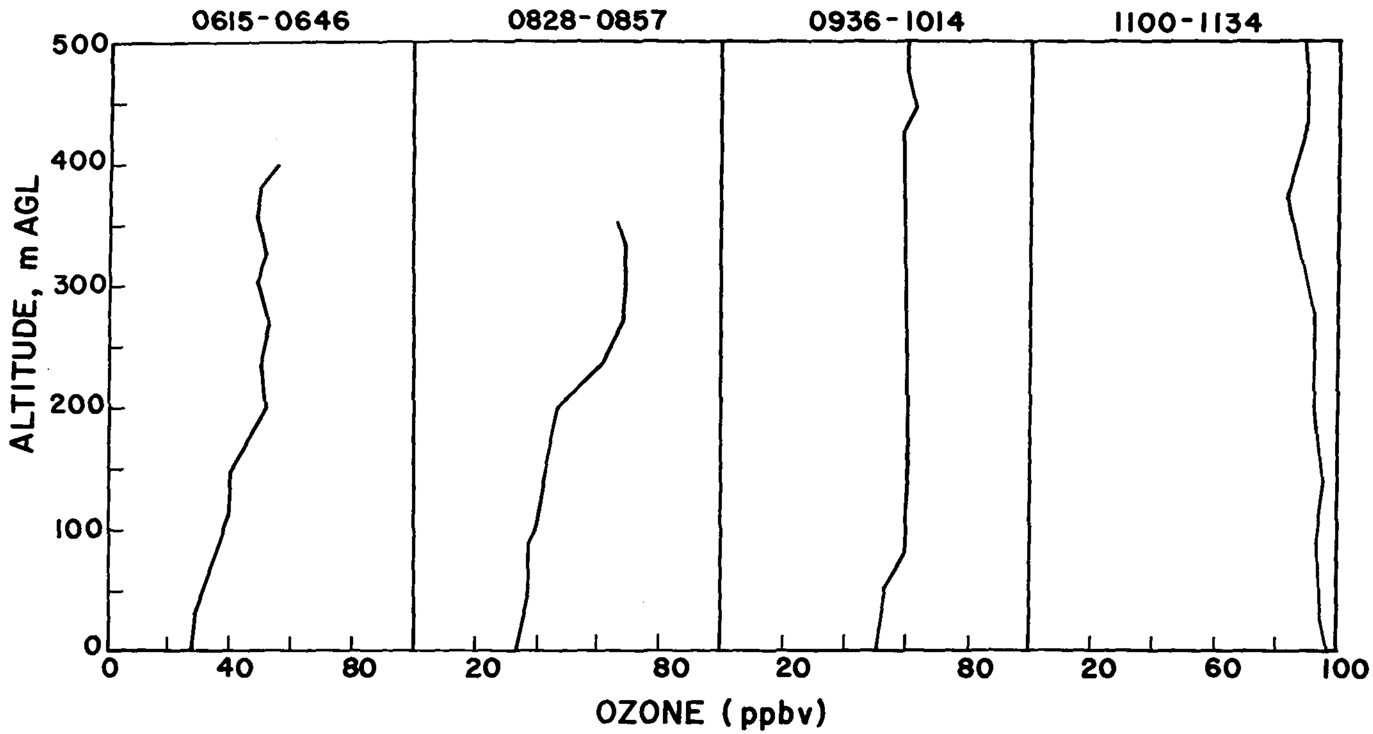


Figure 8(a)

Figure 8. - Ozone and wind speed profiles measured by small tethered balloon on July 21, 1980. (a) Ozone. (b) Wind Speed.

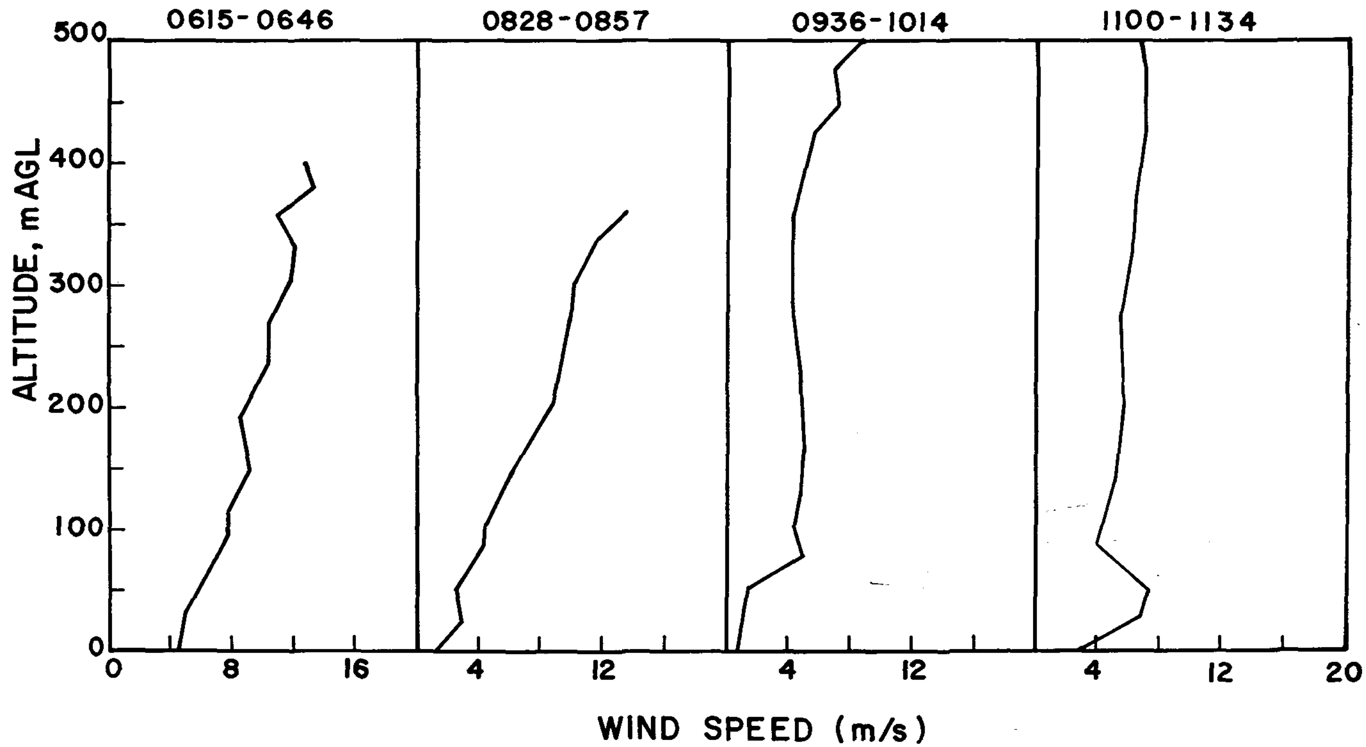

0615-0646
0828-0857
0936-1014
1100-1134
ALTITUDE, m AGL
500
400
300
200
100
0
0
8
16
4
12
4
12
4
12
20
WIND SPEED (m/s)

Figure 8(b)

data for those dates have been archived (see Appendix F). Dr. Bruce Gary of JPL gives details of his experiment in reference 12.

The MARS instrument consists of a three-channel passive microwave radiometer in a spectral region of moderate absorption due to oxygen. The sky is opaque at the three channel frequencies, and only thermal emission from oxygen molecules in the boundary layer is measured. By scanning the multi-channel radiometer through a sequence of elevation angles, a set of "brightness" temperature measurements versus angle and frequency are obtained. These data are processed with a statistical retrieval (SR) algorithm to yield 11 data points of temperature versus altitude. An elevation scan requires about 2 minutes, and a retrieved profile is reported every 10 minutes during the day. A more complete discussion of the SR technique is given in reference 13.

Figure 9 shows a comparison of a MARS-retrieved temperature profile with data obtained with the small tethered balloon system at 0915 EDT on August 7. MARS data are plotted for only those altitudes where both systems obtained data. This sounding occurred during a transition period from a stable nocturnal surface layer to an adiabatic regime. The general character of the MARS profile is a result of the good vertical resolution of the passive technique.

Two additional microwave channels were used as a "water vapor radiometer". Thermal emission due to water vapor varies significantly for the two channels, and this fact allows one to accurately convert differences in the measured emissions to water vapor amount. Measurements were made at 10 minute intervals. Data were obtained from August 6 to 10, and the precipitable water vapor during that period increased from 2.7 cm to about 5.2 cm. The accuracy of these data is of the order of 15 percent (reference 12).

The MARS system provided fairly continuous data on the temperature profile for August 6, 7, 9 and 10. From such data a boundary layer transition and the existence of an elevated inversion were observed. The increase in precipitable water from August 6 to 10 culminated with the occurrence of a severe line of thunderstorms on August 10. Although the archived MARS data sets do not display any new or unusual features, such data and the comparisons with the concurrent tethered balloon profiles yield added confidence in the utility of such a sensor in field studies. The development of refined temperature algorithms is proceeding and it may be possible to retrieve more structure from the profile data with the refined algorithms.

4- and 8-Channel Photometers

Twelve Volz 4-channel sunphotometers, positioned in eight locations during the PEPE/NEROS program, were used to measure solar radiation that was attenuated in four spectral regions by molecules and aerosols from the ground to the top of the atmosphere (see Figure 10). The spectral regions were centered around 380 nm (blue channel), 500 nm (green channel), 875 nm (red channel) and 945 nm (in a water vapor absorption band). Two photometers

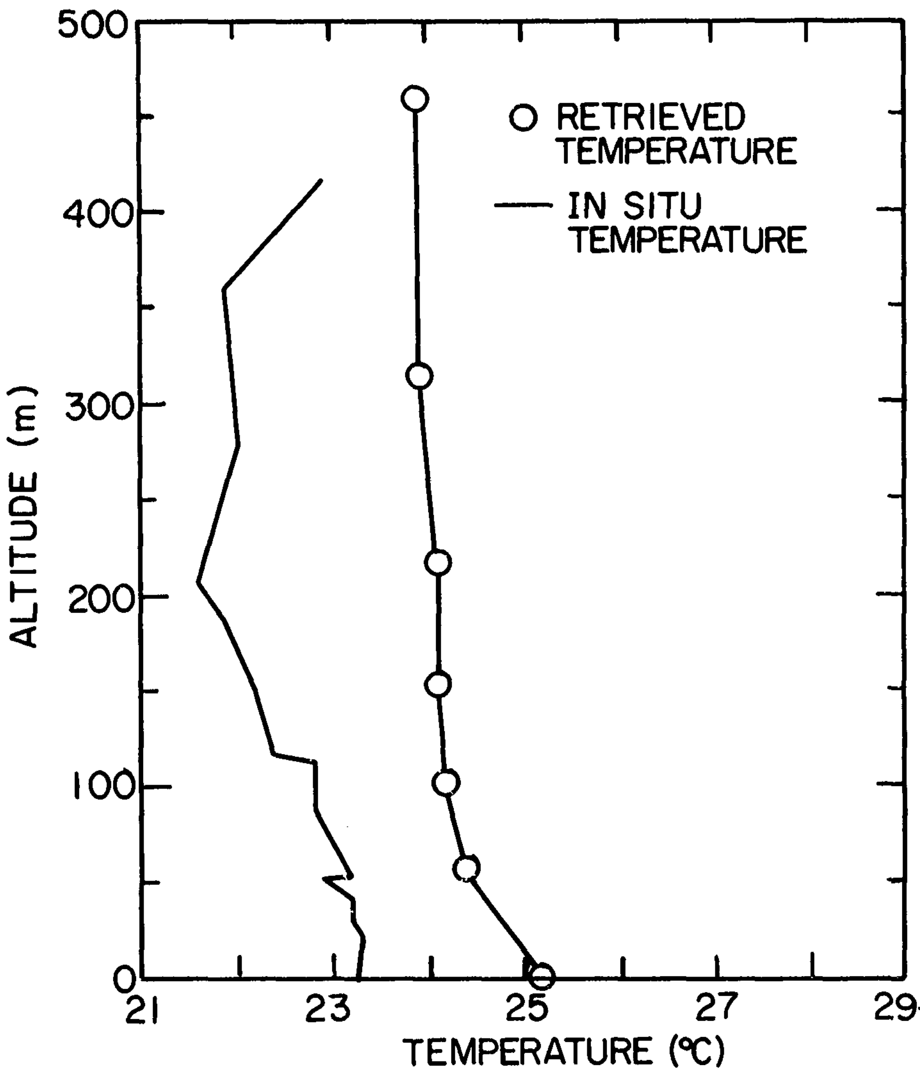


Figure 9. - Comparison of MARS-retrieved temperature profile with small tethered balloon at 0915 EDT on August 7, 1980.

were located in Woods Hole, MA, four in Columbus, OH, and the remaining ones were used to gather data in various locations (although not every day in every location, often due to cloudy conditons) from Albany, NY to Miami, FL and from July 13 to September 1, 1980. At Woods Hole the photometer used in July was replaced by another with differing characteristics in August. A description of each photometer and its location is given in reference 14 and in Appendix F to this report.

