NASA Technical Memorandum 100706

NASA Sea Ice and Snow Validation Program for the DMSP SSM/I

NASA DC-8 Flight Report

D. J. Cavalieri

September 1988

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National Aeronautics and
Space Administration
Scientific and Technical
Information Branch
1988

Frontispiece

Photo of the NASA DC-8-72 over NASA Ames Research Center.

PREFACE

In June 1987 a new microwave sensor called the Special Sensor Microwave Imager (SSM/I) was launched as part of the Defense Meteorological Satellite Program (DMSP). In recognition of the importance of this sensor to the polar research community, NASA developed a program to acquire the data, to convert the data into sea ice parameters, and finally to validate and archive both the SSM/I radiances and the derived sea ice parameters. Because the determination of the accuracy of these parameters is critical to the development of a scientifically useful data set, NASA also formed a team of specialists to validate the sea ice products. A key component of the NASA sea ice validation program was a series of SSM/I aircraft underflights with the NASA DC-8 Airborne Laboratory. The mission (dubbed the Arctic '88 Sea Ice Mission) was completed in March 1988. This report summarizes the mission, includes a summary of aircraft instrumentation, coordination with participating Navy aircraft, flight objectives, flight plans, type of data collected, SSM/I orbits for each day during the mission, and lists several piggyback experiments supported during this mission.

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I. Introduction

In March 1988 the NASA DC-8 Airborne Laboratory completed a series of seven flights in coordination with two Navy research aircraft in support of NASA's Sea Ice and Snow Validation Program (Cavalieri and Swift, 1987). A total of fifteen flights with the three aircraft all based in Fairbanks, Alaska were made over portions of the Bering, Chukchi, and Beaufort seas. The overall goal of this mission was to collect aircraft data coincident with satellite overpasses in different regions of the Arctic for the purpose of assessing the accuracy of the SSM/I-derived ice-edge position, total and multiyear ice concentrations. A secondary objective of the mission was to acquire the requisite data to determine the potential of the new SSM/I 85 GHz channels for polar research.

II. NASA DC-8 Aircraft Instrumentation

The NASA D-8 aircraft was equipped with both active and passive microwave sensors. The complement of fixed-beam, dual-polarized radiometers supplied by the Goddard Space Flight Center (GSFC) has frequencies and polarizations closely matching those of the SSM/I. The development, integration, operation, and calibration of the system called the Aircraft Multichannel Microwave Radiometer (AMMR) was carried out under the direction of Tom Wilheit of the Microwave Sensors and Data Communications Branch at Goddard. The active sensors supplied by the Jet Propulsion Laboratory (JPL) of the California Institute of Technology and operated under the direction of Walt Brown included fully polarimetric C-, L-, and P-band synthetic aperture radars (SAR). The operating characteristics of these microwave sensors are summarized in Table 1.

In addition to the microwave sensors other instruments were flown in a support capacity. These included two Global Positioning System (GPS) receivers operated by Bill Krabill of the Wallops Flight Facility, GSFC. These receivers provided real-time information on the aircraft's position serving as a check on the DC-8 inertial navigation systems. These data will be used in a post-flight capacity to insure accurate determination of the horizontal position of the DC-8. Aerial cameras which included a 35mm Giannini, a 70mm Vinton and a video camera provided information on the sea ice and snow cover when light levels and atmospheric conditions permitted. The audio channel on the video recorder was used for recording the comments from the ice observers during each flight. Other support instruments included two and three stage hygrometers for recording the dew-point temperature of the ambient air, a radar altimeter for providing altitude above terrain, and inertial navigation systems for providing basic navigation and aircraft attitude information. The navigation, aircraft attitude, and radar altimetry data were provided to each experiment onboard the aircraft through the Data Acquisition and Distribution System (DADS). A summary of the NASA DC-8 instrumentation is given in Table 2. The participants

Table 1. NASA DC-8 Microwave Sensors

PASSIVE MICROWAVE

Goddard Aircraft Multichannel Microwave Radiometer (AMMR)

Freq (GHz)	Polarization	Beam Width (degrees)	Resolution	Look angle (degrees)
18.0	H & V	6	1/7 alt.	45 L
21.0	V only	"	"	"
37.0	H & V	"	"	"
92.0	H & V	"	"	"
21.0	-	-	-	skyward
37.0	-	-	-	"

ACTIVE MICROWAVE

JPL Synthetic Aperture Radar (SAR): Left side imaging (30 - 70)

Band	Wavelength	Polarization	Resolution (Azim/Slant)
P	67 cm	H & V alt.trans. H & V simult. rec.	10.7/7.5 meter "
L	24 cm	"	"
C	5.6 cm	"	"

Table 2. NASA DC-8 Instrumentation

SENSOR	EXPERIMENTERS	MEASUREMENT
PRIMARY EXPERIMENTS:		
1. Aircraft Multichannel Microwave Radiometer (AMMR)	Donald J. Cavalieri/NASA GSFC Thomas T. Wilheit/NASA GSFC Donald A. Williams/SciTech Inc.	Microwave signatures of sea ice & snow (see Table 1)
2. Synthetic Aperture Radar (SAR)	Walter E. Brown/JPL Timothy H. Miller/JPL	Microwave signatures of sea ice & snow (see Table 1)
SUPPORT SYSTEMS:		
3. Global Positioning System (GPS) receivers (Motorola Eagle)	William Krabill/NASA GSFC	Tracks phase of L-band carrier of the GPS signals.Provides positional accuracy to about 25 meters.
4. Data Acquisition and Distribution System (DADS)	Russell Burns/Sterl.Software Sarah Young/Sterl.Software	Distributed day, time, latitude, longitude, pitch, roll, wind speed, wind direction, air speed, ground speed, true heading, pressure, altitude, radar altitude, dew-frost point, static and total air temp, cabin alt., sun elevation and azimuth relative to both ground and aircraft mach number, way-point info., and cross-track dist.

Table 2. NASA DC-8 Instrumentation (continued)

	SENSOR	EXPERIMENTERS	MEASUREMENT
5.	2-stage and 3-stage hygrometers (G.E. 1011 and E.G.& G. 300)	Carl Berg/Northrup Serv.Inc.	Provides dew-point temp of the ambient air.
6.	Radar Altimeter (Stewart-Warner APN-222)	John Reller/NASA ARC Carl Berg/Northrup Serv.Inc.	Provides above terrain altitude.
7.	Infrared Radiometer (PRT-5)	John Reller/NASA ARC	Provides surface temperature.
8.	Inertial Navigation Systems	John Reller/NASA ARC Carl Berg/Northrup Inc.	Provides wind speed and direction, position, true heading, attitude, and ground speed.
9.	Aerial photography	Bernardo Ponseggi/NASA ARC Eric James/NASA ARC	a) 35mm Giannini, left viewing, 45 degrees from nadir. b) 70mm Vinton, nadir viewing. c) video camera, left viewing, 45 degrees from nadir.

on the NASA DC-8 flights are listed in Table 3.

III. NASA/Navy Aircraft Coordination

The NASA DC-8 flights were coordinated with two Navy research aircraft also supporting NASA's validation program. An NRL P-3 provided high-resolution (100 meter) passive microwave imagery with the NORDA Ka-band Radiometer Mapping System (KRMS) operating at 33.3 GHz and the NADC P-3 provided wide-swath SAR coverage at C-, L-, and X-bands. Both aircraft flew mosaic patterns measuring approximately 100 km by 200 km in area. These mosaics covered several SSM/I footprints. Ice parameters derived from the aircraft mosaics will be compared with the SSM/I derived parameters, thus providing a direct check on the accuracy of the SSM/I-derived sea ice parameters. Further, an intercomparison of data from the three aircraft will provide additional checks on the validity of the sea ice products and will also serve to identify algorithm improvements. The relative positions of the NASA and Navy aircraft during these flights are illustrated in Figure 1. Participants on the NRL P-3 flights are listed in Table 4 and those on the NADC P-3 flights are listed in Table 5.

IV. Aircraft/Satellite Coordination

A key requirement for planning aircraft flights which provide the optimum opportunity to obtain the requisite data needed for meeting the scientific objectives of the mission was having access to near real-time SSM/I data. Through the cooperation of Capt. Otto Steffin, Chief of NOAA's Ocean Applications Group in Monterey, and his programmer Warren Yogi who provided technical support, we were able to access directly SSM/I radiance data in Monterey. Per Gloersen at Goddard explored various data links and was able ultimately to route the near real-time data to Goddard. Once the data were acquired at Goddard, Steve Schweinfurth gridded the radiances and applied the NASA SSM/I sea ice algorithm. The derived sea ice parameters in the form of total sea ice and multiyear ice concentration computer character maps were then transmitted to our flight operations center in Fairbanks (all within 12 hours!). An example of a Bering Sea ice concentration map for March 21 is shown in Figure 2. Maps similar to these were received in Fairbanks almost every day during the mission. Three DMSP SSM/I orbits providing coverage of the Bering, Beaufort, and Chukchi seas also for March 21, 1988 is shown in Figure 3.

Although most of the flights were at night to obtain coincident observations with the SSM/I, some of the flights were made during daylight coincident with NOAA-9 and -10 and LANDSAT-4 and -5 overpasses. Under clear atmospheric conditions NOAA AVHRR and LANDSAT MSS sensors provided visible and infrared sea ice imagery at spatial resolutions of 1 kilometer and 80-meters respectively. Ice concentrations derived from the high resolution LANDSAT data will be compared with the Goddard AMMR, the JPL and NADC SAR, and the NORDA KRMS ice products.

Table 3. NASA DC-8 Participants

NASA Ames Research Center
Bruce A. Barney, DC-Pilot
Gordon H. Hardy, Co-Pilot
D. Nielsen, Flight Engineer
Leo H. Degreef, Mission Manager
Earl V. Petersen, Mission Manager
Dean N. Jaynes, Mission Manager
Bernardo G. Ponseggi
Eric James

NASA Goddard Space Flight Center
Donald J. Cavalieri
William B. Krabill
Thomas T. Wilheit

Jet Propoulsion Laboratory
Walter E. Brown
John Crawford
JoBea Cimino
Ben Holt
William R. Fiechter
Abel G. Guerra
Johnny Y. Kao
Duc D. Le
Timothy W. Miller
Stephen Smith

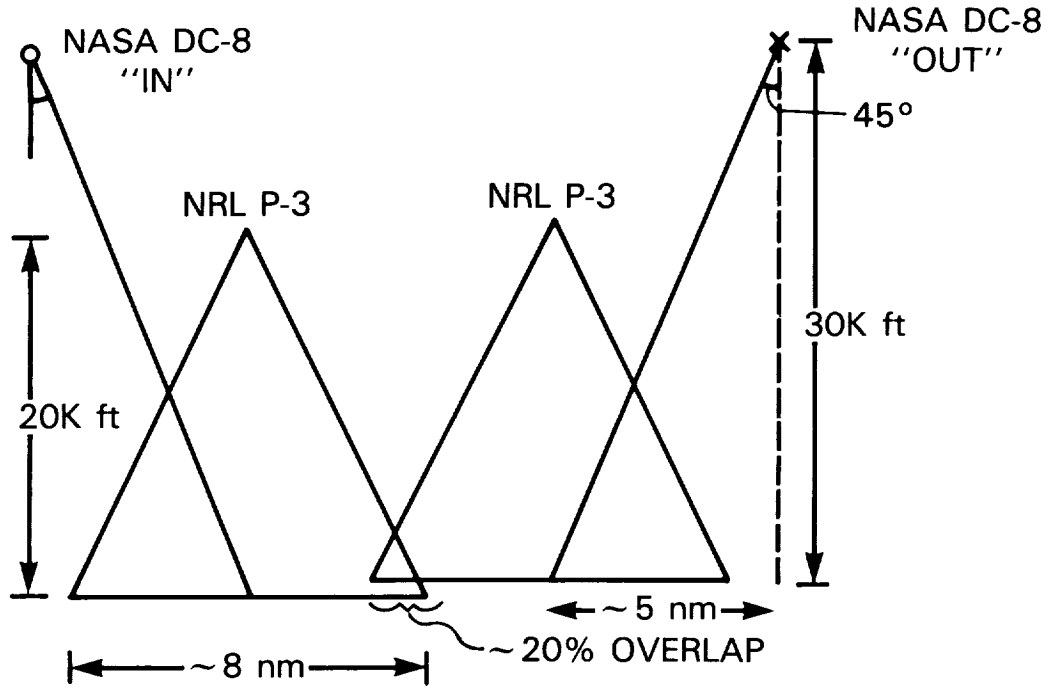
Navy/NOAA Joint Ice Center
Gary Wohl

Northrup Services/ARC
Douglas McKinnon
Paul Alvarez
Steven G. Davis
Glen Harner
James Horvat
Micheal Lakowski
Eugene Moniz
Paul Ristrim
Ken Thomas
Henry Zuberer

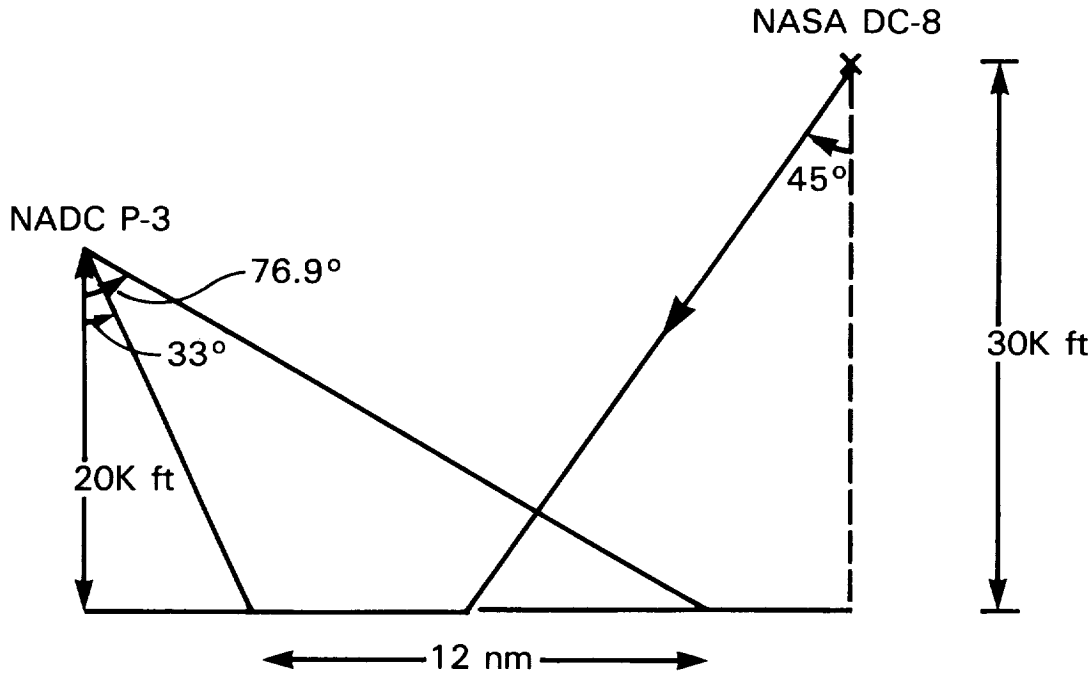
Scientific Technology, Inc.
Donald A. Williams

Sterling Software/ARC
Russell Burns

University of Colorado
Konrad Steffen



a) NASA DC-8/NRL P-3 PLAN



b) NASA DC-8/NADC P-3 PLAN

Figure 1. NASA/Navy flight patterns.