The archived sunphotometer readings I_{corr} have already been corrected for deviations of the detector temperature from 25^oC and for nonlinearities in the spectral sensitivities. The detector temperatures T_d were obtained from measurements of the temperatures as a function of time for each photovoltaic cell and are a function of the circuit components of each photometer. A correction (TCF) to the measured sunphotometer readings (I_{me}) has also been applied to account for nonlinearities in the spectral sensitivities; the readings were adjusted by 0.41 percent/^oC for the blue channel, 0.10 percent for the green channel, 0.03 percent for the red channel and 0.24 percent for the "water" channel. The corrected readings were obtained by

$$I_{corr} = I_{me} + I_{me} * TCF * (25.-T_d)$$

Aerosol turbidities (TBD) for the blue, green and red channels were then calculated and later archived using

$$TBD = \frac{1}{M} \log_{10} \left(\frac{I_o}{I_{corr} *S} \right) - A_c$$

where M is the diopter reading, a measure of atmospheric air mass; I_o and its offset value give an accurate estimate of the unattenuated (or top-of-atmosphere) sunphotometer reading (see Table IX); S is the mean Sun-Earth distance correction factor; and A_c is a correction factor for molecular absorption and Rayleigh scattering (equal to 0.1954 for the blue channel, 0.0670 for the green channel and 0.0062 for the red channel). Since water vapor seriously interferes with an accurate determination of the turbidity in the "water" channel, precipitable water vapor (V_z) was calculated instead of turbidity for the water channel using

$$V_z = \frac{17.2}{M} \left\{ \log_{10} \left(\frac{q_o}{q} \right) \right\}^2$$

where q is the transmission factor in the water vapor band as referenced to the red channel where there is no water vapor absorption. The effect of aerosol extinction is eliminated. The quantity q_o is the value of q if V_z is zero; q_o is different for each sunphotometer (see Table IX).

$$q = \frac{I_{corr,\ water}}{I_{corr,\ red}}$$

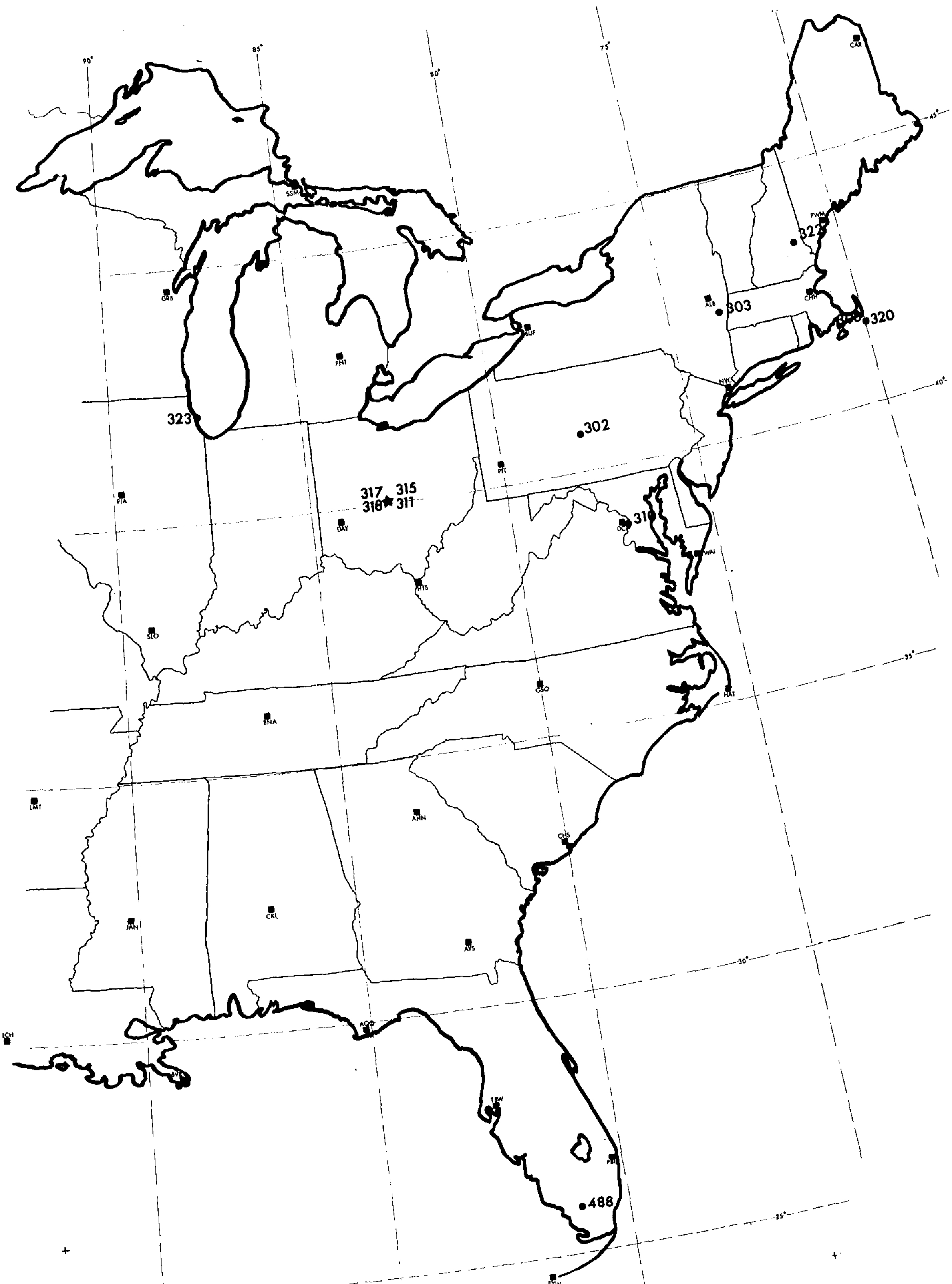


Figure 10. - The 4-channel photometer network (by photometer number). Solid squares represent National Weather Service rawinsonde stations.

The network of sunphotometers was monitored by Dr. Joseph Prospero and colleagues of the University of Miami.

One sunphotometer (#310) was co-located with the 8-channel transmissometer of Dr. Robert Fraser of NASA Goddard Space Flight Center (GSFC) in Greenbelt, Maryland. Table X lists the 8 wavelength channels for the transmissometer and the associated optical thickness for the non-aerosol component of the atmosphere; using this information, aerosol optical thicknesses were calculated from the instrument readings. The aerosol optical thickness τ is defined as

$$\tau = \frac{1}{M} \log_e \frac{I_o}{I} - B_c$$

Atmospheric corrections B_c for Rayleigh scattering and ozone absorption (assuming 0.300 atm-cm O_3) were applied to the total optical thickness for each channel, and the remaining optical thickness was ascribed to aerosol extinction. A calibration of the 8-channel instrument yielded an error in optical thickness of less than 0.005.

Aerosol optical thicknesses from the 8-channel transmissometer were archived for 13 days during the period from July 26 to August 29. Specific dates are July 26, 30 and 31 and August 2, 5, 7, 8, 14, 25, 26, 27, 28 and 29. Data were generally gathered in morning hours, because the formation of fair-weather cumulus clouds, which often appeared by noon, affected the afternoon measurements. Data were recorded over short time intervals ($\sim$ 1 min.), but the time intervals for the archived data are less frequent and at non-uniform time intervals.

Data from the 4- and 8-channel photometers were compared for several dates, as shown in Figure 11, and in most instances the differences are small. To convert the 4-channel turbidities to aerosol optical thickness values for Figure 11, we have applied the following conversion

$$\tau = 2.303 \text{ (TBD)}$$

which represents the difference between the two logarithmic base values. Only values for three of the four sunphotometer channels are plotted. The agreement is generally good.

The turbidity data from the 4-channel network can be used to define the extent of the haze layers during PEPE events. Such data can be intercompared with the surface visibilities and the radiance levels in the digitized GOES satellite imagery. In addition, the 8-channel turbidities can be inverted to derive estimates of the aerosol size distribution for the non-cloudy situations. Because the volume of data from the radiometers is fairly large, it may also be possible to examine the variability of the aerosol properties as a function of air mass properties, such as humidity.

TABLE IX - CHARACTERISTICS OF 4-CHANNEL SUNPHOTOMETERS

PHOTOMETER NUMBER	BLUE CHANNEL		GREEN CHANNEL		RED CHANNEL		WATER CHANNEL		
	I_o	OFFSET	I_o	OFFSET	I_o	OFFSET	I_o	OFFSET	q_o
302	39.90	0.00	217.60	0.00	169.20	0.00	160.90	0.00	1.82
303	70.60	0.00	227.60	0.00	173.50	0.00	159.30	0.00	1.76
308	33.90	0.00	174.90	0.00	170.40	0.00	117.30	0.00	1.32
310	38.80	0.00	145.80	0.00	139.90	0.00	170.80	0.00	2.17
311	62.30	0.20	234.30	0.00	146.40	0.00	182.10	0.00	2.38
315	43.80	0.00	206.30	0.00	188.20	0.00	171.50	0.00	1.74
317	47.20	0.00	205.00	0.00	175.90	0.00	159.40	0.00	1.73
318	58.40	0.00	201.60	0.00	174.60	0.00	156.50	0.00	1.72
320	29.98	0.00	205.20	0.00	141.10	0.00	409.00	0.00	5.55
322	32.10	0.00	185.50	0.00	150.90	0.00	149.00	0.00	1.89
323	39.20	0.00	182.50	0.00	125.70	0.00	135.10	0.00	2.06
488	84.10	0.00	56.00	0.00	50.60	0.00	47.80	0.00	1.79

TABLE X - CHARACTERISTICS OF 8-CHANNEL TRANSMISSOMETER

CHANNEL NUMBER	WAVELENGTH (nm)	OPTICAL THICKNESS	
		MOLECULAR SCATTERING	OZONE ABSORPTION
1	440.0	0.2453	0.001
2	521.7	0.1219	0.0152
3	557.5	0.0930	0.0292
4	612.0	0.0636	0.0357
5	670.8	0.04386	0.0136
6	750.0	0.02793	0.0032
7	779.7	0.02387	0.0022
8	871.7	0.01522	0.0008

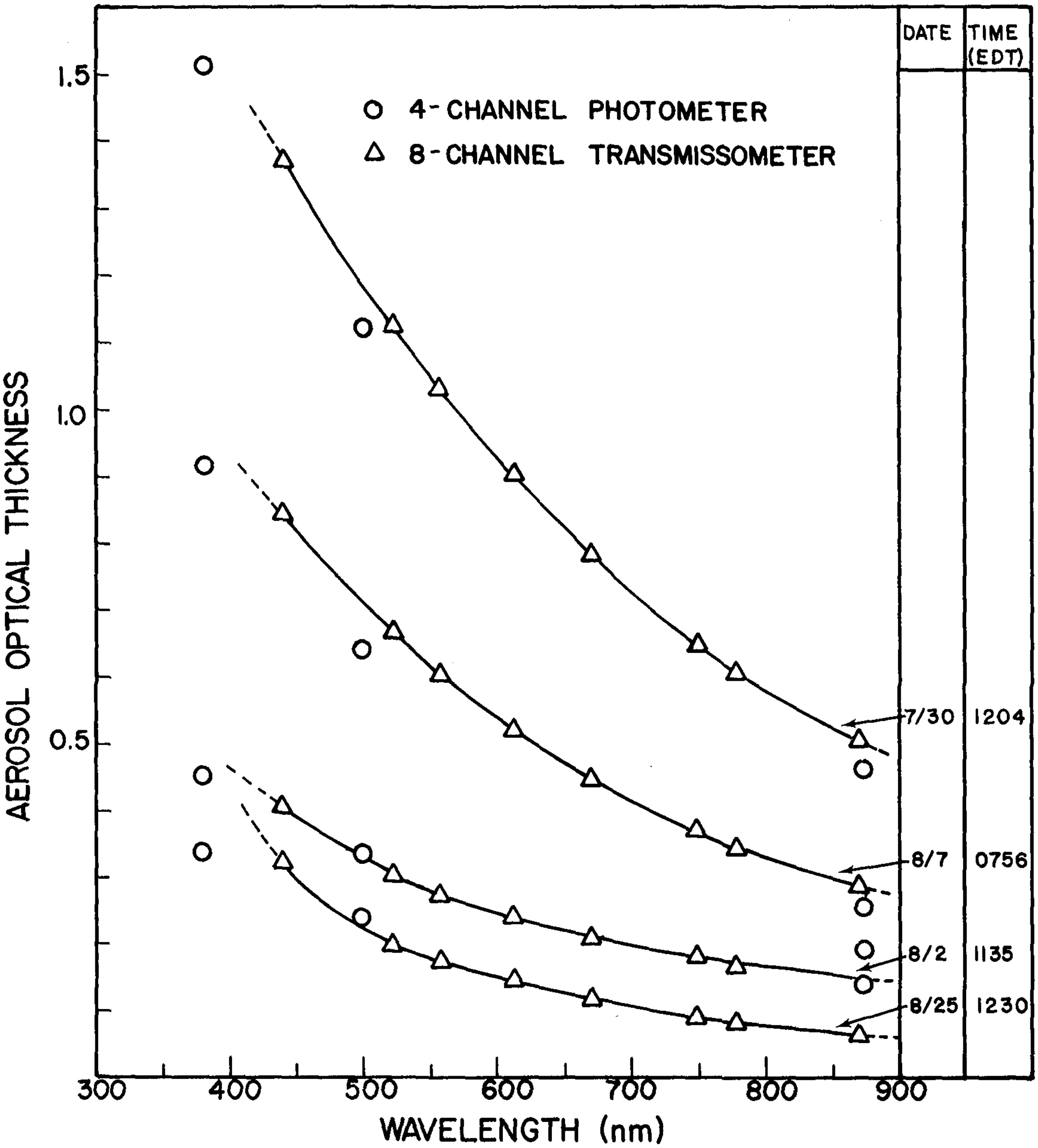


Figure 11. - Comparison of 4- and 8-channel photometer results at Greenbelt, MD, for several dates.