Table 4. NRL P-3 Participants

NAVAL RESEARCH LABORATORY

CDR H. J. Enuk
LCDR C. C. Schoulda
LCDR D. W. Thornburg
LT D. G. Seybold
LT R. J. Miller
AMSC F. J. Peretto
AD1 M. J. Peschl
AT1 W. E. Sears
AD1 F. A. Jones
AT2 T. P. Rizan
AT2 D. V. MacCormack
AMS3 T. F. Anderson

NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY

D. T. Eppler
D. Farmer

Table 5. NADC P-3 Participants

NAVAL AIR DEVELOPMENT CENTER

CDR R. Feierabend
LCDR P. Letarte
LT J. Hovland
LT E. Sugai
AD1 R. Rock
AE1 E. Seaman
AT2 B. Levault
ADCS J. Snow
AX1 D. Jernigan
AE2 R. Strain
ADZ W. Ragan
AMEZ T. Higgins
AMEZ T. Derricott
A. Carreras
K. Birney
S. Lyness
S. Krazsney
A. Ochadlick

ENVIRONMENTAL RESEARCH INSTITUTE OF MICHIGAN

E. Kasischke
J. Lyden

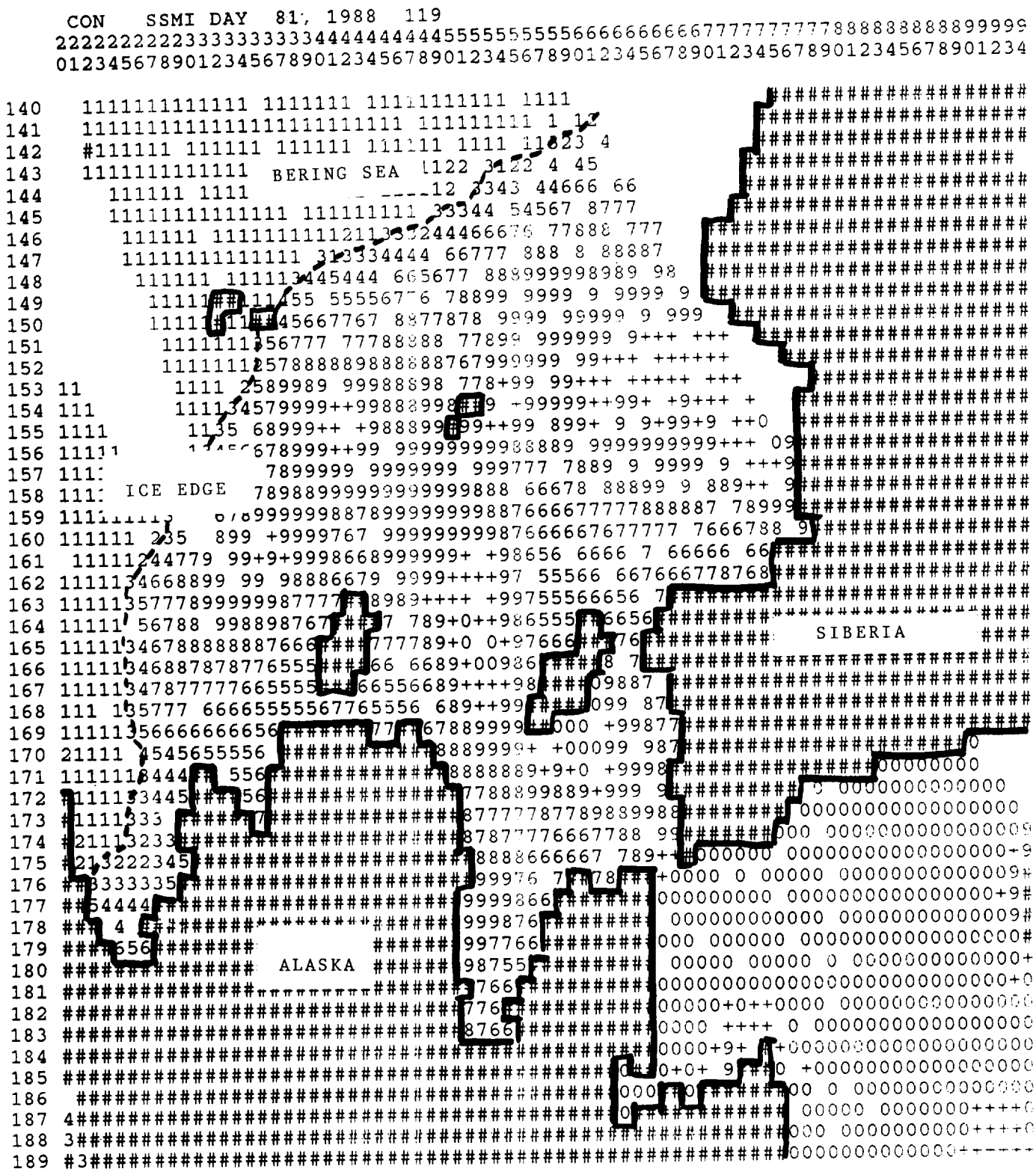


Figure 2. Bering Sea ice concentration derived from near real-time DMSP SSM/I data for March 21, 1988.

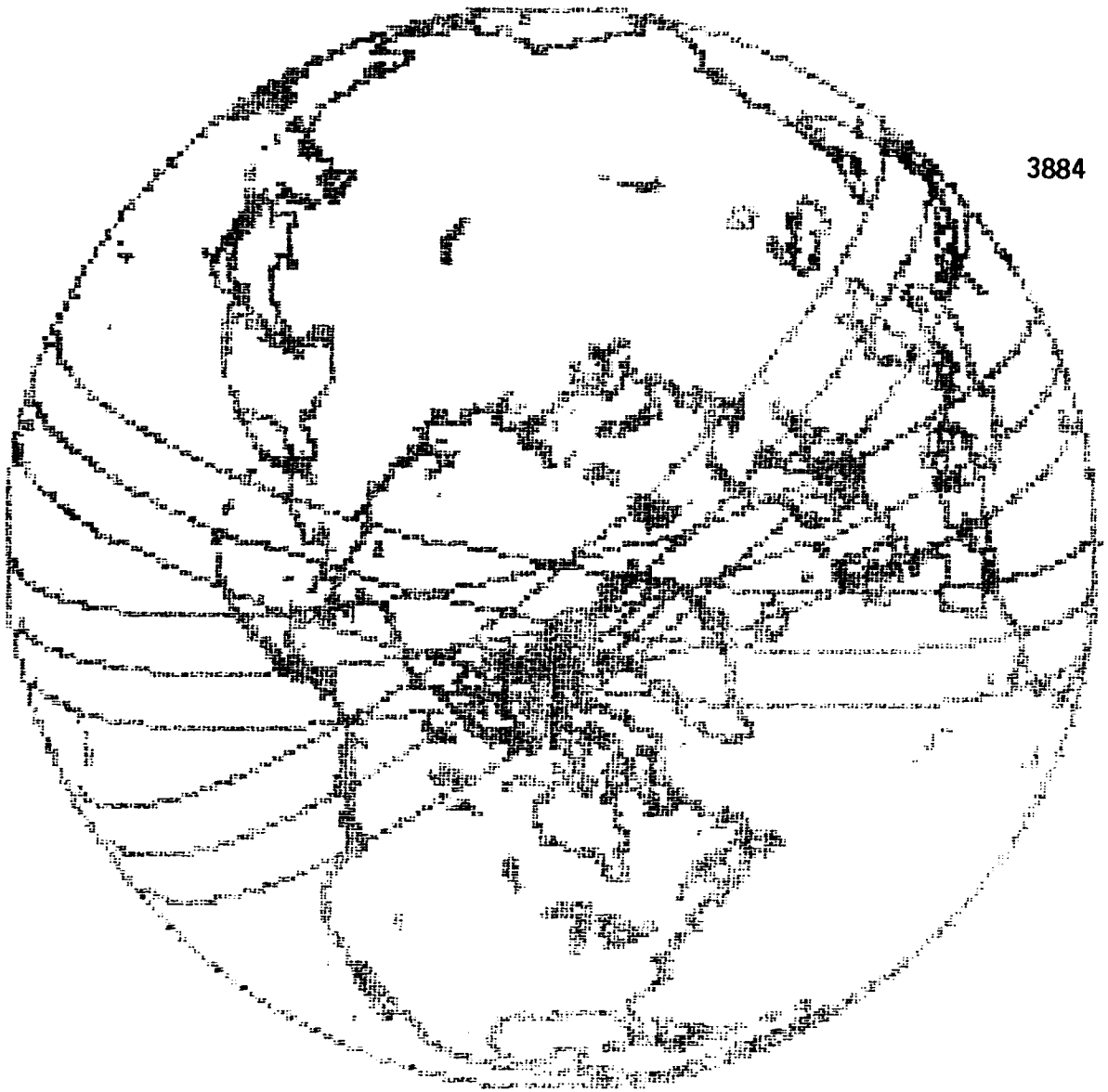


Figure 3. Three DMSP SSM/I orbits providing coverage of the Bering, Beaufort, and Chukchi seas on March 21, 1988.

V. NASA DC-8 Flight Summary

A summary of each of the 17 flights made by the three aircraft including date, aircraft, region flown, flight objective and satellite coverage is given in Table 6. For each of the nine NASA DC-8 flights, a computer generated map of the flight lines, the mission director's flight log, and output from DADS including most of the parameters listed in Table 2 are given in Appendix A. A log of the aerial photography obtained is given in Appendix B.

Gary Wohl of the Navy/NOAA Joint Ice Center provided daily weather briefings for flight planning while in Fairbanks. A summary of the overall weather conditions during our two-week deployment provided by Gary is presented in Appendix C. Gary also kindly provided a set of Navy/NOAA JIC ice charts which appear in Appendix D.

In addition to the SSM/I sea ice and snow validation flight program other experiments were supported as time permitted. These are summarized in Table 7. We were also glad to have visiting scientists from the University of Alaska and from the Fish and Wildlife Service, Department of Interior join us on selected flights. These visitors are listed in Table 8.

VI. Concluding Remarks

This report was written almost six months after the completion of the flights. During this time a preliminary examination of the aircraft microwave data was undertaken and all indications are that the mission was a success. Preliminary results from the NASA DC-8 flights indicate that sea ice signatures obtained with the new dual-polarized 92 GHz aircraft radiometer appear to provide information on surface roughness, variations in snow depth, and on new ice types. These signatures in combination with the lower frequency dual-polarized channels may lead to the development of a new generation of sea ice algorithms. The excellent imagery from the KRMS on the NRL P-3 promises to be extremely useful for comparisons with not only the SSM/I, but also with the DC-8 AMMR and SAR data. In addition, the early results from the JPL and NADC aircraft radars suggest that C-band provides good discrimination between multiyear and first-year sea ice types, while the longer wavelength P- and L-bands from the JPL SAR highlight ridges, but not ice types. This result is particularly promising for the development of C-band SAR algorithms for use with upcoming spacecraft including the Canadian Radarsat and ESA's ERS-1 and SAR-C.

Finally, the coincident satellite/aircraft data set acquired during this Arctic aircraft mission is the best combined active/passive microwave data set collected to date and is expected to serve as the basis for developing new multisensor techniques for monitoring the polar regions with the planned Eos polar orbiting platforms scheduled for the 1990s.

Table 6. NASA/Navy Aircraft Flight Summary

DATE	AIRCRAFT	REGION	OBJECTIVE
Mar 8*	NRL P-3	Chukchi	Underfly SSM/I; thin & thick FY ice; MY/FY transition
Mar 9	NASA DC-8	Transit	Colorado/Wyoming snow basins
Mar 11	NASA DC-8 NRL P-3	Beaufort	Ice camp; sharp MY/FY trans.; MY ice edge definition & variability
Mar 13*	NASA DC-8 NRL P-3	Bering	Overfly polynya; new ice formation; ice concentration variability
Mar 14	NASA DC-8 NRL P-3	Chukchi	Coastal polynya; gradual FY/MY transition; shear zone
Mar 17	NASA DC-8	Prudhoe/ Harrison Bay	Locate and verify MY variability observed in SSMI sea ice imagery
Mar 18	NASA DC-8 NADC P-3	Beaufort	Underfly SSM/I; overfly ice camp.
Mar 19*	NASA DC-8 NADC P-3	Beaufort	Underfly SSM/I; variability of FY/MY ice concentration
Mar 21*	NASA DC-8 NADC P-3	Bering	Underfly SSM/I; definition of ice edge; effectiveness of weather filter; ice concentration variability
Mar 22	NADC P-3	Chukchi	Ice type variability
Mar 23	NASA DC-8	Transit	Alaskan glaciers

* LANDSAT coverage
LANDSAT coverage also for 3/12 and 3/16
DMSP SSM/I each day and DMSP OLS coverage 3/12 through 3/22

Table 7. PiggyBack Experiments

Experiment	Investigator	Comments
Super-Swath	Cimimo/JPL	SAR calibration
Bonanza Creek	Cimino/JPL	Forestry and Snow Studies
Colorado/Wyoming Snow Basins	Campbell/USGS Josburger/USGS	Microwave study of snow
Tanana	Gatto/CRREL	Microwave study of free water
Glacier Bay	Smith, Ranson & Hall/GSFC	Forestry & Glaciology studies with SAR
UAF Tunnel	Farr/JPL Wall/JPL	Microwave penetration of permafrost
Katmai	Mougnis-Mark/UH	Volcanic studies
West Fork, Black Rapids & Fels Glaciers	Cavalieri/GSFC Harrison/UAF Shapiro/UAF	Microwave study of glaciers.
Atigun Gorge & Anwar Line	Shapiro/UAF Benson/UAF	Microwave study of snow

Table 8. Visiting Scientists

Scientist	Interest
Dr. Vera Alexander Professor and Director, Institute of Marine Science Acting Dean, School of Fisheries and Ocean Sciences University of Alaska at Fairbanks	Physical and biological processes associated with Arctic polynyas.
Dr. Susan Hills Fish and Wildlife Service Arctic National Wildlife Refuge U.S. Department of Interior	Arctic marine mammal studies.
Dr. Martin O. Jeffries Research Fellow Geophysical Institute University of Alaska at Fairbanks	Glaciers, ice bergs and sea ice studies.
Mrs. Cindy Wilson Geophysical Institute University of Alaska at Fairbanks	Alaskan SAR Facility

ACKNOWLEDGEMENTS

The planning and successful completion of this mission resulted from the support received from a number of key individuals. In particular Tom Wilheit, Tom Dod, Dick Kutz, and John Fuchs of the Microwave Sensors and Data Communication Branch at Goddard, and Don Williams of Scientific Technology, Inc., are all responsible for the successful operation of the passive microwave radiometers during each of the flights.

Walt Brown and Tim Miller of JPL were responsible for the successful operation of the JPL SAR and John Crawford and Ben Holt of the JPL Oceanography Group provided expert assistance in defining optimum times of SAR sea ice coverage on each flight.

John Reller, NASA DC-8 Aircraft Manager at NASA ARC, was responsible for early mission planning, for overall logistics support, and for coordinating the integration of the sensors on this new NASA aircraft. The successful completion of the NASA aircraft operations phase of the mission is due largely to the mission managers Leo DeGreef, Earl Petersen and Dean Jaynes through their excellent coordination and skillful integration of aircraft system requirements with scientific objectives. A great deal of credit is also given both the ground and flight crew of the DC-8 and in particular Bruce Barney, pilot, Gordon Hardy, co-pilot, and Gene Moniz, navigator, for their support and full cooperation in the planning and execution of each of the flights.

Per Gloersen and Steve Schweinfurth at Goddard and Otto Steffin and Warren Yogi at NOAA's Ocean Applications Group, were responsible for providing the near real-time SSM/I sea ice data. While in Fairbanks, the help of Cindy Wilson, administrative assistant to Gunter Weller of the Geophysical Institute, in setting up the communications to receive the SSM/I data is also greatly appreciated.

The cooperation of the Navy P-3 commanders and crews is also gratefully acknowledged; in particular CDR Enuk, LCDR Schoulda, and LCDR Thornburg with the Naval Research Laboratory aircraft and CDR Feierabend and LCDR Letarte with the Naval Air Development Center aircraft. Helpful discussions during flight coordination planning sessions were held with Duane Eppler and Dennis Farmer of NORDA and with Jim Lyden and Erik Kasischka of ERIM.

Special thanks are due Koni Steffen of the University of Colorado for his help in flight planning and for serving as an ice and snow observer and to Gary Wohl of the Navy/NOAA Joint Ice Center who served both as weather forecaster and ice observer during each of the flights.

Finally, the support of NASA's Oceanic Processes Branch, the Office of Naval Research, the Navy/NOAA Joint Ice Center, the Naval Ocean Research and Development Activity and the Naval Air Development Center is gratefully acknowledged.

REFERENCE

Cavalieri, D. J. and C. T. Swift, NASA Sea Ice and Snow Validation Plan for the Defense Meteorological Satellite Program Special Sensor Microwave Imager, NASA Technical Memorandum No. 100683, National Aeronautics and Space Administration, Washington, DC, September 1987.

Appendix A
NASA DC-8 Aircraft Flight Logs

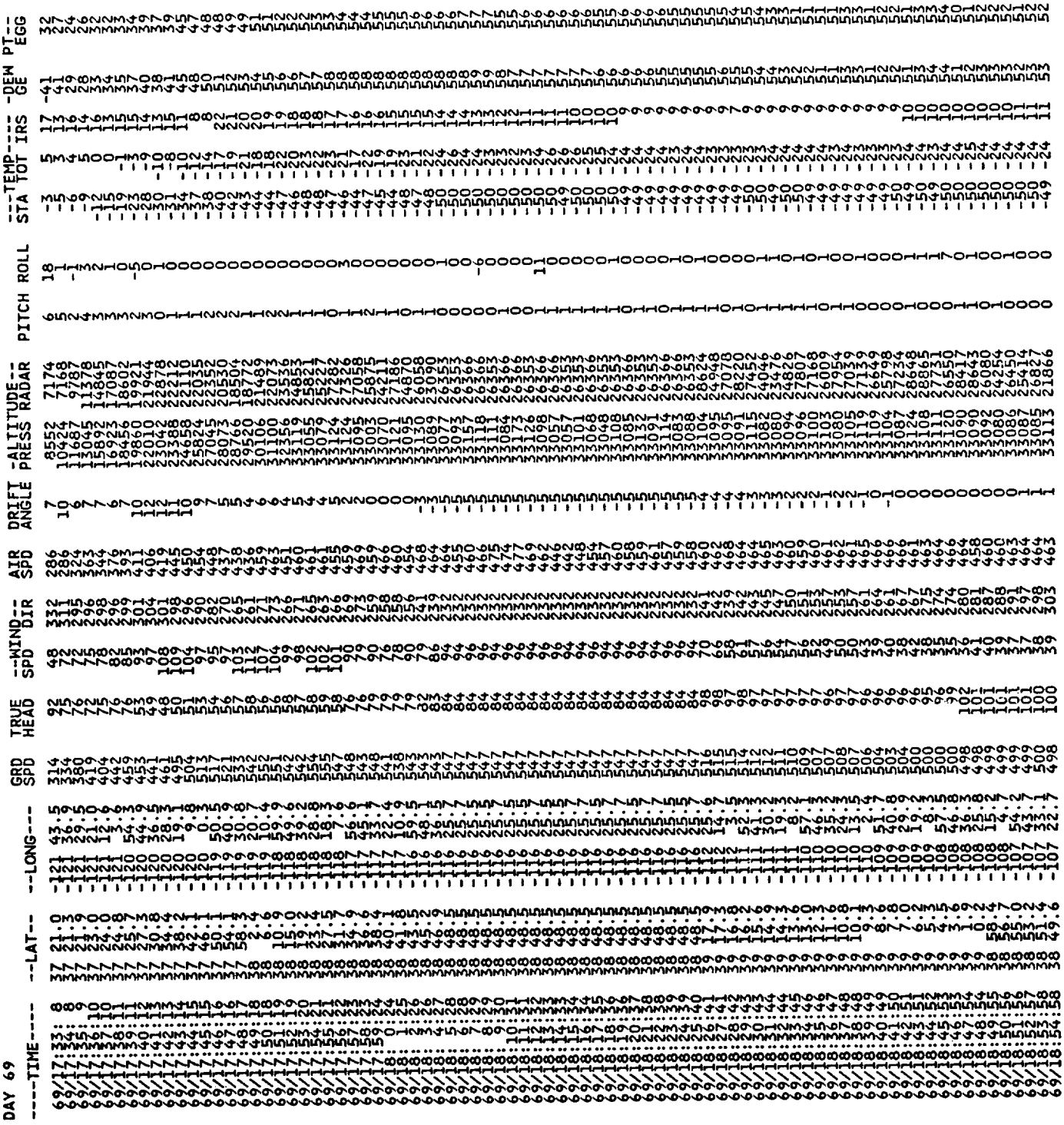
DC-8 Mission Director Log

Mission Name: Sea Ice
Flight Number: 3

17:36:26	Take off time 17-28-30
17:37:35	We had ATC delay, also had to re-align JPS INS before take off
17:43:19	checked first 8 waypoints
18:06:11	>>>> Start of run: practice run Altitude: 33091 Latitude: +38 48.5 Longitude: ??? ?.?
18:07:40	>>>> Start of run: practice run Altitude: 33123 Latitude: +38 48.5 Longitude: ??? ?.?
18:09:42	INS 2 has been selected for EU conversions.
18:10:12	>>>> Start of run: Altitude: 33084 Latitude: +38 47.9 Longitude: ??? ?.?
18:10:26	INS 1 has been selected for EU conversions.
18:27:20	Lat - long froze
18:27:47	Russ said avionics froze
18:28:00	>>>> Start of run: practice Altitude: 33114 Latitude: +39 17.2 Longitude: ??? ?.?
18:28:36	still a problem in the start run
19:10:43	>>>> Start of run: Colorado snow basin Altitude: 35116 Latitude: +38 54.7 Longitude: ??? ?.?

```
19:11:05 | long 105-57.0
---------------
19:30:28 | >>>> End of run:  Colorado snow basin
         |
         |      Altitude: 35127                          Latitude:  +41  0.2
         |                                              Longitude:  ??? ?.?
-------------------------------------------------------------------------
         |
---------------
19:30:57 | long 106-57.3
---------------
         |
-------------------------------------------------------------------------
19:48:55 | >>>> Start of run:  Wind river
         |
         |      Altitude: 38935                          Latitude:  +42 35.2
         |                                              Longitude:  ??? ?.?
---------------
19:49:22 | long 108-58.2
---------------
19:59:44 | >>>> End of run:  Wind river
         |
         |      Altitude: 39108                          Latitude:  +43 23.4
         |                                              Longitude:  ??? ?.?
-------------------------------------------------------------------------
         |
---------------
20:00:57 | long 110-25.4
---------------
20:09:50 | Jackson Hole, WY. SFC Temp = 38F.
---------------
21:07:35 | radar altitude of the wind river run was 30,000 ft
---------------
         |
-------------------------------------------------------------------------
21:23:00 | >>>> Start of run:
         |
         |      Altitude: 39157                          Latitude:  +49  3.8
         |                                              Longitude:  ??? ?.?
---------------
21:24:08 | Wp 5'
---------------
21:33:41 | aircraft vectored to Wp2'' from 5'
---------------
         |
-------------------------------------------------------------------------
23:32:06 | >>>> Start of run:   Seward 342 run
         |
         |      Altitude: 39068                          Latitude:  +60  6.6
         |                                              Longitude:  ??? ?.?
---------------
23:32:34 | long 140-21
---------------
23:38:15 | >>>> End of run:   Seward 342 run
         |
         |      Altitude: 39130                          Latitude:  +60 51.1
         |                                              Longitude:  ??? ?.?
-------------------------------------------------------------------------
```

```
          |
--------------
23:38:33 | long 140-50.4
--------------
23:56:49 | milatary exec in area - unable to do runs around
          | Fairbanks
--------------
```