CONCLUDING REMARKS

Scientific studies which make use of the data reported in this paper have been initiated. Some of those studies are discussed in the referenced reports on the individual experiments, and when the UV-DIAL ozone profiles and the HSRL aerosol extinction profiles are entered into the archive, other studies are anticipated. Even more studies can be contemplated when the entire EPA PEPE/NEROS data set is available. In addition to the intercomparisons that have been conducted between the Cessna data and that from the LAS, UV-DIAL, and HSRL, further "consistency checks" or complementary analyses should be undertaken. Two examples are given below:

1) Mixed layer height - intercompare data from the UV-DIAL, HSRL, EPA airborne lidar, ground-based lidar of the Stanford Research Institute (SRI), data obtained from the National Weather Service (NWS) rawinsonde network, and acoustic sounder network data. Some comparisons will require data interpolation while others can be made at selected locations.

2) Aerosol turbidity - comparisons between the HSRL extinction profiles and β_{scat} profiles from the Cessna spirals and between backscatter profiles from both the UV-DIAL and HSRL have been conducted. Further comparisons with the ground based visibility and sulfate data are recommended. The integration of aerosol profiles will give turbidity information that can be compared with data from the sunphotometer network. Each of those turbidity data sets can be used to check the radiance levels of pollution episodes from the GOES satellite imagery. The GOES images were processed by Dr. Walter Lyons and co-workers of Mesomet, Inc., under a joint EPA/NASA contract.

The regional scale data sets on ozone and aerosols should be of particular value for initializing and validating regional air quality models. The details available in the horizontal and vertical structure of the data fields will be of value both in assessing the degree of homogeneity of the pollutants and in specifying the number of vertical layers required in such models. From data on the regional scale mixing height, the efficiency of ozone and aerosol transport from the mixed layer to the "free troposphere" can be investigated and thus the role of urban ozone on the tropospheric ozone budget can be further evaluated. The details of such exchange processes can be considered by using the EPA aircraft data together with tetroon trajectories and selected individual data sets (such as those obtained with the NASA tethered balloon systems). An increased understanding of the physical and chemical processes responsible for the hazy PEPE phenomena can be achieved by combining data on SO_2, humidity, and aerosol properties and distributions. The interpretation of satellite imagery, from which the evolution and transport of PEPE events were first noted, can then be made more quantitative by considering the auxiliary airborne and ground-based data sets that constitute the EPA/NASA data archive.

Langley Research Center
National Aeronautics and Space Administration
Hampton, VA 23665
July 1, 1982

APPENDIX A

ULTRAVIOLET DIFFERENTIAL LIDAR (UV-DIAL) DATA SET CHARACTERISTICS

File Name:	UVDA
Platform:	UV-DIAL aboard Electra Aircraft
Location:	Variable
Elevation of Site:	Variable
Reference Report:	E. V. Browell, A. F. Carter, and S. T. Shipley, "An Airborne Lidar System for Ozone and Aerosol Profiling in the Troposphere and Lower Stratosphere", PAGEOPH, 117, 851 (1980).
Number of Data Sets in File:	14
Number of Columns of Data:	21
Order of Data:	Time (EDT)
	Latitude (degrees)
	Latitude (minutes)
	Longitude (degrees)
	Longitude (minutes)
	Altitude (mmsl)
	V - notation for variable terrain (determination of surface elevation difficult)
	Mixed Height (magl)
	S - notation for mixed height in mmsl units (-) indicates mixed height lower than indicated altitude
	Standard Deviation of Mixed Height (m)
	Lowest Cloud Condensation Level (magl)
	S - notation for lowest cloud condensation level in mmsl units
	Maximum Cloud Height (magl)

S+ - Notations for (S) maximum cloud height in mmsl units and (+) clouds suspected above indicated altitude

Top of Upper Stable Layer (magl)

SM+ - notations for (S) top of upper stable layer in mmsl units, (M) multiple layering above mixed layer, and (+) layers suspected above indicated altitude

Maximum Signal Height or Maximum Detectable Altitude of Observation (mmsl)

Comment About Data

Number of Cards in File:	1021
Archive Date:	October 9, 1981
Format for Data Cards:	I4,4F5.1,F5.0,1X,A1,F6.0,1X,A1,F6.0,F6.0,1X,A1,F6.0, 1X,2A1,F6.0,1X,3A1,F6.0,I2
Format for Header Cards:	I4,4F5.1,F5.0,2X,F6.0,2X,F5.0,1X,F6.0,2X,F6.0, 3X,F6.0,4X,F6.0,2X

APPENDIX A

ULTRAVIOLET DIFFERENTIAL LIDAR DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/18/80	UVDA01	1030 - 1410	45	77
7/24/80	UVDA01	1130 - 1510	44	74
7/25/80	UVDA01	1000 - 1355	48	78
7/31/80	UVDA01	1315 - 1600	34	62
	UVDA02	2145 - 2500	40	72
8/2/80	UVDA01	0730 - 1200	55	83
8/5/80	UVDA01	1015 - 1345	43	74
8/7/80	UVDA01	1825 - 2205	45	76
8/9/80	UVDA01	0730 - 1055	42	70
8/10/80	UVDA01	0555 - 1015	53	84
8/12/80	UVDA01	0650 - 1145	60	90
8/13/80	UVDA01	1135 - 1415	33	61
	UVDA02	1615 - 1825	27	58
	UVDA03	2220 - 2435	28	62

APPENDIX A

ULTRAVIOLET DIFFERENTIAL LIDAR

SAMPLE DATA SET

PROJECT PEPE/PEPE-NEROS STUDY   UVDA01 7/31/80 18 0

TIME EDT	LAT DEG	LAT MIN	LONG DEG	LONG MIN	ALT MMSL	K	MIXHT MAGL	L	H2SIG M	LWCCL MAGL	M	MXCLD MAGL	N+	TPUSL MAGL	N1+	MAXSG MMSL
1315	38.	00.	72.	00.	0.		100.		30.	700.		1000.		900.		2700.
1600	41.	59.	77.	60.	350.		2500.		260.	2200.		2500.		2200.		3400.
1315	38.	00.	72.	00.	0.		100.		30.	700.		1000.		900.		2700.
1600	41.	59.	77.	60.	350.		2500.		260.	2200.		2500.		2200.		3400.
	34															
1315	38.0	08.7	75.0	41.5	6.		900.		100.	880.		1200.		2200.		3070.
1320	38.0	17.8	76.0	05.0	24.		880.		150.	750.		1000.		2100.		3070.
1325	38.0	30.0	76.0	26.9	46.		1240.		150.	NA		NA		NA		3070.
1330	38.0	41.6	76.0	49.3	60.		1740.		120.	1300.		1800.		NA		3070.
1335	38.0	50.7	77.0	13.3	153.		1460.		100.	1050.		1450.		NA		3070.
1340	38.0	55.6	77.0	27.5	76.		1260.		150.	810.		1710.		NA		3070.
1345	39.0	02.5	76.0	57.0	44.		1650.		220.	1220.		1950.		NA		3070.
1350	39.0	08.5	76.0	27.9												
1355	39.0	13.6	75.0	59.5	18.		1520.		120.	NA		NA		NA		3340.
1400	39.0	17.7	75.0	32.8	21.		1530.		100.	1500.		1650.		NA		3340.
1405	39.0	21.8	75.0	06.5	24.		1530.		150.	1500.		1680.		NA		3340.
1410	39.0	31.1	74.0	34.0	23.		1800.		100.	1650.		1830.		NA		3340.
1415	39.0	41.3	74.0	36.0												
1420	39.0	59.0	74.0	38.7	12.		1950.		150.	1520.		2120.		NA		3310.
1425	40.0	18.8	74.0	41.2	31.		1830.		150.	1920.		1950.		NA		3310.
1430	40.0	37.6	74.0	45.9	46.		1660.		150.	NA		NA		NA		3310.
1435	40.0	54.3	74.0	39.9	342.	V	1890.	S	140.	1890.	S	2080.	S	NA		3310.
1440	41.0	09.0	74.0	16.9	305.	V	1810.	S	100.	1660.	S	2040.	S	NA		3310.
1445	41.0	24.1	73.0	59.9	305.	V	2440.	S	150.	2140.	S	2490.	S	NA		3000.
1450	41.0	40.7	73.0	43.5	169.		1980.		140.	1580.		2100.		NA		2700.
1455	41.0	28.3	73.0	20.2	222.	V	1830.	S	150.	1650.	S	2020.	S	NA		2700.
1500	41.0	15.5	72.0	56.5	1.		1800.		100.	NA		NA		NA		2700.
1505	41.0	02.9	72.0	32.9	16.		1680.		90.	1460.		1700.		NA		2700.
1510	40.0	46.9	72.0	29.6	0.		150.		30.	NA		NA		1800.		2700.
1515	40.0	33.0	72.0	50.0	0.		150.		50.	NA		NA		1880.	M	2700.
1520	40.0	20.4	73.0	07.4	0.		150.		30.	NA		NA		900.	M	2700.
1525	40.0	06.6	73.0	26.5	0.		300.		30.	NA		NA		1500.		2700.
1530	39.0	52.5	73.0	45.0	0.		150.		30.	NA		NA		1800.		2700.
1535	39.0	38.3	74.0	03.8	0.		150.		30.	NA		NA		1800.		2700.
1540	39.0	25.3	74.0	23.4												
1545	39.0	10.3	74.0	41.2	2.		100.		30.	NA		NA		1500.		2700.
1550	38.0	53.4	74.0	55.3	0.		100.		30.	NA		NA		1400.		2700.
1555	38.0	36.0	75.0	09.1	3.		1700.		150.	NA		NA		NA		2700.
1600	38.0	17.2	75.0	20.8	11.		1520.		260.	NA		NA		NA		2700.

10/09/81

18

ULTRAVIOLET DIFFERENTIAL LIDAR DATA MEASURED ABOARD ELECTRA

NOTATIONS IN DATA SET:

(A) V IN COL 31 DENOTES VARIABLE TERRAIN; DETERMINATION OF SURFACE ELEVATION DIFFICULT

(B) S IN COL 39 DENOTES MIXED HEIGHT MEASURED IN MMSL; ABSENCE OF S IN COL 39 SIGNIFIES MIXED HEIGHT IN MAGL

(C) H2SIG IS THE 2-SIGMA VARIATION IN MIXED HEIGHT

(D) LWCCL = LOWEST CLOUD CONDENSATION LEVEL; STANDARD UNITS ARE MAGL BUT WHEN S IS IN COLUMN 53 UNITS ARE MMSL

(E) MXCLD = MAXIMUM CLOUD HEIGHT (MAGL); HOWEVER, AN S IN COL 61 SIGNIFIES UNITS ARE MMSL; + IN COL 62 DENOTES CLOUDS SUSPECTED ABOVE INDICATED ALTITUDE

(F) TPUSL = TOP OF THE UPPER STABLE LAYER (MAGL); HOWEVER, AN S IN COL 70 SIGNIFIES UNITS ARE MMSL.

(G) M IN COL 71 SIGNIFIES MULTIPLE LAYERING ABOVE THE MIXED LAYER; + IN COL 72 DENOTES LAYERS SUSPECTED ABOVE INDICATED ALTITUDE

(H) MAXSG = MAXIMUM SIGNAL HEIGHT IN MMSL OR THE MAXIMUM DETECTABLE ALTITUDE OF OBSERVATION

APPENDIX B

HIGH SPECTRAL RESOLUTION LIDAR (HSRL) DATA SET CHARACTERISTICS

File Name:	HRLA
Platform:	HSRL aboard Electra Aircraft
Location:	Variable
Elevation of Site:	Variable
Reference Report:	S. T. Shipley, D. H. Tracy, E. W. Eloranta, J. T. Trauger, R. J. Parent, F. L. Roesler, and J. A. Weinman, "Optical Extinction Measurement in the Atmosphere by High Spectral Resolution Lidar," Submitted to Applied Optics, 1982.
Number of Data Sets in File:	11
Number of Columns of Data:	4
Order of Data:	Time (EDT) Mean Height (magl) Standard Deviation of Mean Height (m) Comment
Number of Cards in File:	617
Archive Date:	November 24, 1981
Format for Data Cards:	I4,4X,F5.0,4X,F5.0,7X,I2
Format for Header Cards:	I4,4X,F5.0,4X,F5.0

APPENDIX B

HIGH SPECTRAL RESOLUTION LIDAR
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/24/80	HRLA01	1202 - 1242	20	36
7/25/80	HRLA01	1332 - 1356	12	28
7/31/80	HRLA01	1352 - 1610	31	52
	HRLA02	2226 - 0106	31	51
8/2/80	HRLA01	0902 - 0918	9	25
8/5/80	HRLA01	1050 - 1238	28	47
8/7/80	HRLA01	1838 - 2110	53	77
8/9/80	HRLA01	0712 - 1040	104	126
8/12/80	HRLA01	1034 - 1143	37	56
8/13/80	HRLA01	1210 - 1416	35	54
	HRLA02	2216 - 2346	42	65

APPENDIX B

HIGH SPECTRAL RESOLUTION LIDAR
SAMPLE DATA SET

PROJECT PEPE/PEPE-NEROS STUDY HRLA01 7/31/80 3 0

TIME EDT	MEAN HT MAGL	STD DEV M	COMMENT
1352	1535.	8.	
1610	2218.	159.	
1352	1535.	8.	
1610	2218.	159.	
	34		
1352	1832.	53.	
1354	1814.	54.	
1358	ND	ND	1
1424	2065.	19.	
1426	2050.	145.	
1428	1895.	74.	
1430	1907.	107.	
1432	1800.	69.	
1434	1885.	17.	
1436	1870.	17.	
1438	1825.	34.	
1440	1753.	39.	
1442	1808.	26.	
1444	1826.	102.	
1446	1712.	72.	
1448	1772.	8.	
1450	2021.	107.	
1452	2046.	64.	
1454	2063.	52.	
1456	1890.	60.	
1458	ND	ND	1
1520	1851.	42.	
1522	1664.	38.	
1524	ND	ND	1
1552	1673.	153.	
1554	1590.	78.	
1556	1535.	50.	
1558	1648.	40.	
1600	1770.	159.	
1602	2218.	55.	
1604	2095.	151.	
1606	1726.	128.	
1608	1892.	105.	
1610	2051.	79.	