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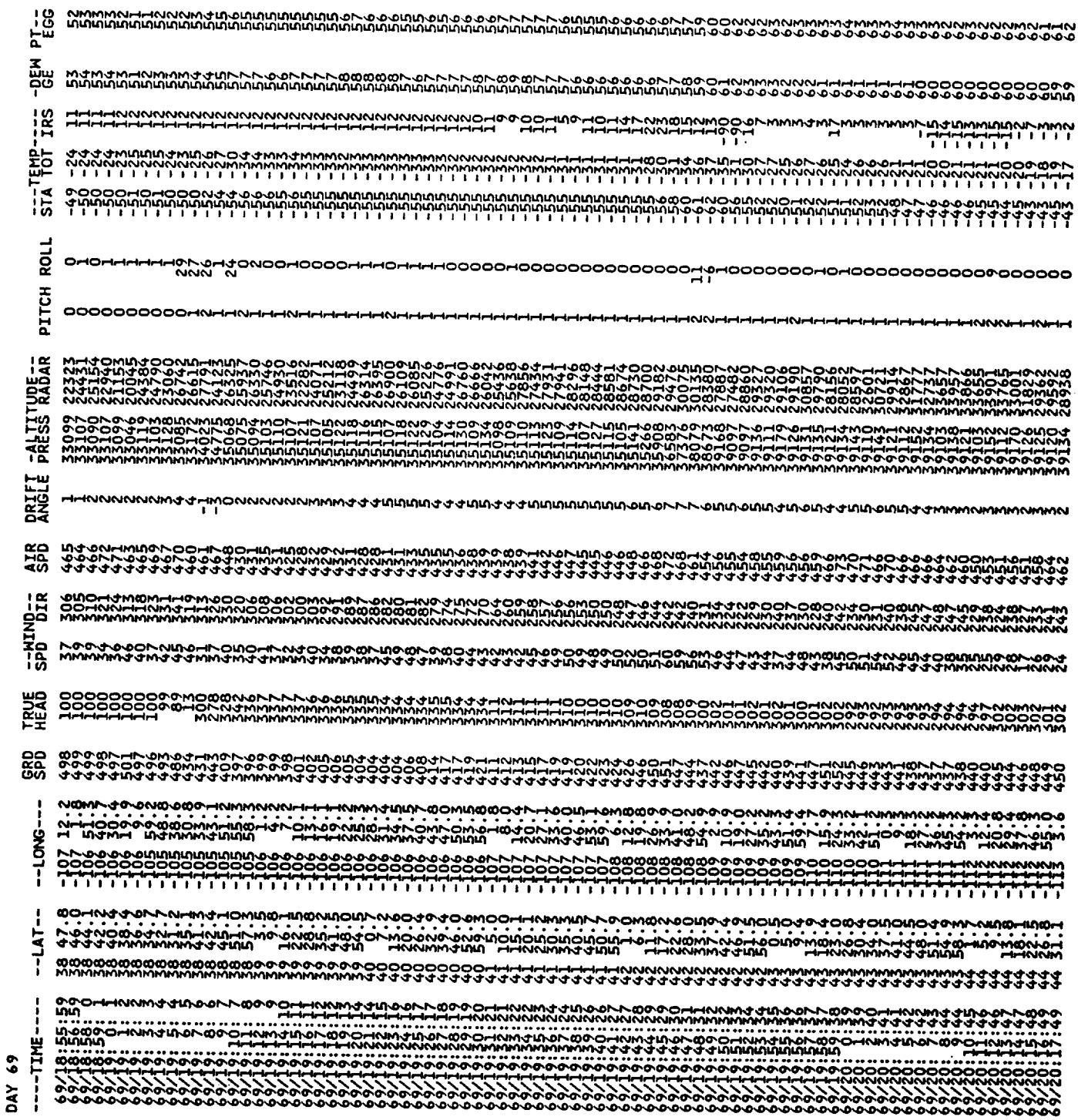
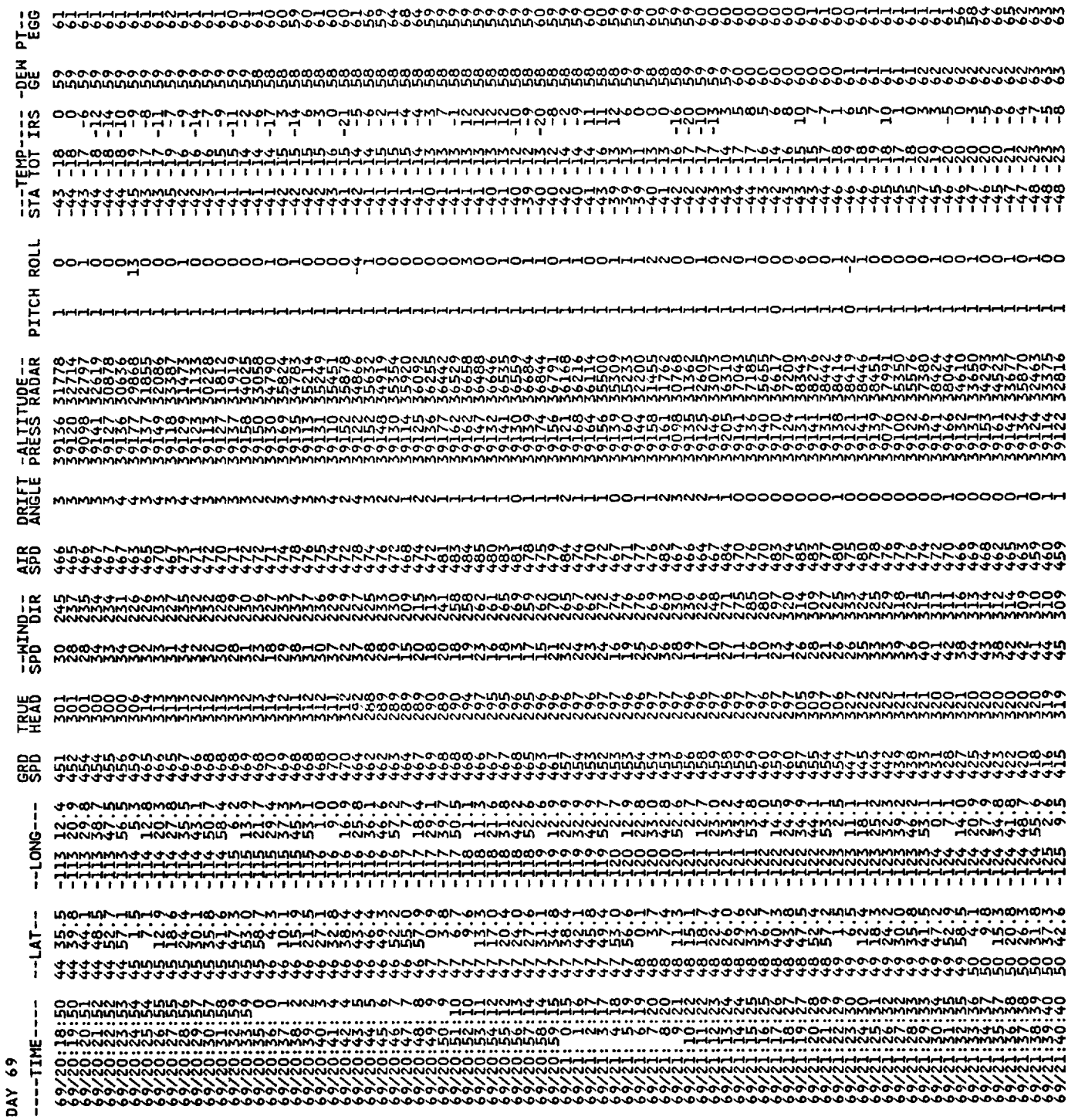
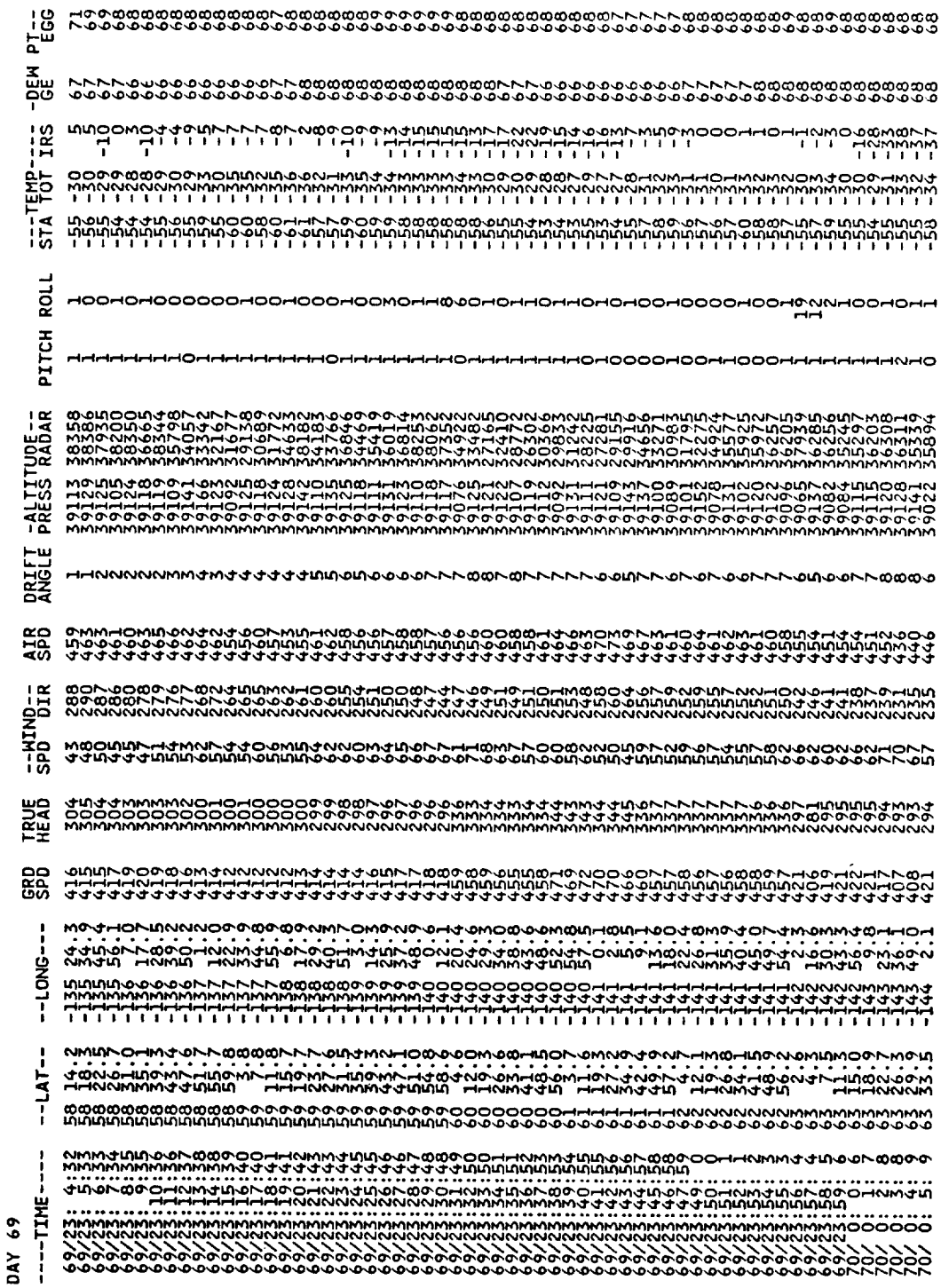
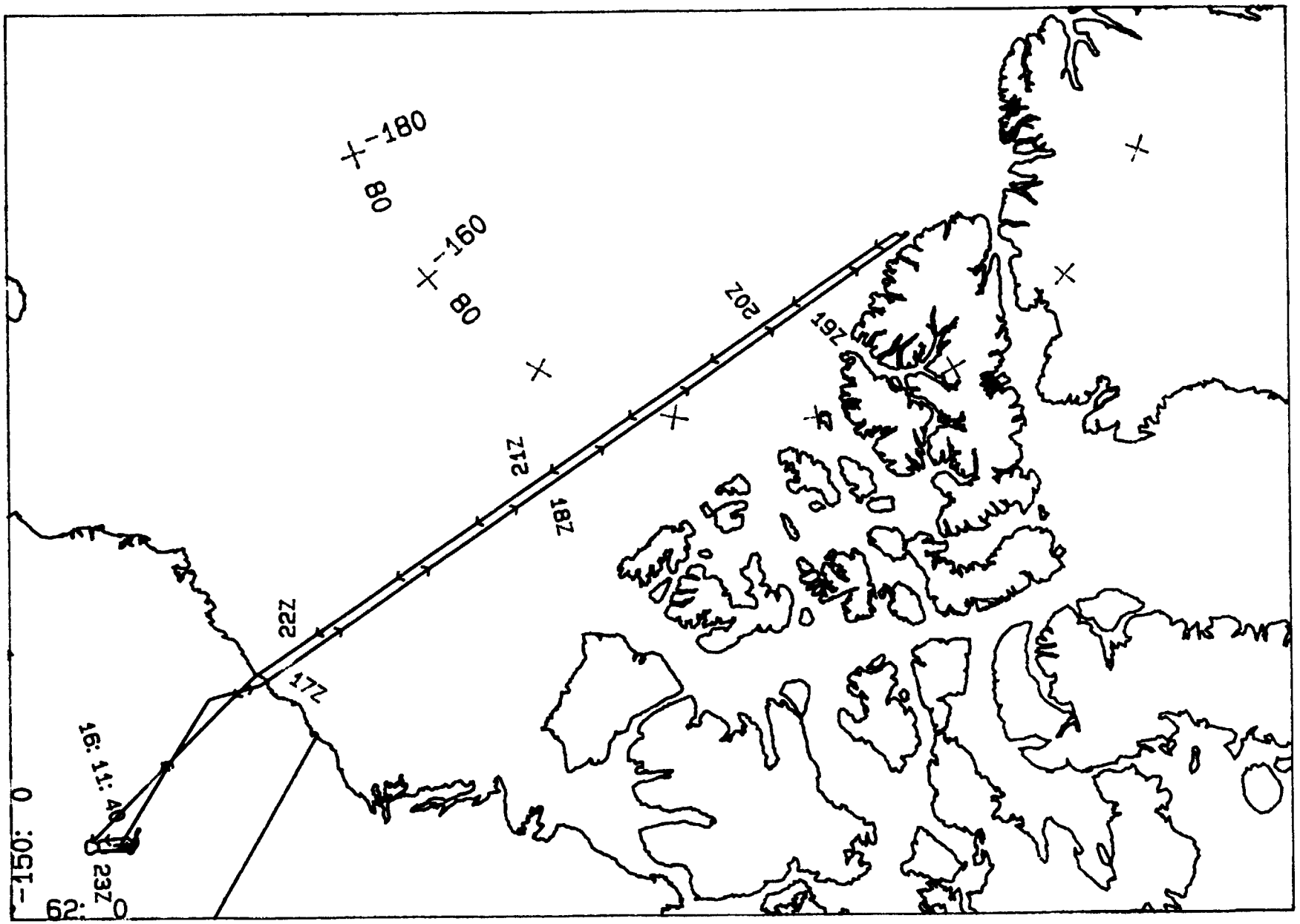








Sea Ice Flight #4 March 11 1988 Fairbanks Local

4.FLT

16: 11: 30 TO 23: 41: 50 UT SCALE 1: 1.50E+07 TIME TIC EVERY 20.00 MINUTES

DC-8 Mission Director Log

Mission Name: Sea Ice
Flight Number: 4 (8 Mar 88)