11/24/81
A

AEROSOL LAYER HEIGHT MEASUREMENTS BY UNIVERSITY OF WISCONSIN HIGH
SPECTRAL RESOLUTION LIDAR (HSRL) FROM ELECTRA PLATFORM
MEAN HEIGHT IS A TWO-MINUTE AVERAGE OF AEROSOL HEIGHT MAXIMA MEASURED
WITH 7-SEC. RESOLUTION
STD DEV IS THE TWO-MINUTE STANDARD DEVIATION OF MEAN HEIGHT
FLIGHTS COINCIDE WITH UV-DIAL FLIGHTS
COMMENTS ARE AS FOLLOWS:
(1) RETUNE AND CALIBRATION

APPENDIX C

LASER ABSORPTION SPECTROMETER DATA SET CHARACTERISTICS

File Name:	LASA
Platform:	Laser Absorption Spectrometer
Location:	Variable; missions flown around Columbus, Ohio on NASA Queen Air aircraft
Elevation Of Site:	Variable
Reference Report:	M. S. Shumate, "Participation of the JPL Laser Absorption Spectrometer in the 1980 PEPE/NEROS Program in Columbus, Ohio", Final Report No. 715-84, Jet Propulsion Laboratory, Pasadena, CA, July, 1980, Revised December, 1980.
Number of Data Sets in File:	6
Number of Columns of Data:	9
Order of Data:	Latitude (degrees) Latitude (minutes) Latitude (seconds) Longitude (degrees) Longitude (minutes) Longitude (seconds) Time (EDT) Altitude (magl) Ozone (ppbv)
Number of Cards in File:	126
Archive Date:	June 5, 1981
Format for Data Cards:	6(I2,6X),I4,4X,F8.1,F3.0,13X
Format for Header Cards:	6(I2,6X),I4,4X,F8.1,F3.0,13X

APPENDIX C

LASER ABSORPTION SPECTROMETER
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/11/80	LASA01	1100	3	17
7/14/80	LASA01	1100 - 1500	6	20
7/15/80	LASA01	1100	3	17
7/18/80	LASA01	1400 - 1500	8	22
7/20/80	LASA01	1000 - 1500	19	33
7/23/80	LASA01	1100	3	17

APPENDIX C

LASER ABSORPTION SPECTROMETER
SAMPLE DATA SET

PROJECT PEPE/PEPE-NEROS STUDY LASA01 07/14/80 9 0

LATD DEGREES	LATM MINUTES	LATS SECONDS	LONGD DEGREES	LONGM MINUTES	LONGS SECONDS	TIME EDT	ALTITUDE MAGL	OZONE PPB
40	01	02	83	04	23	1100	1066.8	71.
40	15	52	83	12	52	1500	1371.6	82.
40	01	02	83	04	23	1100	1066.8	71.
40	15	52	83	12	52	1500	1371.6	82.
	6							
40	01	52	83	04	52	1100	1371.6	77.
40	01	42	83	08	31	1100	1371.6	71.
40	01	42	83	12	23	1100	1371.6	73.
40	10	42	83	04	40	1500	1066.8	82.
40	13	02	83	04	28	1500	1066.8	71.
40	15	03	83	04	28	1500	1066.8	69.

06/05/81
4

LASER ABSORPTION SPECTROMETER MEASUREMENTS OF OZONE BURDEN FROM
GROUND TO AIRCRAFT

DATA REPRESENTS ONE-HOUR AVERAGE OF OZONE MEASUREMENTS

MEASUREMENT UNCERTAINTY = +/- 25. PPB OZONE

APPENDIX D

CESSNA IN SITU OZONE AND B_{scat} DATA
CORRELATIVE WITH LAS
DATA SET CHARACTERISTICS

File Name:	CCLA
Platform:	Cessna In Situ Ozone and B_{scat} Data Corrèlative with the Laser Absorption Spectrometer
Location:	Variable; missions flown around Columbus, Ohio
Elevation:	Variable
Reference Report:	D. S. McDougal, R. B. Lee, III, and R. J. Bendura, "In Situ Ozone Data for Comparison with the Laser Absorption Spectrometer: 1980 PEPE/NEROS Program", NASA Technical Memorandum (in press).
Number of Data Sets in File:	3
Number of Columns of Data:	5
Order of Data:	Altitude (mmsl)
	Average Ozone (ppbv)
	Standard Deviation of Ozone (ppbv)
	Average B_{scat} (m^{-1})
	Standard Deviation of B_{scat} (m^{-1})
Number of Cards in File:	96
Archive Date:	June 5, 1981
Format for Data Cards:	5E11.4,25X
Format for Header Cards:	5E11.4,25X

APPENDIX D

CESSNA IN SITU OZONE AND B_{scat} DATA
CORRELATIVE WITH LAS
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/11/80	CCLA01	1058 - 1210	12	33
7/14/80	CCLA01	1440 - 1540	11	32
7/15/80	CCLA01	0949 - 1030	12	31

APPENDIX D

CESSNA IN SITU OZONE AND B_{scat} DATA
CORRELATIVE WITH LAS
SAMPLE DATA SET

```
PROJECT PEPE/PEPE-NEROS STUDY                                CCLA01 07/14/80      5  0
ALTITUDEOZONE   STD.DEV.B(SCAT) STD.DEV.
MMSL     PPB      PPB      M-1      M-1
+4.91  E+02+5.10  E+01+0.00  E+00+2.20  E-05+0.00  E+00
+2.036 E+03+8.40  E+01+8.00  E+00+9.40  E-05+1.80  E+05
+4.91  E+02+5.10  E+01+0.00  E+00+2.20  E-05+0.00  E+00
+2.036 E+03+8.40  E+01+8.00  E+00+9.40  E-05+1.80  E+05
        11
 491.        83.         0.         9.4 E-05   0.
 704.        83.         6.         9.4 E-05   0.6 E-05
 847.        83.         4.         8.9 E-05   0.7 E-05
 957.        84.         8.         9.3 E-05   1.2 E-05
1116.        83.         8.         9.4 E-05   1.1 E-05
1271.        79.         6.         8.8 E-05   0.9 E-05
1390.        68.         7.         6.5 E-05   1.8 E-05
1548.        61.         4.         4.8 E-05   0.8 E-05
1723.        51.         4.         2.2 E-05   0.2 E-05
1880.        55.         4.         2.6 E-05   0.2 E-05
2036.        57.         3.         2.5 E-05   0.2 E-05
06/05/81
 11
CESSNA CORRELATIVE DATA WITH LASER ABSORPTION SPECTROMETER
LOCATION: LEG A TO B; A=APPLETON VOR 270 DEGREES/40 NAUTICAL MILES
    B = APPLETON VOR 270 DEGREES/48 NAUTICAL MILES
A = LAT 40 DEG 7 MIN 12 SEC N, LONG 83 DEG 27 MIN 12 SEC W
B = LAT 40 DEG 7 MIN N, LONG 83 DEG 39 MIN 6 SEC W
TIME = 1440 TO 1540 EDT
DATA REPRESENTATIVE OF VERTICAL STRUCTURE OVER ENTIRE LEG AB;
  MINOR VARIATIONS IN DATA AT POINTS A AND B ARE NOTED BELOW 1050 M
SPECIAL NOTES: MIXING LAYER HEIGHT AT ABOUT 1050 M; MAJOR LEVEL
    ABOVE 1300 M; SEVERAL SMALL-SCALE LAYERS ARE APPARENT;
    CONSTANT VALUES ABOVE 1500 M
```

APPENDIX D

CESSNA IN SITU TEMPERATURE DATA CORRELATIVE WITH LAS DATA SET CHARACTERISTICS

File Name:	CLTA
Platform:	Cessna In Situ Temperature Data Correlative with the Laser Absorption Spectrometer
Location:	Variable; missions flown around Columbus, Ohio
Elevation of Site:	Variable
Reference Report:	D. S. McDougal, R. B. Lee, III, and R. J. Bendura, "In Situ Ozone Data for Comparison with the Laser Absorption Spectrometer: 1980 PEPE/NEROS Program", NASA Technical Memorandum (in press).
Number of Data Sets in File:	3
Number of Columns of Data:	5
Order of Data:	Altitude (mmsl) Temperature ($^{\circ}C$) Dew Point ($^{\circ}C$) Ozone (ppbv) B_{SCAT} (m^{-1})
Number of Cards in File:	247
Archive Date:	June 5, 1981
Format for Data Cards:	5E11.4,25X
Format for Header Cards:	E11.4,1x,4E11.4

APPENDIX D

CESSNA IN SITU TEMPERATURE DATA
CORRELATIVE WITH LAS
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/11/80	CLTA01	1139 - 1152	79	94
7/14/80	CLTA01	1440 - 1451	67	82
7/15/80	CLTA01	1017 - 1026	56	71

APPENDIX D

CESSNA IN SITU TEMPERATURE DATA
CORRELATIVE WITH LAS
SAMPLE DATA SET

```
PROJECT PEPE/PEPE-NEROS STUDY                                CLTA01 07/14/80        5  0
ALTITUDETEMP     DEW PT  OZONE    BSCAT
MMSL     DEG C   DEG C   PPB      M-1
+5.890 E+02 +2.38  E+01-1.24  E+01+4.10  E+01+2.02  E-05
+1.878 E+03 +2.83  E+01+1.54  E+01+8.50  E+01+9.50  E-05
+5.890 E+02 +2.38  E+01-1.24  E+01+4.10  E+01+2.00  E-05
+1.878 E+03 +2.83  E+01+1.54  E+01+8.50  E+01+9.50  E-05
       67
```

1878.	24.2	2.6	63.	.3240E-04
1852.	24.1	2.0	65.	.3000E-04
1828.	24.1	.8	56.	.2360E-04
1803.	24.3	.7	58.	.2140E-04
1775.	24.6	.8	59.	.2180E-04
1751.	24.9	.8	59.	.2560E-04
1732.	25.0	.8	61.	.2540E-04
1714.	25.1	.9	54.	.2520E-04
1686.	25.4	1.1	49.	.2240E-04
1661.	25.6	1.2	54.	.2160E-04
1637.	25.8	1.0	58.	.2440E-04
1607.	26.1	.7	58.	.2320E-04
1578.	26.3	-1.1	59.	.2420E-04
1554.	26.5	-2.3	54.	.2560E-04
1526.	26.4	-4.6	55.	.2520E-04
1494.	26.0	-6.9	52.	.2160E-04
1464.	26.1	-6.3	51.	.2500E-04
1437.	26.2	-6.5	49.	.2300E-04
1414.	25.9	-9.0	41.	.2160E-04
1392.	25.9	-11.0	49.	.2020E-04
1367.	26.0	-12.0	53.	.2600E-04
1343.	25.5	-9.7	57.	.2540E-04
1319.	25.0	.4	61.	.3520E-04
1290.	24.6	5.4	67.	.4220E-04
1262.	24.3	8.2	61.	.5220E-04
1233.	24.8	8.5	57.	.5320E-04
1201.	25.4	6.3	61.	.4860E-04
1177.	25.2	8.3	66.	.4880E-04
1147.	25.4	8.2	59.	.5160E-04
1122.	25.5	6.7	67.	.3820E-04
1100.	25.3	4.1	65.	.3440E-04
1080.	24.8	5.6	62.	.5240E-04
1061.	23.8	14.6	66.	.8060E-04
1037.	24.0	13.8	82.	.8220E-04
1009.	24.2	13.1	83.	.7740E-04
978.	24.9	11.2	81.	.7300E-04
948.	25.2	11.5	78.	.7400E-04
923.	25.2	12.9	77.	.7800E-04
905.	25.2	14.2	76.	.8800E-04
877.	25.5	13.8	81.	.8960E-04
847.	25.8	14.0	81.	.8180E-04
816.	26.2	14.0	81.	.8600E-04
805.	26.2	14.1	81.	.8460E-04
785.	26.4	13.6	83.	.8080E-04
765.	26.5	13.8	85.	.8420E-04
742.	26.6	14.1	83.	.8500E-04
719.	26.9	14.5	80.	.8420E-04
698.	27.2	14.5	77.	.8520E-04
675.	27.4	14.6	82.	.8860E-04
657.	27.7	13.9	77.	.8680E-04
635.	28.0	13.3	81.	.8160E-04
613.	28.2	14.0	84.	.8620E-04
604.	28.2	14.8	83.	.8580E-04
595.	28.3	15.0	82.	.8220E-04
590.	28.2	14.7	85.	.8100E-04
585.	28.3	14.9	85.	.8500E-04
584.	28.1	14.8	79.	.8740E-04
586.	27.9	14.8	82.	.8840E-04
597.	27.7	14.8	83.	.8580E-04
582.	27.9	15.4	80.	.9500E-04
580.	27.9	14.7	82.	.8540E-04
598.	27.5	14.8	82.	.8340E-04
596.	27.4	14.5	80.	.8320E-04
594.	27.6	14.5	80.	.8420E-04
594.	27.7	14.0	78.	.8720E-04
591.	27.7	14.3	75.	.8860E-04
589.	27.8	14.0	79.	.8560E-04

```
06/05/81
  5
CESSNA INSITU T,TDP,O3,BSCAT SPIRAL DATA(LAS CORRELATION)
LOCATION: APPLETON VOR 270 DEGREES/40 NAUTICAL MILES
(LAT 40 DEG 7 MIN 12 SEC N, LONG 83 DEG 27 MIN 12 SEC W
TIME = 1440 TO 1451 EDT
SPECIAL NOTES: DATA APPLIES TO OZONE AND BSCAT FILE CCLA01
```