16:13:43 | take off at16-09-15

16:31:33 | This flight is the Beaufort sea flight

16:45:52 | time sink was done GPS is 4 sec ahead of aircraft and JPL time

16:54:30 | >>>> Start of run: Ice point station r

Altitude: 31045 Latitude: +70 5.4
Longitude: -146 7.8

17:00:00 | >>>> Start of run: INS test

Altitude: 31049 Latitude: +70 26.9
Longitude: -145 43.4

17:04:09 | >>>> Start of run: INS check

Altitude: 31039 Latitude: +71 13.6
Longitude: -144 47.0

17:05:53 | avionics system was frozen during the INS check

17:15:00 | >>>> Start of run: #2 INS check

Altitude: 31042 Latitude: +72 28.9
Longitude: -143 5.0

17:28:24 | at 17-24 the following was recorded

17:28:50 | GPS altitude = 29,242 feet

17:29:55 | Radar altitude = 29,240 feet

17:30:23 | Baro Altitude = 31,040 feet

17:31:33 | the above alt. data was the result of the INS check at 17-15-00

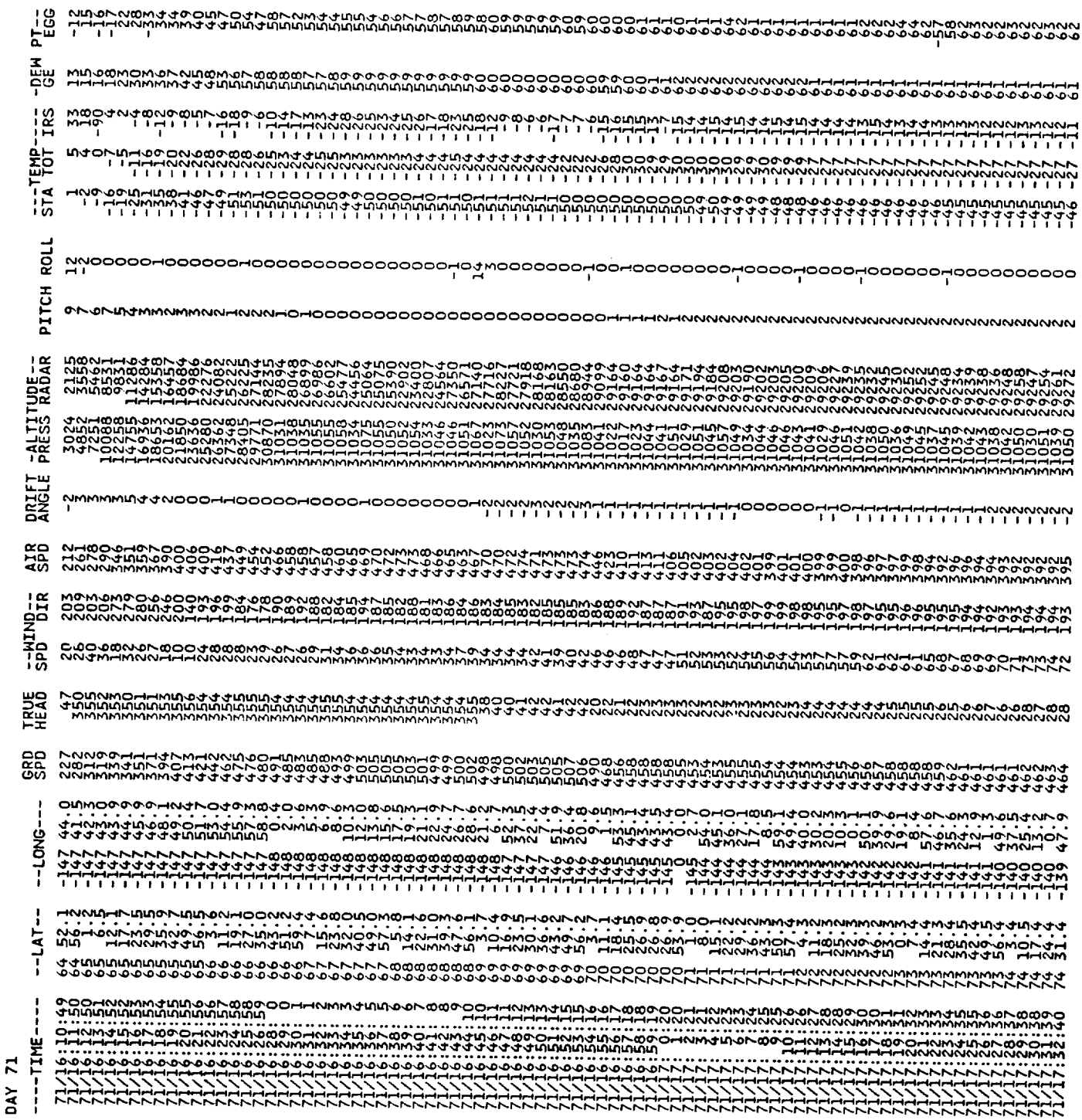
17:41:59 | pitch attitude of the aircraft at level flight is + 2.7

```
---------------------------------------------------------------------
17:45:00 | >>>> Start of run:  INS check #3
         |
         |      Altitude: 31047                      Latitude:  +75 54.8
         |                                          Longitude: -136 57.5
--------------
17:53:05 | The P-3 is now 60 miles behind us
--------------
17:54:27 | They climbed to FL 200 to 220 and their SAR pathwidth
         | is 13 miles
--------------
         |
---------------------------------------------------------------------
18:15:01 | >>>> Start of run:  INS check
         |
         |      Altitude: 31042                      Latitude:  +79  4.7
         |                                          Longitude: -127 16.2
--------------
18:22:33 | estimated cloud tops FL 280 to 300, cld top temp =
         | -35.7 deg centg.
--------------
18:24:23 | P3 dropped back to FL 200, they tried Fl 240 but wx
         | was bad.
--------------
18:27:03 | GPS now has acquired 4 satellites.
--------------
         |
---------------------------------------------------------------------
18:30:00 | >>>> Start of run:  INS check
         |
         |      Altitude: 31029                      Latitude:  +80 27.7
         |                                          Longitude: -120 19.5
--------------
         |
---------------------------------------------------------------------
18:37:08 | >>>> Start of run:
         |
         |      Altitude: 31041                      Latitude:  +81  3.9
         |                                          Longitude: -116 16.4
--------------
         |
---------------------------------------------------------------------
18:37:37 | >>>> Start of run:  position check
         |
         |      Altitude: 31036                      Latitude:  +81  6.2
         |                                          Longitude: -115 58.9
--------------
18:42:53 | Both GPS units are tracking 4 satellites,  and are in
         | agreement.
--------------
18:44:39 | At 1835 GMT GPS alt = 29,795;Radar alt = 29,730; Baro
         | alt = 31,040.
--------------
18:49:28 | Laying down contrail, which is being observer on LHS
         | of AC.
--------------
18:52:59 | Over flying alto stratus, cld top temp = -14 deg C.
--------------
```

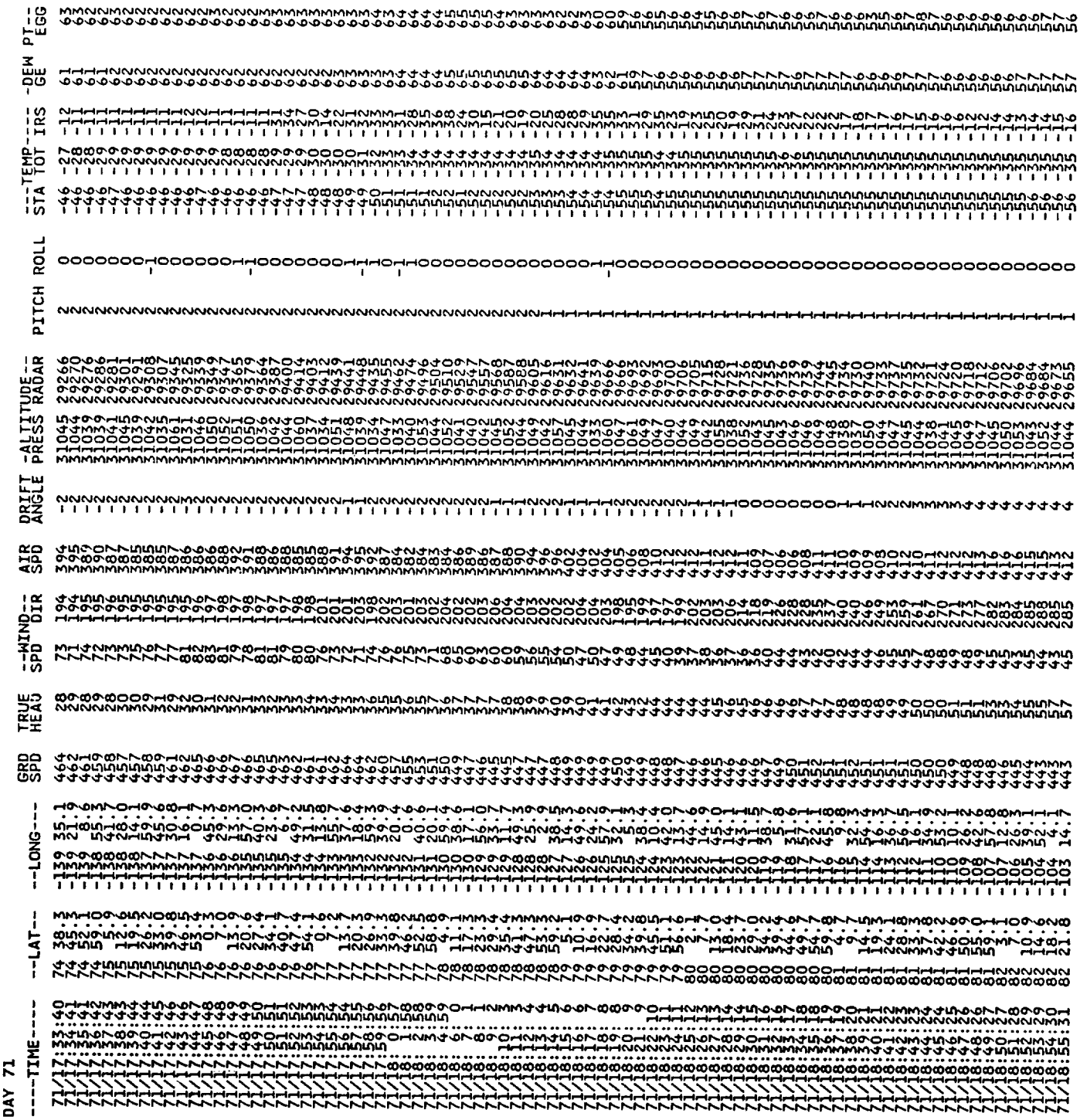
19:00:02	>>>> Start of run: ins check
	Altitude: 31039 Latitude: +82 36.5 Longitude: - 99 25.2
19:20:00	>>>> Start of run: INS check
	Altitude: 31044 Latitude: +83 14.6 Longitude: - 79 57.6
19:24:56	>>>> Start of run: End of WPT 5, 45 de
	Altitude: 31054 Latitude: +83 16.1 Longitude: - 74 41.5
19:26:31	>>>> Start of run: END of turn
	Altitude: 31277 Latitude: +83 20.0 Longitude: - 74 41.9
19:30:33	started return track at 19 30 00
19:31:17	>>>> End of run: END of turn
	Altitude: 31053 Latitude: +83 26.9 Longitude: - 78 57.6
19:34:32	the last end of run was a "show Earl " the commands
19:35:02	the printer shut itself off at 19-31
19:37:50	time check with P3
19:39:34	P3 reports they are 3 seconds faster
19:41:30	time check between JPL and GPS shows GPS ahead by 3 seconds now
19:54:36	P3 isturning around now
19:56:32	P3 reported seeing us on right side they were out bound and we were in bound
19:58:49	correction the P3 reported " look out your right window and you will see us "

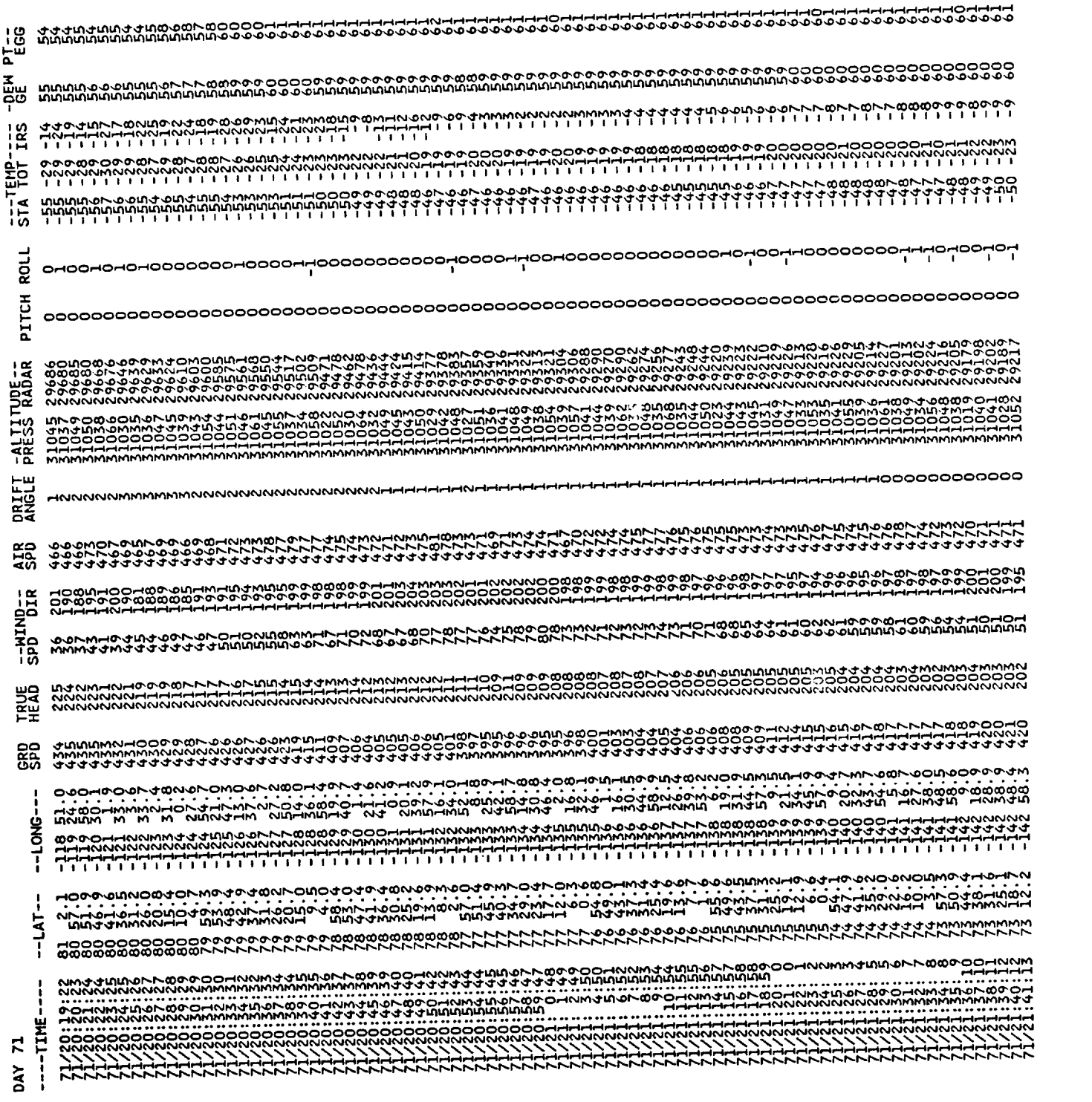
```
20:00:00 | >>>> Start of run:  INS check #5
         |
         |      Altitude: 31054                          Latitude:  +82 25.1
         |                                               Longitude: -105 59.8
--------------
20:32:48 | P3 and 171 just time sinked
--------------
20:33:25 | they were 3 sec faster
--------------
         |
-------------------------------------------------------------------------
20:35:00 | >>>> Start of run:  INS check
         |
         |      Altitude: 31022                          Latitude:  +79 40.3
         |                                               Longitude: -126 24.3
--------------
         |
-------------------------------------------------------------------------
21:04:08 | >>>> Start of run:  SAR recording
         |
         |      Altitude: 31053                          Latitude:  +76 58.8
         |                                               Longitude: -135 36.5
--------------
         |
-------------------------------------------------------------------------
21:46:35 | >>>> Start of run:  Wp #8 Ice point sta
         |
         |      Altitude: 31053                          Latitude:  +72 37.6
         |                                               Longitude: -143 47.4
--------------
22:09:27 | >>>> End of run:  Wp #1' Coast line
         |
         |      Altitude: 31055                          Latitude:  +70  3.5
         |                                               Longitude: -146 57.7
-------------------------------------------------------------------------
         |
--------------
22:34:01 | 3 stage hydrometer reading off
--------------
22:34:37 | re-cycled now working
--------------
22:48:48 | 3 stage has been turned off -- the pump not working
--------------
         |
-------------------------------------------------------------------------
22:50:00 | >>>> Start of run:  INS check
         |
         |      Altitude: 31047                          Latitude:  +65 10.5
         |                                               Longitude: -148 53.4
--------------
         |
-------------------------------------------------------------------------
23:00:51 | >>>> Start of run:  super swath
         |
         |      Altitude: 31066                          Latitude:  +64 32.8
         |                                               Longitude: -148 29.6
--------------
23:05:36 | >>>> End of run:  super swath Wp #4'
```

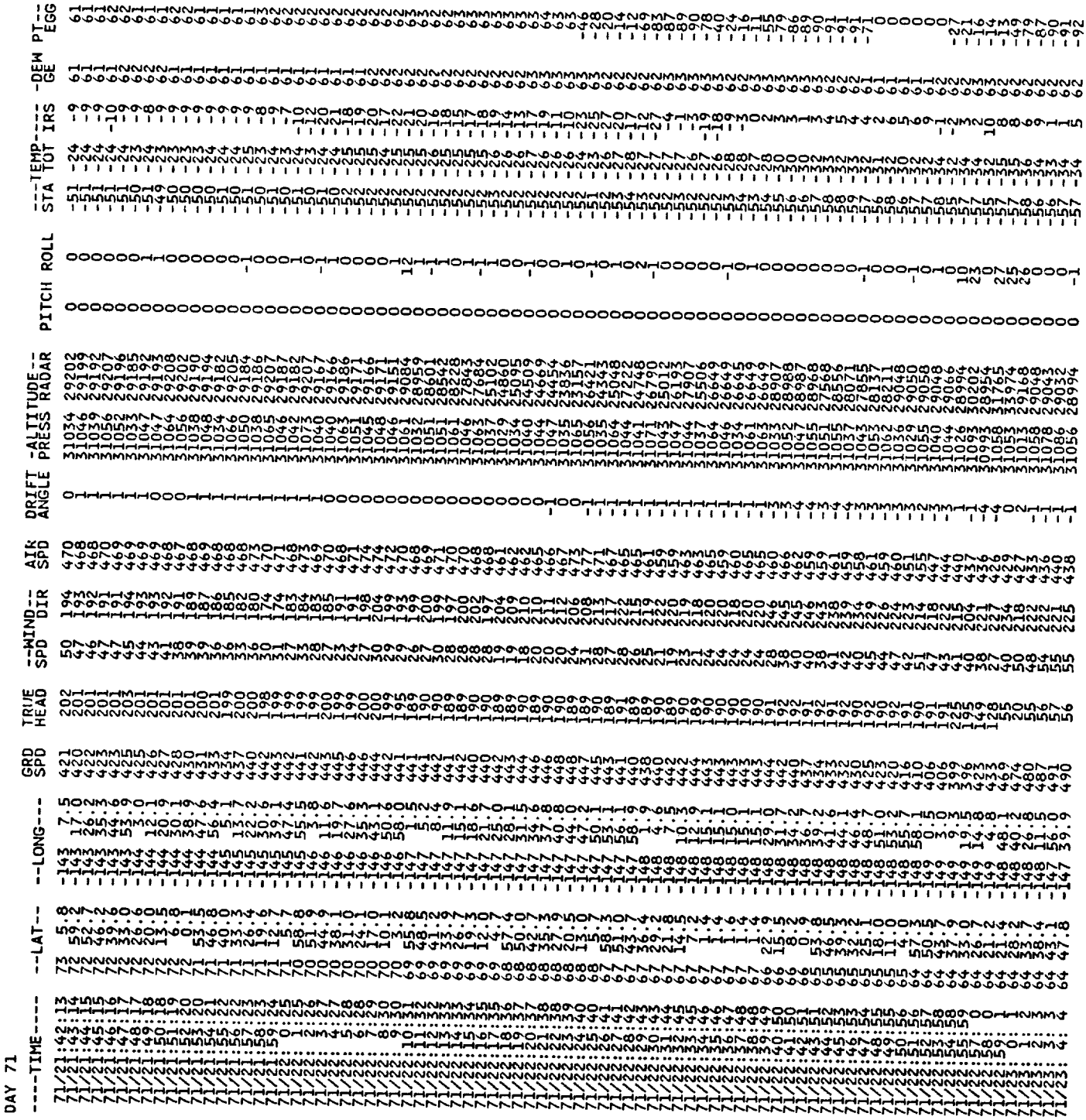
```
          |
          |      Altitude: 31100                          Latitude:  +64 54.9
          |                                               Longitude: -147 15.9
----------|-------------------------------------------------------------------
          |
----------
          |
----------|-------------------------------------------------------------------
23:20:12  | >>>> Start of run:  Farr run Wp #5'
          |
          |      Altitude: 30991                          Latitude:  +64 40.5
          |                                               Longitude: -148  2.0
          |
----------
23:24:46  | >>>> End of run:  Farr run Wp #6'
          |
          |      Altitude: 31040                          Latitude:  +65  5.2
          |                                               Longitude: -147  1.5
----------|-------------------------------------------------------------------
          |
----------
23:37:19  | AMMr worked 90 Gh down 2 hours
----------
```