APPENDIX D

CESSNA IN SITU OZONE AND B_{scat} DATA CORRELATIVE WITH UV-DIAL DATA SET CHARACTERISTICS

File Name:	CORA
Platform:	Cessna In Situ Ozone and B_{scat} Data Correlative with the UV-DIAL Instrument
Location:	Variable
Elevation of Site:	Variable
Reference Report:	Gerald L. Gregory, Sherwin M. Beck, and Joe J. Mathis, Jr., "In Situ Correlative Measurements for the Ultraviolet Differential Absorption Lidar and High Spectral Resolution Lidar Air-Quality Remote Sensors: 1980 PEPE/NEROS Program", NASA Technical Memorandum, NASA TM-83107, April, 1981.
Number of Data Sets in File:	14
Number of Columns of Data:	5
Order of Data:	Altitude (mmsl) Average Ozone (ppbv) Standard Deviation of Ozone (ppbv) Average B_{scat} (m^{-1}) Standard Deviation of B_{scat} (m^{-1})
Number of Cards in File:	475
Archive Date:	April 27, 1981
Format for Data Cards:	5E11.4,25X
Format for Header Cards:	5E11.4,25X

APPENDIX D

CESSNA IN SITU OZONE AND B_{scat} DATA
CORRELATIVE WITH UV-DIAL
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/24/80	CORA01	1200 - 1226	14	30
	CORA02	1327 - 1402	14	30
7/25/80	CORA01	1120 - 1144	14	30
	CORA02	1240 - 1310	15	31
7/31/80	CORA01	[1325 - 1338] [1408 - 1430]	17	33
	CORA02	1325 - 1430	18	39
	CORA03	2109 - 2212	17	37
8/02/80	CORA01	1225 - 1325	19	41
8/05/80	CORA01	0946 - 1109	23	44
8/07/80	CORA01	1746 - 1838	12	31
8/12/80	CORA01	1130 - 1215	15	35
8/13/80	CORA01	1237 - 1329	12	32
	CORA02	1619 - 1646	14	32
	CORA03	1652 - 1717	14	30

APPENDIX D

CESSNA IN SITU OZONE AND B_{scat} DATA
CORRELATIVE WITH UV-DIAL
SAMPLE DATA SET

```
PROJECT PEPE/PEPE-NEROS STUDY                          CORA02 07/31/80     5  0
ALTITUDEOZONE    STD.DEV.B(SCAT) STD.DEV.
MMSL     PPB      PPB      M-1      M-1
+0.00  E+00+0.00  E+00+0.00  E+00+0.00  E+00+0.00  E+00
+3.410 E+03+1.30  E+02+2.70  E+01+5.20  E-04+9.50  E-05
+0.00  E+00+0.00  E+00+0.00  E+00+0.00  E+00+0.00  E+00
+3.410 E+03+1.30  E+02+2.70  E+01+5.20  E-04+9.50  E-05
       18
 119.          94.          2.         32.5 E-05     .6 E-05
 233.          92.          6.         31.7 E-05    2.5 E-05
 390.          98.          4.         30.9 E-05    3.0 E-05
 529.          99.          6.         31.3 E-05    2.9 E-05
 686.          94.          4.         30.6 E-05    3.0 E-05
 845.          94.          3.         29.4 E-05    1.5 E-05
 995.          93.          2.         28.6 E-05    2.0 E-05
1138.          91.          2.         29.2 E-05    2.0 E-05
1292.          92.          4.         29.8 E-05    1.9 E-05
1447.          82.          8.         20.8 E-05    6.7 E-05
1603.          72.          2.         13.9 E-05    9.4 E-05
1755.          60.          6.          6.9 E-05    4.9 E-05
1914.          53.          3.          2.6 E-05     .8 E-05
2070.          52.          3.          2.8 E-05     .5 E-05
2198.          56.          3.          3.0 E-05     .4 E-05
2371.          57.          3.          3.0 E-05     .2 E-05
2507.          58.          4.          3.4 E-05     .6 E-05
2657.          64.          5.          4.8 E-05     .4 E-05
04/27/81
 11
CESSNA CORRELATIVE DATA
LOCATION: LEG B TO C; B= KENTON VOR 270 DEG/33 NAUTICAL MILES; C= KENTON
          VOR 292 DEG/8 NAUTICAL MILES; LEG MIDPOINT A= KENTON VOR
          275 DEG/20 NAUTICAL MILES
B= LAT 39 DEG 9 MIN N, LONG 76 DEG 13 MIN W
C= LAT 39 DEG 16 MIN N, LONG 75 DEG 41 MIN W
A= LAT 39 DEG 12 MIN N, LONG 75 DEG 57 MIN W
TIME= 1325 TO 1430 EDT
DATA REPRESENTATIVE OF ENTIRE LEG BC; INCLUDES SPIRALS AT END POINTS AND
MIDPOINT AND CONSTANT RATE OF DESCENT TRAVERSES OF LEG BC
SPECIAL NOTES: NONE
```

APPENDIX D

CESSNA IN SITU TEMPERATURE DATA
CORRELATIVE WITH UV-DIAL
DATA SET CHARACTERISTICS

File Name:	CRTA
Platform:	Cessna In Situ Temperature Data Correlative with the UV-DIAL Instrument
Location:	Variable
Elevation of Site:	Variable
Reference Report:	Gerald L. Gregory, Sherwin M. Beck, and Joe J. Mathis, Jr., "In Situ Correlative Measurements for the Ultraviolet Differential Absorption Lidar and the High Spectral Resolution Lidar Air-Quality Remote Sensors: 1980 PEPE/NEROS Program", NASA Technical Memorandum, NASA TM-83107, April, 1981.
Number of Data Sets in File:	12
Number of Columns of Data:	3
Order of Data:	Altitude (mmsl) Temperature (^{o}C) Dew Point (^{o}C)
Number of Cards in File:	737
Archive Date:	April 27, 1981
Format for Data Cards:	3E11.4,47X
Format for Header Cards:	3E11.4,47X

APPENDIX D

CESSNA IN SITU TEMPERATURE DATA
CORRELATIVE WITH UV-DIAL
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/24/80	CRTA01	1204 - 1217	39	54
	CRTA02	1336 - 1350	41	56
7/25/80	CRTA01	1124 - 1137	39	54
	CRTA02	1248 - 1302	42	57
7/31/80	CRTA01	1409 - 1426	51	67
	CRTA02	2140 - 2158	54	69
8/02/80	CRTA01	1254 - 1312	54	69
8/05/80	CRTA01	1022 - 1045	70	85
8/07/80	CRTA01	1824 - 1836	36	55
8/12/80	CRTA01	1108 - 1130	54	73
8/13/80	CRTA01	1237 - 1247	31	46
	CRTA01	1633 - 1646	36	52

APPENDIX D

CESSNA IN SITU TEMPERATURE DATA
CORRELATIVE WITH UV-DIAL
SAMPLE DATA SET.

PROJECT PEPE/PEPE-NEROS STUDY CRTA01 07/31/80 3 0

ALTITUDE MMSL	TEMP DEG C	DEW PT DEG C
0.	6.00000E+00	-2.10000E+01
1.03937E+03	3.80000E+01	2.50000E+01
0.	6.00000E+00	-2.10000E+01
1.03937E+03	3.80000E+01	2.50000E+01
	51	
205.	30.5	15.8
273.	29.4	15.2
318.	28.8	15.1
372.	28.3	14.7
415.	28.0	15.1
461.	27.5	14.9
519.	26.8	15.0
577.	26.2	14.9
612.	25.9	14.7
671.	25.3	14.3
738.	24.8	14.4
788.	24.3	14.4
836.	23.6	14.3
886.	23.1	14.1
942.	22.4	14.3
991.	22.0	14.3
1024.	21.7	13.8
1080.	21.1	13.6
1127.	20.5	14.0
1181.	20.1	13.2
1247.	19.2	13.2
1299.	18.6	12.9
1351.	18.6	10.2
1406.	18.9	5.8
1464.	19.0	5.1
1512.	17.7	6.0
1556.	17.7	3.0
1597.	18.2	-2.1
1639.	18.0	-2.6
1690.	17.7	-1.5
1748.	17.2	-1.1
1792.	16.9	0.0
1843.	16.5	1.8
1895.	16.0	2.9
1950.	15.5	3.4
2007.	14.8	3.3
2058.	14.5	3.9
2101.	14.1	3.9
2147.	13.8	4.0
2190.	13.6	4.6
2232.	13.2	4.7
2274.	12.8	4.7
2329.	12.4	4.5
2385.	12.4	4.2
2438.	12.0	3.9
2484.	11.6	3.7
2530.	11.4	3.5
2575.	11.5	3.9
2626.	11.5	3.3
2686.	11.2	3.3
2744.	10.7	3.3

04/27/81
6
CESSNA CORRELATIVE TEMPERATURE DATA
LOCATION: KENTON VOR 275 DEG/20 NAUTICAL MILES
LAT= 39 DEG 12 MIN N, LONG= 75 DEG 57 MIN W
TIME=1409 TO 1426 EDT
SPECIAL NOTES: DATA APPLIES TO OZONE AND B(SCAT) FILES CORA01 AND
CORA02 7/31/80

APPENDIX E

SMALL TETHERED BALLOON
DATA SET CHARACTERISTICS

File Name:	STBG
Platform:	Small Tethered Balloon
Location:	Columbus, Ohio Latitude 40°12'N; longitude 82°42' W
Elevation of Site:	353.6 mmsl
Reference Report:	R. J. Sentell, R. W. Storey, J. J. C. Chang, and S. J. Jacobson, "Tethered Balloon-Based Measurements of Meteorological Variables and Aerosols", NASA Technical Memorandum, NASA TMX-73999 (Avail. NTIS N77-15586), December, 1976.
Number of Data Sets in File:	81
Number of Columns of Data:	6
Order of Data:	Altitude (mmsl) Temperature (°C) Relative Humidity (%) Wind Speed (m/s) Ozone (ppbv) Wind Direction (degrees)
Number of Cards in File:	5835
Archive Date	January 5, 1981
Format for Data Cards:	6E11.4,14X
Format for Header Cards:	6E11.4,14X

APPENDIX E

SMALL TETHERED BALLOON DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/16/80	STBG01	1557 - 1616	36	52
	STBG02	1622 - 1718	87	103
7/17/80	STBG01	1216 - 1314	72	88
7/18/80	STBG01	0546 - 0629	77	93
	STBG02	0629 - 0709	76	92
	STBG03	0725 - 0806	74	90
	STBG04	0807 - 0856	66	82
	STBG05	1032 - 1113	69	85
	STBG06	1114 - 1152	66	82
	STBG07	1156 - 1237	69	85
7/20/80	STBG01	0600 - 0624	10	26
	STBG02	0803 - 0824	12	28
7/21/80	STBG01	0538 - 0646	49	65
	STBG02	0756 - 0857	45	61
	STBG03	0904 - 1014	54	70
	STBG04	1032 - 1134	54	70
7/23/80	STBG01	0552 - 0651	41	57
	STBG02	0824 - 0925	48	64
	STBG03	0959 - 1046	47	63
	STBG04	1121 - 1206	41	57
7/24/80	STBG01	0548 - 0649	41	57
	STBG02	0840 - 0931	44	60
	STBG03	0935 - 1028	52	68
	STBG04	1110 - 1158	48	64
7/25/80	STBG01	0702 - 0751	44	60
	STBG02	1017 - 1101	44	60
	STBG03	1122 - 1204	39	55
	STBG04	1211 - 1231	16	32
7/26/80	STBG01	0627 - 0655	20	36
	STBG02	0812 - 0901	36	52
	STBG03	0913 - 1003	40	56