ORIGINAL PAGE IS
OF POOR QUALITY

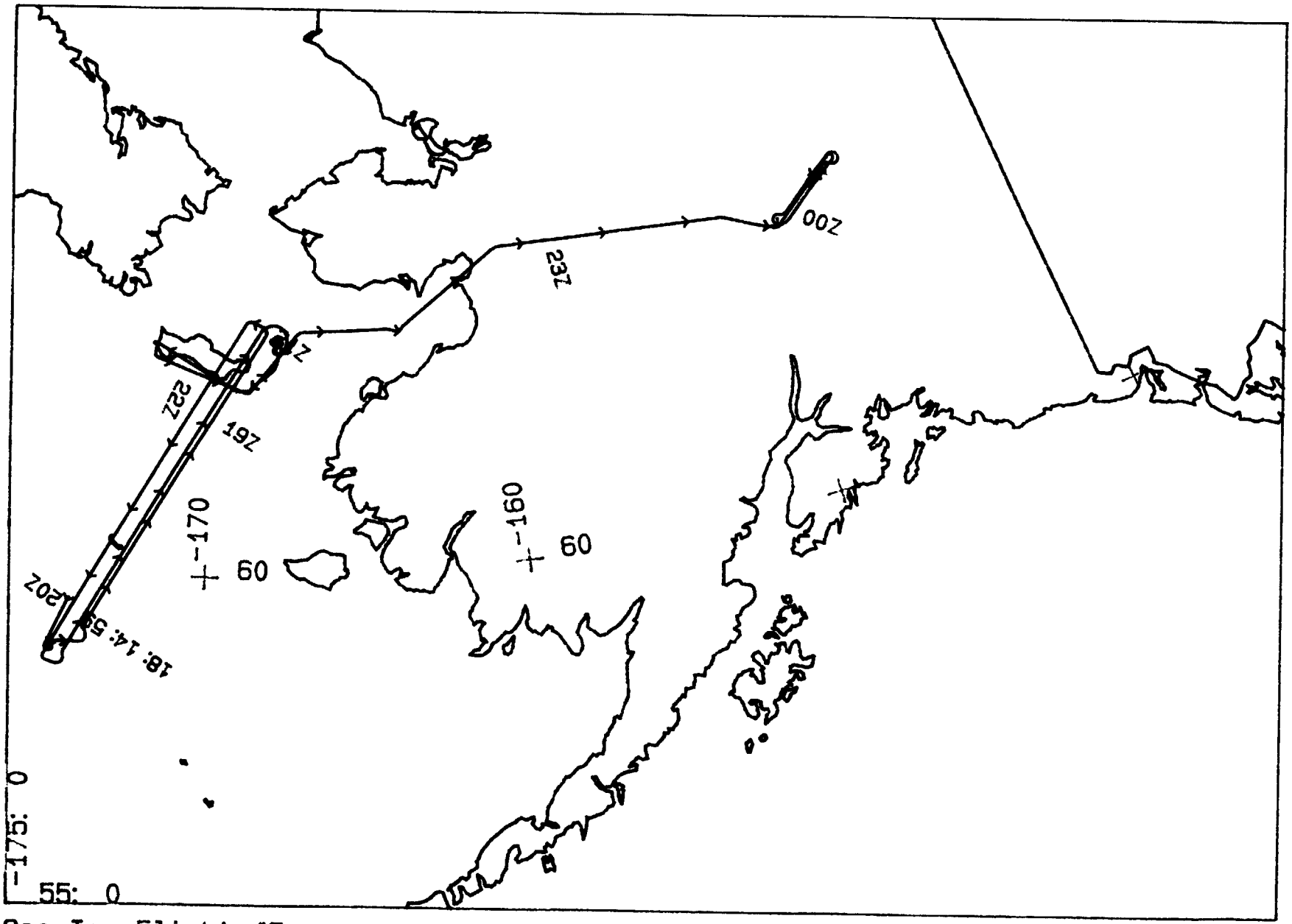






DAY 71

----TIME----	--LAT--	--LONG---	GRD SPD	TRUE HEAD	--WIND-- SPD	DIR	AIR SPD	DRIFT ANGLE	-ALTITUDE- PRESS	RADAR	PITCH	ROLL	---TEMP---- STA	TOT	IRS	-DEW PT- GE	EGG
71/23:55:26	64.2	-147 23.9	492	55	57	225	437	-1	31023	28920	0	10	-56	-33	9	62	-92
71/23:56:26	64.4	-147 28.1	496	55	64	225	440	-1	31039	28503	0	24	-55	-32	9	62	-91
71/23:57:26	64.5	-147 32.2	496	55	64	225	440	-1	31055	28086	0	23	-55	-32	9	62	-86
71/23:58:26	64.7	-147 36.4	481	55	64	225	445	-1	31070	27669	0	21	-55	-32	9	62	-82
71/23:59:26	64.8	-147 40.5	485	55	64	225	447	-1	31086	27252	0	17	-55	-32	9	62	-76
71/24:00:26	64.9	-147 44.7	494	55	64	225	447	-1	31103	26835	0	27	-55	-32	9	62	-62
71/24:01:26	65.0	-147 48.8	493	55	64	225	447	-1	31118	26418	0	0	-55	-32	9	62	-62
71/24:02:26	65.1	-147 52.9	493	55	64	225	447	-1	31134	26001	0	0	-55	-32	9	62	-62
71/24:03:26	65.2	-147 57.1	493	55	64	225	447	-1	31150	25584	0	0	-55	-32	9	62	-62
71/24:04:26	65.3	-148 1.2	493	55	64	225	447	-1	31166	25167	0	0	-55	-32	9	62	-62
71/24:05:26	65.4	-148 5.3	493	55	64	225	447	-1	31182	24750	0	0	-55	-32	9	62	-62
71/24:06:26	65.5	-148 9.5	493	55	64	225	447	-1	31198	24333	0	0	-55	-32	9	62	-62
71/24:07:26	65.6	-148 13.6	493	55	64	225	447	-1	31214	23916	0	0	-55	-32	9	62	-62
71/24:08:26	65.7	-148 17.7	493	55	64	225	447	-1	31230	23499	0	0	-55	-32	9	62	-62
71/24:09:26	65.8	-148 21.9	493	55	64	225	447	-1	31246	23082	0	0	-55	-32	9	62	-62
71/24:10:26	65.9	-148 26.0	493	55	64	225	447	-1	31262	22665	0	0	-55	-32	9	62	-62
71/24:11:26	66.0	-148 30.1	493	55	64	225	447	-1	31278	22248	0	0	-55	-32	9	62	-62
71/24:12:26	66.1	-148 34.3	493	55	64	225	447	-1	31294	21831	0	0	-55	-32	9	62	-62
71/24:13:26	66.2	-148 38.4	493	55	64	225	447	-1	31310	21414	0	0	-55	-32	9	62	-62
71/24:14:26	66.3	-148 42.5	493	55	64	225	447	-1	31326	20997	0	0	-55	-32	9	62	-62
71/24:15:26	66.4	-148 46.7	493	55	64	225	447	-1	31342	20580	0	0	-55	-32	9	62	-62
71/24:16:26	66.5	-148 50.8	493	55	64	225	447	-1	31358	20163	0	0	-55	-32	9	62	-62
71/24:17:26	66.6	-148 54.9	493	55	64	225	447	-1	31374	19746	0	0	-55	-32	9	62	-62
71/24:18:26	66.7	-148 59.1	493	55	64	225	447	-1	31390	19329	0	0	-55	-32	9	62	-62
71/24:19:26	66.8	-149 3.2	493	55	64	225	447	-1	31406	18912	0	0	-55	-32	9	62	-62
71/24:20:26	66.9	-149 7.3	493	55	64	225	447	-1	31422	18495	0	0	-55	-32	9	62	-62
71/24:21:26	67.0	-149 11.5	493	55	64	225	447	-1	31438	18078	0	0	-55	-32	9	62	-62
71/24:22:26	67.1	-149 15.6	493	55	64	225	447	-1	31454	17661	0	0	-55	-32	9	62	-62
71/24:23:26	67.2	-149 19.7	493	55	64	225	447	-1	31470	17244	0	0	-55	-32	9	62	-62
71/25:24:26	67.3	-149 23.9	493	55	64	225	447	-1	31486	16827	0	0	-55	-32	9	62	-62
71/25:25:26	67.4	-149 28.0	493	55	64	225	447	-1	31502	16410	0	0	-55	-32	9	62	-62
71/25:26:26	67.5	-149 32.1	493	55	64	225	447	-1	31518	15993	0	0	-55	-32	9	62	-62
71/25:27:26	67.6	-149 36.3	493	55	64	225	447	-1	31534	15576	0	0	-55	-32	9	62	-62
71/25:28:26	67.7	-149 40.4	493	55	64	225	447	-1	31550	15159	0	0	-55	-32	9	62	-62
71/25:29:26	67.8	-149 44.5	493	55	64	225	447	-1	31566	14742	0	0	-55	-32	9	62	-62
71/25:30:26	67.9	-149 48.7	493	55	64	225	447	-1	31582	14325	0	0	-55	-32	9	62	-62
71/25:31:26	68.0	-149 52.8	493	55	64	225	447	-1	31598	13908	0	0	-55	-32	9	62	-62
71/25:32:26	68.1	-149 56.9	493	55	64	225	447	-1	31614	13491	0	0	-55	-32	9	62	-62
71/25:33:26	68.2	-150 1.1	493	55	64	225	447	-1	31630	13074	0	0	-55	-32	9	62	-62
71/25:34:26	68.3	-150 5.2	493	55	64	225	447	-1	31646	12657	0	0	-55	-32	9	62	-62
71/25:35:26	68.4	-150 9.3	493	55	64	225	447	-1	31662	12240	0	0	-55	-32	9	62	-62
71/25:36:26	68.5	-150 13.5	493	55	64	225	447	-1	31678	11823	0	0	-55	-32	9	62	-62
71/25:37:26	68.6	-150 17.6	493	55	64	225	447	-1	31694	11406	0	0	-55	-32	9	62	-62
71/25:38:26	68.7	-150 21.7	493	55	64	225	447	-1	31710	10989	0	0	-55	-32	9	62	-62
71/25:39:26	68.8	-150 25.9	493	55	64	225	447	-1	31726	10572	0	0	-55	-32	9	62	-62
71/25:40:26	68.9	-150 30.0	493	55	64	225	447	-1	31742	10155	0	0	-55	-32	9	62	-62
71/25:41:26	69.0	-150 34.1	493	55	64	225	447	-1	31758	9738	0	0	-55	-32	9	62	-62
71/25:42:26	69.1	-150 38.3	493	55	64	225	447	-1	31774	9321	0	0	-55	-32	9	62	-62
71/25:43:26	69.2	-150 42.4	493	55	64	225	447	-1	31790	8904	0	0	-55	-32	9	62	-62
71/25:44:26	69.3	-150 46.5	493	55	64	225	447	-1	31806	8487	0	0	-55	-32	9	62	-62
71/25:45:26	69.4	-150 50.7	493	55	64	225	447	-1	31822	8070	0	0	-55	-32	9	62	-62
71/25:46:26	69.5	-150 54.8	493	55	64	225	447	-1	31838	7653	0	0	-55	-32	9	62	-62
71/25:47:26	69.6	-150 58.9	493	55	64	225	447	-1	31854	7236	0	0	-55	-32	9	62	-62
71/25:48:26	69.7	-151 3.1	493	55	64	225	447	-1	31870	6819	0	0	-55	-32	9	62	-62
71/25:49:26	69.8	-151 7.2	493	55	64	225	447	-1	31886	6402	0	0	-55	-32	9	62	-62
71/25:50:26	69.9	-151 11.3	493	55	64	225	447	-1	31902	5985	0	0	-55	-32	9	62	-62
71/25:51:26	70.0	-151 15.5	493	55	64	225	447	-1	31918	5568	0	0	-55	-32	9	62	-62
71/25:52:26	70.1	-151 19.6	493	55	64	225	447	-1	31934	5151	0	0	-55	-32	9	62	-62
71/25:53:26	70.2	-151 23.7	493	55	64	225	447	-1	31950	4734	0	0	-55	-32	9	62	-62
71/25:54:26	70.3	-151 27.9	493	55	64	225	447	-1	31966	4317	0	0	-55	-32	9	62	-62
71/25:55:26	70.4	-151 32.0	493	55	64	225	447	-1	31982	3900	0	0	-55	-32	9	62	-62
71/25:56:26	70.5	-151 36.1	493	55	64	225	447	-1	31998	3483	0	0	-55	-32	9	62	-62
71/25:57:26	70.6	-151 40.3	493	55	64	225	447	-1	32014	3066	0	0	-55	-32	9	62	-62
71/25:58:26	70.7	-151 44.4	493	55	64	225	447	-1	32030	2649	0	0	-55	-32	9	62	-62
71/25:59:26	70.8	-151 48.5	493	55	64	225	447	-1	32046	2232	0	0	-55	-32	9	62	-62



Sea Ice Flight #5 March 13 1988 Fairbanks Local
5.FLT
18: 14: 49 TO 0: 20: 59 UT SCALE 1: 1.00E+07 TIME TIC EVERY 10.00 MINUTES

DC-8 Mission Director Log

Mission Name: Sea Ice
Flight Number: 5 (13 Mar 88)

16:11:51 | Today's date is March 13 , 1988

16:12:17 | take off at 16-05-36

16:13:52 | Flight title is "Bering Sea / Polinia

16:22:28 | when the intercom is in the emergency position there
| is a lot of noise on the system

16:44:25 | balance of 3 stage is difficult ---reading alot
| different than 2 stage

16:56:27 | >>>> Start of run: coast line
|
| Altitude: 29023 Latitude: +64 56.4
| Longitude: -160 55.7

17:07:00 | >>>> Start of run:
|
| Altitude: 29009 Latitude: +64 10.4
| Longitude: -163 2.7

17:07:34 | the above was an INS check

17:08:50 | >>>> End of run: coast run
|
| Altitude: 29031 Latitude: +64 2.2
| Longitude: -163 24.4

17:10:56 | >>>> Start of run: Bering sea
|
| Altitude: 29034 Latitude: +64 0.5
| Longitude: -163 57.2

17:13:34 | GPS 4 sec ahead of JPL and aircraft time

17:16:39 | hydrometers seem to be working

17:24:51 | >>>> Start of run: time check
|
| Altitude: 29020 Latitude: +64 1.9
| Longitude: -167 45.5

```
--------------
          |
-------------------------------------------------------------------------
17:25:35  | >>>> Start of run:  time check
          |
          |       Altitude: 29013                          Latitude:  +64  1.9
          |                                               Longitude: -167 57.5
--------------
          |
-------------------------------------------------------------------------
17:29:59  | >>>> Start of run:  INS check #2
          |
          |       Altitude: 29011                          Latitude:  +64  1.0
          |                                               Longitude: -169  8.3
--------------
17:32:19  | >>>> End of run:  Bering Sea
          |
          |       Altitude: 29012                          Latitude:  +64  0.3
          |                                               Longitude: -169 45.4
-------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------
17:35:03  | >>>> Start of run:  St. Law #1
          |
          |       Altitude: 29020                          Latitude:  +63 47.5
          |                                               Longitude: -170 13.1
--------------
17:39:10  | the time that the ice observers quote is from the DADS
          | display which appears to be 3 sec later than aircraft
          | time
--------------
18:10:36  | P3 visable
--------------
18:11:17  | Dino turned off camera / video recording
--------------
18:11:43  | recording on now
--------------
18:20:01  | >>>> End of run:  ST Law
          |
          |       Altitude: 29027                          Latitude:  +59  0.3
          |                                               Longitude: -174 29.8
-------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------
18:30:42  | >>>> Start of run:  St.Law #2 Wp 5
          |
          |       Altitude: 28981                          Latitude:  +59 18.3
          |                                               Longitude: -173 23.6
--------------
18:32:55  | we missed the Wp capture point , capture was late
--------------
          |
-------------------------------------------------------------------------
18:33:52  | >>>> Start of run:  INS check
```

	Altitude: 28992	Latitude: +59 37.7 Longitude: -173 4.0
18:37:00	>>>> Start of run: INS check	
	Altitude: 28990	Latitude: +59 56.8 Longitude: -172 44.2
19:11:56	>>>> End of run: St. Law #2 Wp 6	
	Altitude: 28999	Latitude: +63 36.7 Longitude: -168 19.3
19:17:30	>>>> Start of run: St. Law #3 Wp 7	
	Altitude: 28979	Latitude: +63 50.4 Longitude: -168 56.6
19:46:52	>>>> Start of run: P3 observed on LHS	
	Altitude: 28990	Latitude: +60 52.1 Longitude: -172 29.8
20:05:14	>>>> End of run: St. Law #3 Wp 8	
	Altitude: 28997	Latitude: +58 56.8 Longitude: -174 24.9
20:10:05	radar alt. stopped in the 45 degree turn	
20:12:49	>>>> Start of run: St. Law #4 Wp1'	
	Altitude: 29025	Latitude: +58 53.0 Longitude: -173 58.0
20:22:24	JPL said their SAR can now see the bottom and top of the ice with P-band	
20:58:33	>>>> End of run: St.Law. #4 Wp 2	
	Altitude: 29031	Latitude: +63 38.5 Longitude: -168 32.0

21:00:19 | the aircraft will decend with 60 degree bank

21:30:37 | >>>> Start of run: #1 low level Wp 4'

Altitude: 1691 Latitude: +62 52.2
Longitude: -169 9.3

21:31:45 | >>>> Start of run: low level again

Altitude: 1685 Latitude: +62 54.4
Longitude: -169 17.8

21:50:35 | >>>> End of run: low level #1

Altitude: 1744 Latitude: +63 33.9
Longitude: -171 58.1

21:54:48 | >>>> Start of run: low level #2

Altitude: 1612 Latitude: +63 18.9
Longitude: -171 48.2

21:58:10 | the first low level psss was too far north , so on the return is parrell to the orgional track with a 1.6 mile off set