APPENDIX E

SMALL TETHERED BALLOON
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/29/80	STBG01	1026 - 1138	51	67
	STBG02	1204 - 1302	48	64
	STBG03	1511 - 1615	53	69
7/30/80	STBG01	0606 - 0700	65	81
	STBG02	0700 - 0748	60	76
	STBG03	1731 - 1818	57	73
	STBG04	1821 - 1856	47	63
	STBG05	1955 - 2047	57	73
	STBG06	2111 - 2141	21	37
	STBG07	2248 - 2323	24	40
	STBG08	2326 - 2358	25	41
8/01/80	STBG01	1644 - 1704	19	35
	STBG02	1730 - 1934	71	87
	STBG03	2005 - 2125	41	57
	STBG04	2151 - 2244	30	46
	STBG05	2246 - 2321	27	43
8/04/80	STBG01	0555 - 0648	40	56
	STBG02	0656 - 0806	70	86
	STBG03	2208 - 2254	37	53
	STBG04	1730 - 1811	32	48
	STBG05	1936 - 2014	33	49
	STBG06	2027 - 2042	9	25
8/06/80	STBG01	0601 - 0633	62	78
	STBG02	0633 - 0700	51	67
	STBG03	0747 - 0815	55	71
	STBG04	0816 - 0842	51	67
	STBG05	0842 - 0907	51	67
	STBG06	0926 - 0948	43	59
	STBG07	0958 - 1029	59	75
	STBG08	1029 - 1100	59	75
	STBG09	1139 - 1225	87	103
	STBG10	1226 - 1306	77	93
	STBG11	1319 - 1420	117	133

APPENDIX E

SMALL TETHERED BALLOON
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
8/07/80	STBG01	0557 - 0631	64	80
	STBG02	0632 - 0737	124	140
	STBG03	0738 - 0827	92	108
	STBG04	0834 - 0912	72	88
	STBG05	0912 - 0947	67	83
	STBG06	0948 - 1022	61	77
	STBG07	1726 - 1822	86	102
	STBG08	1822 - 1917	105	121
	STBG09	1930 - 2020	88	104
	STBG10	2038 - 2109	55	71
	STBG11	2109 - 2135	49	65
	STBG12	2141 - 2212	57	73
	STBG13	2212 - 2236	43	59
8/08/80	STBG01	0631 - 0731	116	132
	STBG02	0738 - 0824	86	102
	STBG03	0929 - 1030	116	132
8/09/80	STBG01	0558 - 0656	112	128

APPENDIX E

SMALL TETHERED BALLOON
SAMPLE DATA SET

```
PROJECT PEPE/PEPE-NEROS STUDY                                 STBG02 07/20/80     6  0
ALTITUDETEMP     REL HUM WIND SPDOZONE     WIND DIR
MMSL     DEG C   PERCENT M/S      PPB      DEG
+0.00   E+00+1.40  E+01+0.00  E+00+0.00  E+00+0.00  E+00+0.00  E+00
+1.05   E+03+3.50  E+01+1.00  E+02+1.00  E+01+1.51  E+02+3.60  E+02
+0.00   E+00+1.40  E+01+0.00  E+00+0.00  E+00+0.00  E+00+0.00  E+00
+1.05   E+03+3.50  E+01+1.00  E+02+1.00  E+01+1.51  E+02+3.60  E+02
   12
353.6         24.         84.          .8         50.        225.0
365.3         24.         84.         4.3         49.        202.5
376.8         24.         81.         4.1         58.        247.5
383.9         24.         81.         5.4         50.        202.5
400.5         24.         79.         6.5         54.        202.5
406.5         24.         79.         6.3         58.        247.5
418.6         24.         79.         6.0         60.        247.5
447.1         24.         78.         7.4         58.        225.0
454.4         24.         76.         8.1         60.        225.0
484.8         24.         75.         8.3         62.        247.5
513.8         24.         75.         1.0         61.        202.5
534.0         25.         71.         2.0         64.        202.5
01/05/81
  6
SMALL TETHERED BALLOON
START=0803
STOP=0824
COLUMBUS, OHIO, 40 DEG 12 MIN N LAT, 82 DEG 42 MIN W LONG
ELEVATION = 353.568 M
C                                ASCENT ONLY
```

APPENDIX E

LARGE TETHERED BALLOON DATA SET CHARACTERISTICS

File Name: LTBG

Platform: Large Tethered Balloon

Location: Aberdeen Proving Ground, Maryland

Latitude 39°27'N; longitude 76°7'W

Elevation of Site: 6.1 mmsl

Reference Report: R. J. Sentell, R. W. Storey, J. J. C. Chang, and S. J. Jacobson, "Tethered Balloon-based Measurements of Meteorological Variables and Aerosols", NASA Technical Memorandum, NASA TMX-73999 (Avail. NTIS N77-15586), Dec., 1976.

Number of Data Sets in File: 112

Number of Columns of Data: 6, except for profiles on 7/24/80, 7/25/80 and 8/7/80

Order of Data: Altitude (mmsl)

Temperature (°C)

Ozone (ppbv) [not available for some profiles on 8/7/80]

Wind Speed (m/s)

Wet Bulb (°C) [not available for profiles on 7/25/80 and 8/7/80; not available for profiles 2-5 and 7-11 on 7/24/80]

Wind Direction (degrees)

Number of Cards in File: 24902

Archive Date: November 19, 1981

Format for Data Cards:

Cards: F6.1,6X,F4.1,7X,F4.1,7X,F4.1,8X,F4.0,6X,F5.1

For profile numbers 1, 2, 3, 6, and 7 on 8/7/80:
F6.1,6X,F4.1,7X,F4.1,7X,F5.1

For profile numbers 2-5 and 7-11 on 7/24/80:
F6.1,6X,F4.1,6X,F4.1,8X,F4.1,6X,F5.1

APPENDIX E

For profile numbers 4, 5, and 8-13 on 8/7/80:
F6.1,6X,F4.1,7X,F4.1,7X,F4.1,7X,F5.1

For profiles on 7/25/80:
F6.1,6X,F4.1,7X,F4.1,7X,F4.1,7X,F5.1

Format for Header Cards: 6E12.5

For profiles on 7/25/80: 5E12.5

For profile numbers 1, 2, 3, 6, and 7 on 8/7/80:
4E12.5

For profile numbers 4, 5, and 8-13 on 8/7/80: 5E12.5

For profile numbers 2-5 and 7-11 on 7/24/80: 5E12.5

APPENDIX E

LARGE TETHERED BALLOON
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/24/80	LTBG01	1134 - 1201	273	290
	LTBG02	1201 - 1226	288	305
	LTBG03	1226 - 1242	207	224
	LTBG04	1242 - 1259	224	241
	LTBG05	1259 - 1316	230	247
	LTBG06	1321 - 1327	50	67
	LTBG07	2007 - 2032	284	301
	LTBG08	2031 - 2053	206	223
	LTBG09	2053 - 2119	283	300
	LTBG10	2130 - 2155	284	301
	LTBG11	2201 - 2209	96	113
7/25/80	LTBG01	0659 - 0724	294	311
	LTBG02	0732 - 0752	224	241
	LTBG03	0759 - 0825	291	308
	LTBG04	0833 - 0904	288	305
	LTBG05	1815 - 1839	239	256
	LTBG06	1901 - 1934	296	313
	LTBG07	1938 - 1946	86	103
	LTBG08	1950 - 2002	192	209
	LTBG09	2008 - 2025	296	313
	LTBG10	2031 - 2045	175	192
	LTBG11	2104 - 2124	219	236
	LTBG12	2130 - 2153	251	268

APPENDIX E

LARGE TETHERED BALLOON DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/28/80	LTBG01	0829 - 0851	245	262
	LTBG02	0857 - 0906	79	96
	LTBG03	0910 - 0919	95	112
	LTBG04	0924 - 0945	243	260
	LTBG05	0951 - 1012	240	257
	LTBG06	1018 - 1031	150	167
	LTBG07	1124 - 1210	191	208
	LTBG08	1216 - 1229	150	167
	LTBG09	1234 - 1249	169	186
7/29/80	LTBG01	1506 - 1526	230	247
	LTBG02	1541 - 1602	249	266
	LTBG03	1611 - 1619	50	67
	LTBG04	1622 - 1643	245	262
7/30/80	LTBG01	0520 - 0541	243	260
	LTBG02	0546 - 0607	249	266
	LTBG03	0615 - 0636	241	258
	LTBG04	0643 - 0653	134	151
	LTBG05	0724 - 0745	249	266
	LTBG06	0752 - 0812	235	252
	LTBG07	1402 - 1423	191	208
	LTBG08	1429 - 1450	244	261
	LTBG09	1502 - 1513	130	147
	LTBG10	1520 - 1542	247	264
	LTBG11	1613 - 1627	158	175
	LTBG12	1634 - 1655	249	266
	LTBG13	1703 - 1725	247	264
7/31/80	LTBG01	0707 - 0728	249	266
	LTBG02	0734 - 0755	249	266
	LTBG03	0801 - 0805	46	63
	LTBG04	0855 - 0917	249	266
	LTBG05	0925 - 0947	249	266

APPENDIX E

LARGE TETHERED BALLOON
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/31/80	LTBG06	0949 - 1007	168	185
	LTBG07	1014 - 1018	54	71
	LTBG08	1152 - 1213	249	266
	LTBG09	1221 - 1242	249	266
	LTBG10	1250 - 1255	50	67
	LTBG11	1303 - 1317	170	187
	LTBG12	1324 - 1345	249	266
	LTBG13	1350 - 1411	234	251
8/1/80	LTBG01	0807 - 0828	249	266
	LTBG02	0838 - 0859	250	267
	LTBG03	0906 - 0920	165	182
	LTBG04	0925 - 0946	240	257
	LTBG05	0951 - 0954	42	59
8/4/80	LTBG01	1019 - 1040	233	250
	LTBG02	1045 - 1106	249	266
	LTBG03	1124 - 1145	248	263
	LTBG04	1156 - 1209	156	173
	LTBG05	1505 - 1526	241	258
	LTBG06	1532 - 1553	248	265
	LTBG07	1559 - 1620	248	265
	LTBG08	1633 - 1638	53	70
	LTBG09	1641 - 1658	183	200
8/5/80	LTBG01	0548 - 0609	243	260
	LTBG02	0614 - 0625	125	142
	LTBG03	0631 - 0641	71	88
	LTBG04	0646 - 0659	173	190
	LTBG05	0751 - 0807	180	197
	LTBG06	0814 - 0822	82	99
	LTBG07	0828 - 0849	248	265
	LTBG08	0856 - 0917	242	259

APPENDIX E

LARGE TETHERED BALLOON DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
8/5/80	LTBG09	0923 - 0944	245	262
	LTBG10	1139 - 1200	248	265
	LTBG11	1207 - 1220	244	261
	LTBG12	1235 - 1251	190	207
	LTBG13	1255 - 1317	247	264
8/6/80	LTBG01	0539 - 0600	249	266
	LTBG02	0606 - 0627	245	262
	LTBG03	0654 - 0715	249	266
	LTBG04	0721 - 0742	249	266
	LTBG05	0748 - 0808	242	259
	LTBG06	0907 - 0928	249	266
	LTBG07	0936 - 0957	249	266
	LTBG08	1033 - 1054	240	257
	LTBG09	1101 - 1121	249	266
	LTBG10	1129 - 1138	76	93
	LTBG11	1142 - 1203	249	266
	LTBG12	1209 - 1223	169	186
8/7/80	LTBG01	0419 - 0440	249	266
	LTBG02	0447 - 0452	60	77
	LTBG03	0457 - 0514	210	227
	LTBG04	0636 - 0655	217	234
	LTBG05	0701 - 0721	236	251
	LTBG06	0731 - 0751	220	235
	LTBG07	0759 - 0819	230	247
	LTBG08	0917 - 0938	249	266
	LTBG09	0944 - 0959	160	177
	LTBG10	1004 - 1017	122	139
	LTBG11	1029 - 1037	93	110

APPENDIX E

LARGE TETHERED BALLOON
SAMPLE DATA SET

```
PROJECT PEPE/PEPE-NEROS STUDY                              LTBG03  7/29/80     6    0
ALTITUDETEMP    OZONE    WIND SPD WET BULBWIND DIR
MMSL     DEG C   PPB      M/SEC     DEG C   DEG
 9.51000E+02 1.94000E+01 6.90000E+01 4.00000E+00 1.80000E+01 2.70000E+02
 1.10340E+03 2.06000E+01 7.10000E+01 7.20000E+00 1.80000E+01 3.00000E+02
 9.51000E+02 1.94000E+01 6.90000E+01 4.00000E+00 1.80000E+01 2.70000E+02
 1.10340E+03 2.06000E+01 7.10000E+01 7.20000E+00 1.80000E+01 3.00000E+02
        50
1088.3      19.4       70.7       5.9        18.       298.0
1087.4      19.4       70.7       5.6        18.       298.0
1086.7      19.5       70.7       5.3        18.       298.0
1085.7      19.5       70.7       5.3        18.       297.0
1085.7      19.5       70.7       5.3        18.       297.0
1084.5      19.6       70.7       5.3        18.       297.0
1083.1      19.6       70.7       5.1        18.       297.0
1081.0      19.6       70.2       5.4        18.       297.0
1075.1      19.7       69.9       5.0        18.       297.0
1071.1      19.7       70.0       5.0        18.       297.0
1067.3      19.6       70.0       5.0        18.       297.0
1063.3      19.7       69.5       4.4        18.       297.0
1060.5      19.7       70.3       4.5        18.       297.0
1057.4      19.7       70.0       4.5        18.       297.0
1053.7      19.8       70.0       4.5        18.       297.0
1049.0      19.8       70.0       4.2        18.       297.0
1044.3      19.8       70.0       4.8        18.       297.0
1040.1      19.9       70.1       4.8        18.       297.0
1034.8      19.9       69.6       4.8        18.       297.0
1029.0      20.1       70.1       4.7        18.       297.0
1024.8      20.1       70.3       4.7        18.       297.0
1019.4      20.1       70.3       4.7        18.       297.0
1013.3      20.2       70.3       4.7        18.       274.0
1009.7      20.2       70.3       4.7        18.       274.0
1007.2      20.3       70.3       4.5        18.       274.0
1003.9      20.3       70.3       4.7        18.       274.0
1000.8      20.3       70.3       4.4        18.       274.0
 997.0      20.3       70.1       4.6        18.       274.0
 994.3      20.3       69.8       4.6        18.       274.0
 991.2      20.3       70.2       4.6        18.       274.0
 988.3      20.3       70.1       5.3        18.       274.0
 985.9      20.3       69.6       5.7        18.       274.0
 983.6      20.4       70.1       5.7        18.       297.0
 982.7      20.3       70.1       5.7        18.       297.0
 982.0      20.4       70.1       5.7        18.       297.0
 979.8      20.4       70.1       5.9        18.       297.0
 979.3      20.4       70.1       6.8        18.       297.0
 978.7      20.3       70.2       6.9        18.       297.0
 978.0      20.4       70.9       6.6        18.       297.0
 977.8      20.3       70.8       5.8        18.       297.0
 977.6      20.4       70.9       5.9        18.       297.0
 978.6      20.4       70.9       5.9        18.       294.0
 978.1      20.4       70.9       5.9        18.       294.0
 976.9      20.4       70.9       5.1        18.       294.0
 977.6      20.4       70.9       4.8        18.       294.0
 978.7      20.4       70.8       4.8        18.       294.0
 979.9      20.4       70.6       4.8        18.       294.0
 979.2      20.5       70.5       4.8        18.       294.0
 978.0      20.4       70.1       4.8        18.       294.0
 978.2      20.4       69.8       5.1        18.       294.0
11/19/81
  7
LARGE TETHERED BALLOON
ABERDEEN PROVING GROUND, MD
LAT=39 DEG 27 MIN N; LONG=76 DEG 7 MIN W
ELEVATION=6.1 M
START TIME=1611 EDT
STOP TIME=1619 EDT
DESCENT
```

APPENDIX F

PASSIVE MICROWAVE RADIOMETER DATA SET CHARACTERISTICS

File Name:	PMRG
Platform:	Passive Microwave Radiometer
Location:	Columbus, Ohio
	Latitude $40^{\circ}12'$ N; longitude $82^{\circ}42'$ W
Elevation Of Site:	353.6 mmsl
Reference Report:	Bruce L. Gary, "Microwave Atmospheric Remote Sensing of Vertical Temperature Profiles during the 1980 PEPE/NEROS Experiment", Final Report No. 5030-498, Jet Propulsion Laboratory, Pasadena, CA, May, 1981.
Number of Data Sets in File:	5
Number of Columns of Data:	2
Order of Data:	Time (EDT)
	Precipitable Water Vapor (cm)
Number of Cards in File:	228
Archive Date:	April 29, 1981
Format for Data Cards:	I4,F6.2,70X
Format for Header Cards:	I4,F6.2,70X

APPENDIX F

PASSIVE MICROWAVE RADIOMETER
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
8/06/80	PMRG01	1005 - 2004	33	52
8/07/80	PMRG01	0711 - 1953	39	58
8/08/80	PMRG01	1720 - 1730	2	21
8/09/80	PMRG01	0541 - 1143	24	43
8/10/80	PMRG01	0712 - 1830	35	54

APPENDIX F

PASSIVE MICROWAVE RADIOMETER
SAMPLE DATA SET

```
PROJECT PEPE/PEPE-NEROS STUDY                            PMRG01 08/09/80      2  0
TIME      VZ
EDT       CM
0541   3.39
1143   4.69
0541   3.39
1143   4.69
          24
 541   3.39
 552   4.26
 602   4.25
 612   4.25
 622   4.23
 632   4.21
 642   4.29
 652   4.30
 703   4.37
 713   4.39
 723   4.32
 918   4.22
 929   4.15
 939   4.08
 949   4.10
 960   4.10
1010   4.06
1020   4.21
1051   4.29
1102   4.16
1112   4.26
1122   4.42
1133   4.63
1143   4.69
04/29/81
  9
PASSIVE MICROWAVE RADIOMETER MEASUREMENTS OF PRECIPITABLE WATER VAPOR (VZ)
VZ=HEIGHT TO WHICH THE VAPOR IN A COLUMN OF UNIFORM CROSS SECTION
(1 CM**2),FROM THE SURFACE TO SPACE,WOULD EXTEND IF THE VAPOR WERE
CONDENSED TO LIQUID WATER
ELEVATION=353.568 MMSL
LOCATION=COLUMBUS OH
LAT=40 DEG,12 MIN N
LONG=82 DEG,42 MIN W
MEAN PRESSURE=9.76E+05 DYNES/CM**2
```

APPENDIX F

REMOTE MICROWAVE SPECTROMETER DATA SET CHARACTERISTICS

File Name:	RMSG
Platform:	Remote Microwave Spectrometer
Location:	Columbus, Ohio Latitude 40°12' N; longitude 82°42' W
Elevation of Site:	353.6 mmsl
Reference Report:	Bruce L. Gary, "Microwave Atmospheric Remote Sensing of Vertical Temperature Profiles during the 1980 PEPE/NEROS Experiment", Final Report No. 5030-498, Jet Propulsion Laboratory, Pasadena, CA, May, 1981.
Number of Data Sets in File:	5
Number of Columns of Data:	13
Order of Data:	Time (EDT) 12 temperatures at applicable altitudes (°C)
Number of Cards in File:	245
Archive Date:	April 29, 1981
Format for Data Cards:	I4,12(1X,F4.1),16X
Format for Header Cards:	I4,12(1X,F4.1),16X

APPENDIX F

REMOTE MICROWAVE SPECTROMETER
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
8/6/80	RMSG01	0959 - 1946	34	52
8/7/80	RMSG01	0553 - 1947	54	72
8/8/80	RMSG01	1655 - 1724	3	21
8/9/80	RMSG01	0535 - 1953	31	49
8/10/80	RMSG01	0610 - 1823	33	51

APPENDIX F

REMOTE MICROWAVE SPECTROMETER
SAMPLE DATA SET

```
PROJECT PEPE/PEPE-NEROS STUDY                                  RMSG01 08/09/80     13  0
TIME TEMP TEMP TEMP TEMP TEMP TEMP TEMP TEMP TEMP TEMP TEMP TEMP
EDT  DEGC DEGC DEGC DEGC DEGC DEGC DEGC DEGC DEGC DEGC DEGC DEGC
0535 23.0 24.8 25.1 24.8 24.7 24.0 23.0 22.3 21.2 19.5 15.3 10.9
1953 29.9 27.9 27.6 27.1 26.7 26.3 25.2 24.1 23.2 21.9 18.6 20.5
0535 23.0 24.8 25.1 24.8 24.7 24.0 23.0 22.3 21.2 19.5 15.3 10.9
1953 29.9 27.9 27.6 27.1 26.7 26.3 25.2 24.1 23.2 21.9 18.6 20.5
     31
 535 23.9 25.8 26.4 26.5 26.5 26.3 25.2 24.1 23.1 21.3 17.2 13.1
 546 23.8 25.6 26.1 26.2 26.3 25.9 24.6 23.5 22.4 20.8 16.5 13.1
 556 23.3 25.7 26.2 26.5 26.5 26.1 24.9 23.9 23.2 21.0 17.1 13.2
 606 23.2 25.4 26.2 26.2 26.4 25.8 24.8 23.6 22.8 20.6 16.4 12.8
 616 23.1 25.6 26.3 26.4 26.4 26.2 24.9 23.8 22.7 21.0 16.8 13.0
 626 23.6 25.4 26.0 26.1 26.2 25.7 24.5 23.6 22.6 20.6 16.9 12.3
 636 23.1 25.2 25.8 26.1 26.0 25.7 24.2 22.6 22.0 20.1 16.0 11.9
 646 23.0 25.2 25.8 26.1 26.1 25.7 24.5 23.5 22.8 20.5 16.8 12.4
 657 23.1 25.2 25.9 26.1 26.2 25.9 24.3 23.7 22.5 20.3 16.4 12.5
 707 23.6 24.8 25.3 25.5 25.7 25.5 24.1 22.8 21.9 20.0 16.3 12.1
 717 23.8 24.9 25.6 25.9 26.2 25.7 24.3 23.2 22.1 20.3 16.2 12.2
 728 24.1 25.1 25.5 25.7 26.0 25.6 24.6 23.4 22.4 20.6 16.8 12.6
 738 24.4 25.1 25.5 25.8 25.9 25.6 24.5 23.4 22.4 20.1 16.6 11.4
 912 25.4 25.3 25.4 25.2 25.0 24.6 23.5 22.3 21.4 20.0 16.5 12.1
 923 25.5 25.4 25.4 25.0 25.1 24.4 23.4 22.4 21.7 19.8 15.9 12.3
 933 25.7 25.2 25.3 25.0 24.7 24.3 23.3 22.6 21.4 19.6 15.8 11.4
 943 25.7 25.2 25.1 24.8 24.7 24.0 23.0 22.5 21.7 19.5 15.7 11.2
 954 26.0 25.4 25.3 25.1 24.8 24.0 23.2 22.4 21.6 19.7 15.7 11.5
1004 26.3 25.6 25.3 24.9 24.8 24.2 23.4 22.3 21.6 19.6 16.1 11.3
1014 26.6 25.6 25.3 24.9 24.7 24.2 23.3 22.3 21.2 19.5 15.3 11.2
1025 26.7 25.9 25.6 25.4 25.1 24.5 23.6 22.7 21.8 19.6 15.5 10.9
1035 26.7 26.0 25.8 25.5 25.2 24.7 23.9 22.8 22.1 20.0 16.1 11.3
1045 27.3 26.7 26.4 26.1 25.8 25.3 24.2 23.4 22.0 20.5 16.3 11.7
1055 27.7 26.7 26.5 26.1 25.9 25.3 24.6 23.5 22.7 20.6 16.4 12.0
1106 27.7 26.8 26.6 26.2 26.0 25.4 24.5 23.5 22.5 20.7 16.9 12.0
1116 27.9 27.1 26.7 26.4 26.0 25.5 24.5 23.3 22.4 20.6 16.3 12.3
1127 28.5 27.4 27.0 26.6 26.3 25.7 24.9 23.7 22.9 20.7 16.4 12.3
1137 28.5 27.4 27.0 26.5 26.1 25.4 24.5 23.3 22.2 20.5 16.2 12.7
1347 29.2 27.9 27.5 27.1 26.7 26.0 24.8 23.7 22.8 21.9 16.7 20.5
1358 29.9 27.9 27.6 27.1 26.6 25.8 24.7 23.2 22.8 21.5 18.6 19.5
1953 27.7 26.3 26.2 26.0 25.8 25.1 24.2 22.7 22.4 21.0 16.0 16.2
04/29/81
  8
REMOTE MICROWAVE SPECTROMETER BRIGHTNESS TEMPERATURE FOR
APPLICABLE HEIGHTS
ELEVATION=354 MMSL
LOCATION=COLUMBUS OH
LAT=40 DEG,12 MIN N
LONG=82 DEG,42 MIN W
APPLICABLE ALTITUDES(MMSL)=354,411,454,507,571,668,814,942,
1085,1338,1908,2518
```

APPENDIX G

8-CHANNEL RADIOMETER
DATA SET CHARACTERISTICS

File Name:	SP8G
Platform:	8-channel Radiometer
Location:	Goddard Space Flight Center, Greenbelt, MD
	Latitude 37° 45' N; Longitude 75° 33' W
Elevation of Site:	
Reference Report:	None
Number of Data Sets in File:	13
Number of Columns of Data:	9
Order of Data:	Time (EDT)
	Aerosol Optical Thicknesses in 8 Channels (1) 440.0 nm (2) 521.7 nm (3) 557.5 nm (4) 612.0 nm (5) 670.8 nm (6) 750.0 nm (7) 779.7 nm (8) 871.7 nm
Number of Cards in File:	580
Archive Date:	June 8, 1981
Format for Data Cards:	I4,8F8.4
Format for Header Cards:	I4,8F8.4

APPENDIX G

8-CHANNEL RADIOMETER
DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/26/80	SP8G01	0740 - 0954	17	44
7/30/80	SP8G01	0758 - 1204	21	48
7/31/80	SP8G01	0836 - 1153	15	42
8/2/80	SP8G01	0813 - 1135	16	43
8/5/80	SP8G01	0748 - 1331	22	49
8/7/80	SP8G01	0756 - 1043	17	44
8/8/80	SP8G01	0753 - 1201	14	41
8/14/80	SP8G01	0740 - 0954	17	44
8/25/80	SP8G01	0838 - 1240	17	44
8/26/80	SP8G01	0739 - 1241	23	50
8/27/80	SP8G01	0722 - 1240	26	53
8/28/80	SP8G01	0730 - 1012	17	44
8/29/80	SP8G01	0949 - 1251	8	34

APPENDIX G

8-CHANNEL RADIOMETER
SAMPLE DATA SET

PROJECT PEPE/PEPE-NEROS STUDY SP8G01 07/26/80 9 0

TIME	TAUM 1	TAUM 2	TAUM 3	TAUM 4	TAUM 5	TAUM 6	TAUM 7	TAUM 8
EDT								
0740	.9968	.8043	.7230	.6254	.5287	.4297	.3971	.3240
0954	1.3713	1.1637	1.0535	.9274	.8115	.6859	.6373	.5289
0740	.9968	.8043	.7230	.6254	.5287	.4297	.3971	.3240
0954	1.3713	1.1637	1.0535	.9274	.8115	.6859	.6373	.5289
	17							
0740	.9968	.8043	.7230	.6254	.5287	.4297	.3971	.3240
0742	1.0091	.8145	.7333	.6280	.5355	.4355	.3979	.3240
0743	1.0081	.8075	.7303	.6271	.5323	.4322	.3983	.3243
0744	1.0074	.8096	.7330	.6291	.5361	.4363	.4020	.3272
0749	1.0687	.8596	.7791	.6730	.5740	.4675	.4332	.3532
0750	1.0801	.8683	.7841	.6756	.5768	.4719	.4368	.3569
0755	1.0441	.8424	.7589	.6514	.5542	.4500	.4145	.3372
0757	1.0356	.8375	.7591	.6533	.5555	.4513	.4159	.3383
0802	1.0065	.8119	.7324	.6307	.5376	.4396	.4061	.3458
0807	1.0241	.8354	.7581	.6552	.5607	.4581	.4229	.3449
0812	1.1079	.9050	.8223	.7102	.6068	.4947	.4569	.3740
0820	1.1706	.9565	.8710	.7556	.6479	.5313	.4912	.4023
0825	1.2484	1.0344	.9429	.8215	.7102	.5849	.5426	.4465
0830	1.3660	1.1637	1.0535	.9274	.8115	.6859	.6373	.5289
0924	1.3318	1.0941	.9983	.8777	.7597	.6224	.5832	.4760
0925	1.3713	1.1289	1.0265	.8905	.7550	.6174	.5761	.4725
0954	1.3669	1.1418	1.0410	.9067	.7840	.6640	.5999	.4881

06/08/81
17

AEROSOL OPTICAL THICKNESSES MEASURED FROM 8-CHANNEL RADIOMETER AT
GODDARD SPACE FLIGHT CENTER, GREENBELT, MD
LATITUDE 37 DEG 45 MIN N; LONGITUDE 75 DEG 33 MIN W
TAUM=AEROSOL OPTICAL THICKNESS
TAUMS=OPTICAL THICKNESS FOR MOLECULAR SCATTERING
TAUO3=OPTICAL THICKNESS FOR OZONE ABSORPTION
LAMBDA=CENTRAL WAVELENGTH OF FILTER
ASSUMPTION: TOTAL AMOUNT OF OZONE=0.3 ATM-CM
FILTER CHARACTERISTICS:

NO.	LAMBDA	TAUMS	TAUO3
NO. 1	LAMBDA = 440.0 NM	TAUMS = 0.2453	TAUO3 = 0.001
NO. 2	LAMBDA = 521.7 NM	TAUMS = 0.1219	TAUO3 = 0.0152
NO. 3	LAMBDA = 557.5 NM	TAUMS = 0.0930	TAUO3 = 0.0292
NO. 4	LAMBDA = 612.0 NM	TAUMS = 0.0636	TAUO3 = 0.0357
NO. 5	LAMBDA = 670.8 NM	TAUMS = 0.04386	TAUO3 = 0.0136
NO. 6	LAMBDA = 750.0 NM	TAUMS = 0.02793	TAUO3 = 0.0032
NO. 7	LAMBDA = 779.7 NM	TAUMS = 0.02387	TAUO3 = 0.0022
NO. 8	LAMBDA = 871.7 NM	TAUMS = 0.01522	TAUO3 = 0.0008

APPENDIX G

4-CHANNEL SUNPHOTOMETERS DATA SET CHARACTERISTICS

File Name: SP4G

Platform: 4-channel sunphotometers at 12 locations

Locations:

#302 Penn State University, University Park, PA
40°47' N latitude 77°54' N longitude

#303 Atmospheric Sciences Research Center, Albany, NY
42°37' N latitude 73°50' W longitude

#308 Woods Hole, MA
41°30' N latitude 70°40' W longitude

#310 Goddard Space Flight Center, Greenbelt, MD
39°01' N latitude 76°50' W longitude

#311 Mobile Radar, Columbus, OH
39°56' N latitude 83°00' W longitude

#315 Columbus, OH
39°56' N latitude 83°00' W longitude

#317 Minnesota Van, Columbus, OH
39°56' N latitude 83°00' W longitude

#318 Moving Lab, Columbus, OH
variable latitude and longitude

#320 Woods Hole, MA
41°30' N latitude 70°40' W longitude

#322 Hubbard Brook Experimental Forest, W. Thornton, NH
43°56' N latitude 71°40' W longitude

#323 Governor's State University, Chicago, IL
41°25' N latitude 87°43' W longitude

#488 Rosensteil School of Marine and Atmospheric Sciences, University of Miami, Miami, FL
25°36' N latitude 80°12' W longitude

Elevation of Sites: Variable

Reference Report: Joseph M. Prospero, Dennis L. Savoie and Thomas H. Snowdon, "Aerosol Optical Depth Measurements in Pollution Episodes", Final Report, NASA Contract NAS5-26241, Rosensteil School of Marine and Atmospheric Science, University of Miami, Miami, FL, January, 1981, Revised May, 1981.

APPENDIX G

Number of Data Sets in File:	46
Number of Columns of Data:	11
Order of Data:	Time(EDT)
	Photometer Number
	Temperature of Detector (°C)
	Sunphotometer Reading of Blue Channel Corrected for Deviation of Detector from 25°C
	Sunphotometer Reading of Green Channel Corrected for Deviation of Detector from 25°C
	Sunphotometer Reading of Red Channel Corrected for Deviation of Detector from 25°C
	Sunphotometer Reading of Water Channel Corrected for Deviation of Detector from 25°C
	Turbidity Measured in Blue Channel (at 380 nm)
	Turbidity Measured in Green Channel (at 500 nm)
	Turbidity Measured in Red Channel (at 875 nm)
	Precipitable Water Vapor(cm), Measured in Water Channel (at 945 nm)
Number of Cards in File:	1736
Archive Date:	July 1, 1981
Format for Data Cards:	2I4,9F6.2
Format for Header Cards:	2I4,9F6.2

APPENDIX G

4-CHANNEL SUNPHOTOMETERS DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
7/13/80	SP4G01	0808 - 1920	36	55
7/14/80	SP4G01	0803 - 1519	18	41
7/15/80	SP4G01	0629 - 1509	26	48
7/16/80	SP4G01	0705 - 1357	18	41
7/17/80	SP4G01	0855 - 1245	11	34
7/18/80	SP4G01	0632 - 1412	31	56
7/19/80	SP4G01	0809 - 1304	8	28
7/20/80	SP4G01	0705 - 1809	26	48
7/21/80	SP4G01	0831 - 1311	15	37
7/22/80	SP4G01	0737 - 1246	8	29
7/23/80	SP4G01	0728 - 1232	9	29
7/24/80	SP4G01	0704 - 1629	29	54
7/25/80	SP4G01	0707 - 1318	28	53
7/26/80	SP4G01	0728 - 1149	22	44
7/27/80	SP4G01	0711 - 1138	19	39
7/28/80	SP4G01	0729 - 1228	13	34
7/29/80	SP4G01	0736 - 1228	12	33
7/30/80	SP4G01	0747 - 1256	22	43
7/31/80	SP4G01	0714 - 1302	38	63
8/01/80	SP4G01	0719 - 1226	8	29
8/02/80	SP4G01	0724 - 1255	28	49
8/03/80	SP4G01	0824 - 1652	7	26
8/04/80	SP4G01	0945 - 1820	9	30
8/05/80	SP4G01	0822 - 1557	10	32
8/07/80	SP4G01	0712 - 1135	16	38
8/08/80	SP4G01	0706 - 1204	31	56
8/09/80	SP4G01	0739 - 1202	8	30
8/10/80	SP4G01	0727 - 1123	7	28
8/11/80	SP4G01	0847 - 1221	6	28
8/12/80	SP4G01	0732 - 1134	7	29
8/13/80	SP4G01	0933 - 1209	15	39
8/14/80	SP4G01	0821 - 1243	14	35

APPENDIX G

4-CHANNEL SUNPHOTOMETERS DATA SET SPECIFICATIONS

Date	Data Set Name	Time of Measurement (EDT)	Number of Data Points	Number of Cards in Data Set
8/15/80	SP4G01	0749 - 1236	10	31
8/17/80	↓	0914 - 1205	6	27
8/18/80	↓	0925 - 1335	2	21
8/20/80	↓	0815 - 0919	2	21
8/21/80	↓	0733 - 1132	10	32
8/22/80	↓	0839 - 1111	6	27
8/23/80	↓	0732 - 0958	3	23
8/24/80	↓	0832 - 1028	3	22
8/25/80	↓	0734 - 1243	27	51
8/26/80	↓	0733 - 1233	33	56
8/27/80	↓	0725 - 1243	33	54
8/28/80	↓	0726 - 1130	24	46
8/29/80	↓	0745 - 1239	24	46
9/01/80	↓	1003 - 1115	4	23

APPENDIX G

4-CHANNEL SUNPHOTOMETERS
SAMPLE DATA SET

PROJECT PEPE/PEPE-NEROS STUDY SP4G01 07/16/80 11 0

TIME EDT	PNO	TEMP DEG C	BLCOR	GNCOR	RDCOR	WACOR	BLTBD	GNTBD	RDTBD	VZ CM
0705	310	24.6	0.0	0.0	13.0	0.0	0.000	.117	.056	0.000
1357	488	31.8	29.5	111.6	147.6	55.4	.451	.483	.547	0.528
0705	310	24.6	0.0	0.0	13.0	0.0	0.000	.117	.056	0.000
1357	488	31.8	29.5	111.6	147.6	55.4	.451	.483	.547	0.528
	18									
0705	310	27.1	0.0	4.1	46.6	5.4	0.000	.251	.109	5.779
0817	310	29.1	1.6	23.3	81.6	21.5	.396	.269	.110	6.191
0901	310	32.4	3.1	35.2	90.6	30.2	.409	.269	.117	6.356
1112	310	37.7	7.2	57.1	102.0	49.3	.418	.270	.133	6.262
1306	310	30.3	9.2	65.4	109.1	50.7	.387	.252	.119	7.331
1357	310	31.0	10.0	66.5	109.3	50.2	.343	.241	.117	7.357
0754	315	27.1	1.2	33.5	83.4	9.8	.251	.156	.091	6.804
0842	315	27.4	4.9	67.5	125.0	26.6	.213	.137	.065	6.196
0935	315	25.2	8.6	90.5	137.8	39.2	.209	.134	.065	6.211
1034	315	25.6	13.3	111.6	147.6	50.2	.173	.118	.061	6.305
0802	320	24.6	2.7	46.3	83.6	55.4	.285	.226	.093	6.796
1142	323	27.4	6.8	41.1	28.1	14.0	.451	.483	.547	5.657
0715	488	28.3	0.0	.0	13.0	0.0	0.000	.307	.065	0.000
0728	488	30.0	0.0	3.3	21.0	.0	0.000	.138	.056	0.000
0756	488	30.5	2.9	9.2	28.0	2.2	.190	.138	.059	8.528
0850	488	30.0	11.8	19.2	33.9	5.9	.190	.140	.067	8.061
0946	488	28.5	20.0	25.2	37.0	9.4	.193	.145	.072	7.856
1053	488	31.8	29.5	32.3	40.1	15.2	.165	.117	.065	6.354

07/01/81
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4-CHANNEL SUNPHOTOMETER MEASUREMENTS OF ATMOSPHERIC TURBIDITY
TURBIDIY MEASUREMENTS FOR BLUE(BLTBD), GREEN(GNTBD) AND RED(RDTBD) CHANNELS;
PRECIPITABLE WATER VAPOR(VZ) FOR WATER CHANNEL
TEMP=TEMP OF DETECTOR; BLCOR, GNCOR, RDCOR AND WACOR=CORRECTED SUNPHOTOMETER
READINGS OF BLUE, GREEN, RED AND WATER CHANNELS, RESPECTIVELY
MEASUREMENTS MADE AT SEVERAL LOCATIONS (PNO=PHOTO. NO.)

PHOTO. NO.	LOCATION	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
310	GODDARD SPACE FLIGHT CTR., GREENBELT, MD	39	01N	76	50W
315	COLUMBUS, OH	39	56N	83	00W
320	WOODS HOLE, MA	41	30N	70	40W
323	GOVERNOR'S STATE UNIV., CHICAGO, IL	41	25N	87	43W
488	RSMAS, UNIV. OF MIAMI, MIAMI, FL	25	36N	80	12W

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16. Abstract The NASA Langley Research Center conducted and/or coordinated a total of eight experimental air quality measurement systems during July and August 1980 as part of the EPA PEPE/NEROS field measurement program. Data from those efforts have been entered into an archive that may be accessed by other researchers. The data sets consists of airborne measurements of regional mixed layer heights and aerosol and ozone distributions as well as point measurements of meteorological parameters and ozone obtained during diurnal transitions in the planetary boundary layer. This report gives a discussion of each measurement system, a preliminary assessment of data quality, a description of the archive format for each data set, and a summary of several proposed scientific studies which will utilize these data.

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