22:12:18 | >>>> End of run: low level #2

Altitude: 1620 Latitude: +62 50.9
Longitude: -168 55.9

22:16:07 | radar alt problems

22:28:32 | >>>> Start of run: line #7

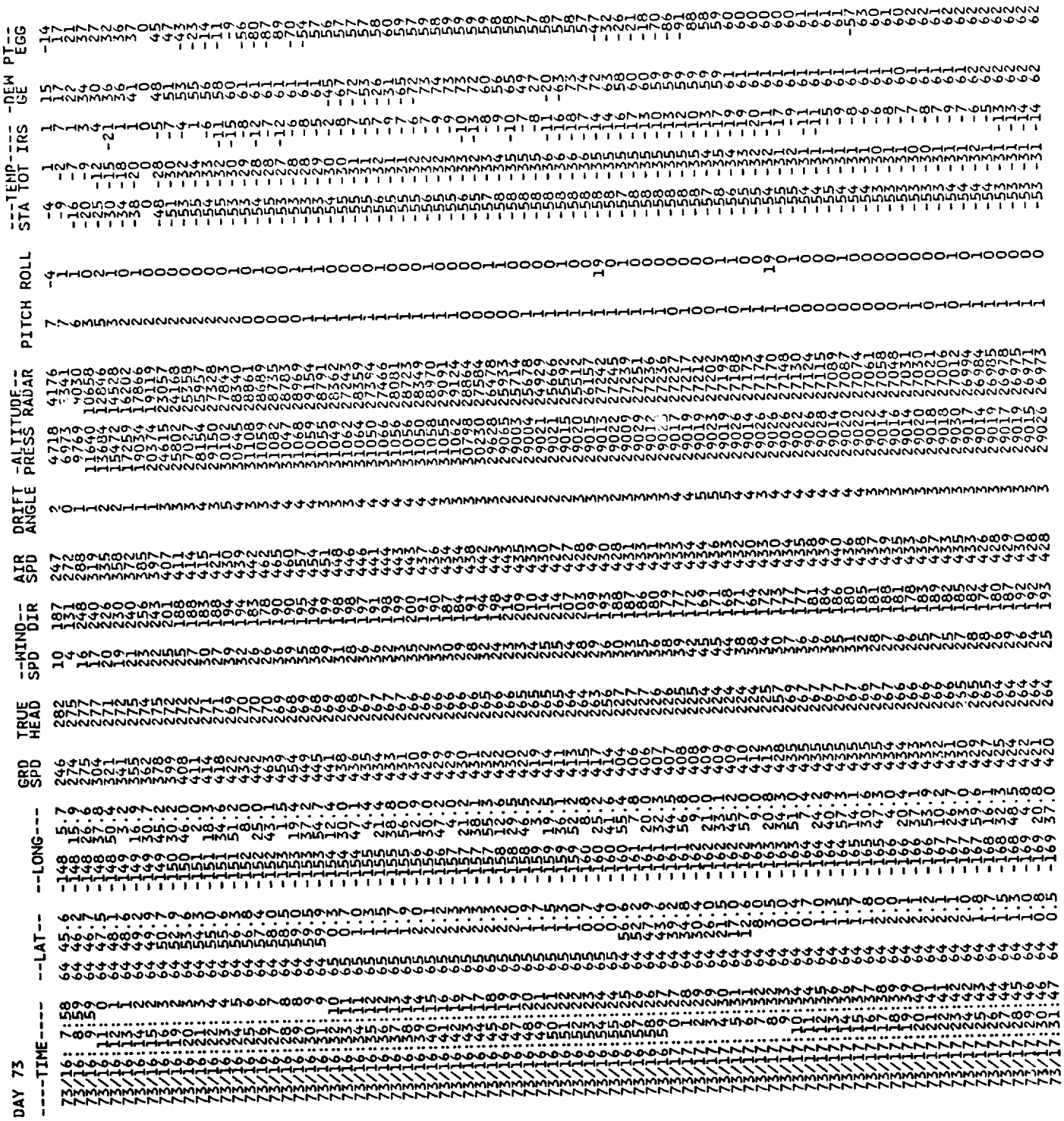
Altitude: 29069 Latitude: +63 47.6
Longitude: -165 52.7

22:36:50 | >>>> End of run: line #7

Altitude: 29051 Latitude: +63 45.5
Longitude: -163 38.9

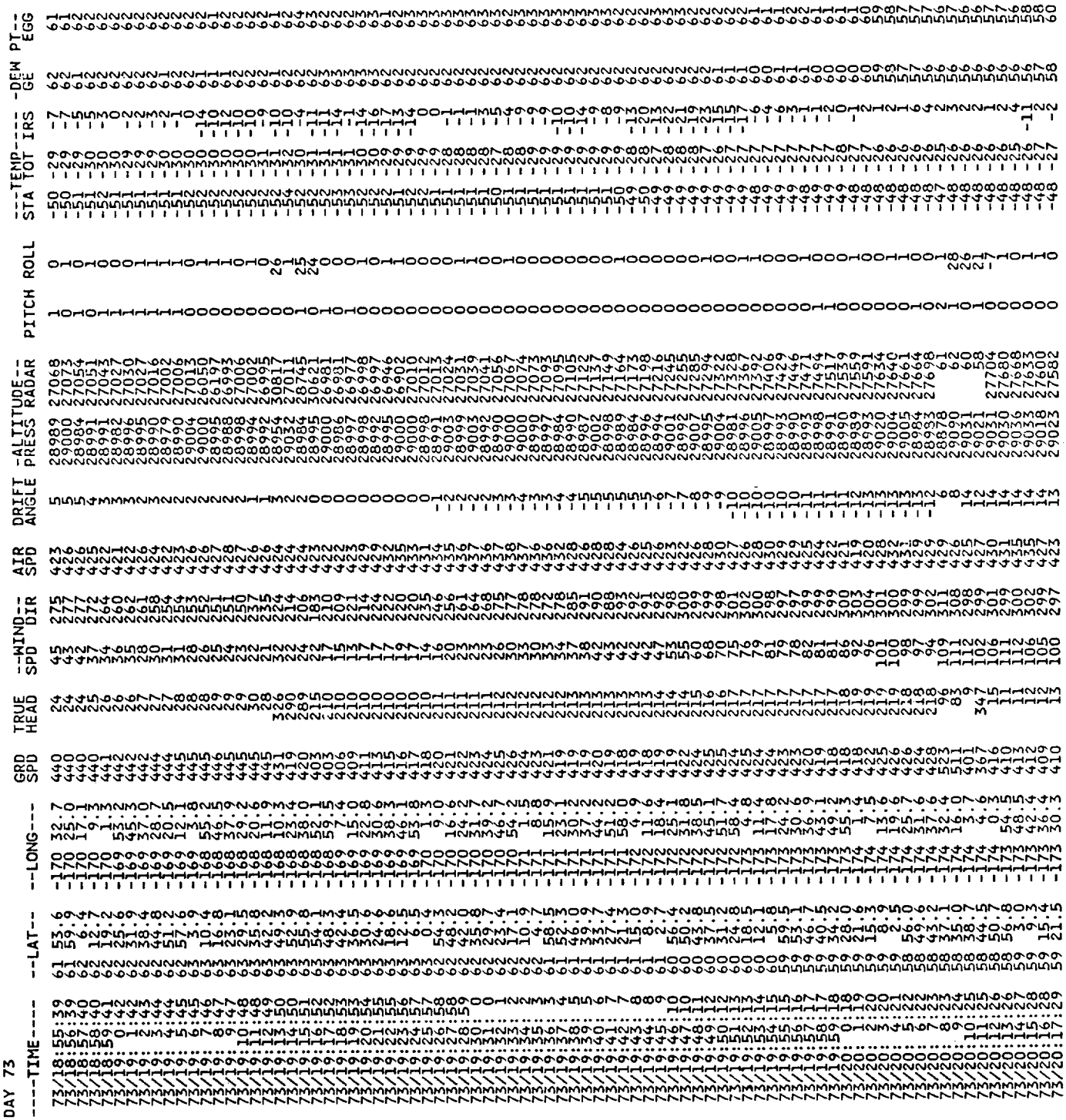
```
-------------------------------------------------------------------
22:39:50 | >>>> Start of run:  line 7
         |
         |      Altitude: 29062                    Latitude:  +63 57.0
         |                                        Longitude: -163  0.0
--------------
22:52:41 | >>>> End of run:  line 7 Wp 8'
         |
         |      Altitude: 29068                    Latitude:  +64 51.4
         |                                        Longitude: -160  5.6
-------------------------------------------------------------------
         |
--------------
         |
-------------------------------------------------------------------
22:54:59 | >>>> Start of run:  INS
         |
         |      Altitude: 29075                    Latitude:  +64 56.6
         |                                        Longitude: -159 30.3
--------------
         |
-------------------------------------------------------------------
23:31:00 | >>>> Start of run:  Farr-30
         |
         |      Altitude: 31136                    Latitude:  +64 26.5
         |                                        Longitude: -149  0.6
--------------
23:39:17 | >>>> End of run:  Farr-30
         |
         |      Altitude: 31140                    Latitude:  +65  1.1
         |                                        Longitude: -147  9.9
-------------------------------------------------------------------
         |
--------------
         |
-------------------------------------------------------------------
23:44:54 | >>>> Start of run:  Goose-45
         |
         |      Altitude: 31118                    Latitude:  +65  7.6
         |                                        Longitude: -146 57.1
--------------
23:54:17 | >>>> End of run:  Goose-45
         |
         |      Altitude: 31116                    Latitude:  +64 31.4
         |                                        Longitude: -148 54.7
-------------------------------------------------------------------
         |
--------------
         |
-------------------------------------------------------------------
00:00:55 | >>>> Start of run:  Cimino -42
         |
         |      Altitude: 31106                    Latitude:  +64 27.1
         |                                        Longitude: -148 42.6
--------------
00:07:30 | >>>> End of run:  Cimino -42
         |
         |      Altitude: 31097                    Latitude:  +64 54.2
```

```
          |                                                  Longitude: -147 15.6
-------------------------------------------------------------------------------
          |
--------------
00:18:00 | touchdown at 00-24-45
--------------
00:18:47 | INS #1 at TD 64-50.7 n   147 55.4 w
--------------
00:20:03 | INS #2 at TD 64-48.1 n   147 51.7 w
--------------
```



DAY 73

----TIME----	--LAT--	--LONG---	GRD SPD	TRUE HEAD	--WIND-- SPD	DIR	AIR SPD	DRIFT ANGLE	-ALTITUDE-- PRESS	RADAR	PITCH	ROLL	---TEMP---- STA	TOT	-DEW PT-- IRS	GE	EGG
73/17:32:47	63 59.4	-169 52.4	409	234	28	181	426	2	29037	28108	0	22	-53	-31	-18	62	63
73/17:33:48	63 54.6	-170 3.2	406	221	20	201	425	1	29036	26968	1	1	-53	-32	-13	63	62
73/17:34:49	63 48.9	-170 11.5	405	206	15	208	420	0	28998	26943	1	2	-53	-32	-16	63	62
73/17:35:49	63 42.8	-170 18.2	406	204	12	193	419	0	29018	26959	1	0	-52	-31	-11	62	62
73/17:36:50	63 36.6	-170 24.7	406	205	14	226	419	0	29022	25667	1	0	-52	-31	-19	62	62
73/17:37:51	63 30.4	-170 31.2	406	205	15	235	420	-1	29018	26426	1	0	-53	-31	-14	62	63
73/17:38:51	63 24.3	-170 37.5	407	205	14	237	420	-1	29012	26951	1	1	-53	-32	-18	62	60
73/17:39:52	63 18.0	-170 43.9	408	205	14	240	420	-1	29032	26978	1	1	-52	-31	-1	62	62
73/17:40:52	63 11.8	-170 50.2	411	205	12	244	421	-1	29014	26970	1	1	-53	-31	-2	62	63
73/17:41:53	63 5.5	-170 56.5	413	205	11	251	423	-1	29023	26984	1	0	-52	-31	-3	62	62
73/17:42:54	62 59.1	-171 2.8	416	206	12	258	426	-1	29022	26981	1	1	-52	-30	-3	62	62
73/17:43:54	62 52.8	-171 9.1	417	206	14	250	431	-1	29032	26994	1	0	-51	-29	-6	62	62
73/17:44:55	62 46.4	-171 15.4	417	206	19	249	430	-1	29023	26995	1	1	-52	-29	-7	62	62
73/17:45:55	62 40.1	-171 21.6	416	206	19	255	429	-2	29015	26999	1	1	-52	-30	-7	62	62
73/17:46:56	62 33.6	-171 27.8	416	206	17	254	428	-1	29022	27016	1	0	-51	-29	-6	62	62
73/17:47:57	62 27.3	-171 33.9	417	206	23	261	430	-2	29019	27033	1	1	-51	-29	-9	62	62
73/17:48:57	62 20.9	-171 40.0	416	206	25	260	431	-2	29028	27055	1	1	-51	-29	-9	62	62
73/17:49:58	62 14.5	-171 46.1	415	206	29	258	433	-3	29022	27039	1	1	-51	-29	-9	62	62
73/17:50:59	62 8.1	-171 52.1	414	207	31	266	429	-3	29014	27048	1	0	-51	-29	-13	62	63
73/17:51:59	62 1.8	-171 57.9	413	207	30	269	427	-3	29016	27051	1	1	-51	-29	-12	62	63
73/17:53: 0	61 55.4	-172 3.8	413	207	32	268	428	-3	29027	27071	1	1	-51	-29	-14	62	63
73/17:54: 0	61 49.1	-172 9.6	413	207	32	271	427	-4	29022	27090	1	1	-51	-29	-16	62	62
73/17:55: 1	61 42.7	-172 15.4	412	207	34	271	427	-4	29014	27079	1	1	-51	-30	-16	62	62
73/17:56: 2	61 36.3	-172 21.2	412	208	37	276	426	-4	29016	27092	1	1	-51	-29	-17	62	63
73/17:57: 2	61 30.0	-172 26.8	413	208	38	276	426	-4	29008	27098	1	1	-51	-29	-19	62	62
73/17:58: 3	61 23.6	-172 32.5	413	208	39	279	424	-5	29019	27119	1	1	-51	-29	-14	62	62
73/17:59: 4	61 17.2	-172 38.2	413	208	41	283	423	-5	29028	27136	1	1	-51	-29	-24	62	63
73/18: 0: 4	61 10.8	-172 43.7	414	208	41	288	420	-5	29019	27142	1	0	-50	-29	-24	62	63
73/18: 1: 5	61 4.3	-172 49.4	415	208	42	287	422	-5	29013	27156	1	1	-50	-29	-28	62	62
73/18: 2: 5	60 58.0	-172 54.8	417	208	44	288	422	-5	29018	27180	1	1	-51	-30	-26	62	62
73/18: 3: 6	60 51.5	-173 0.4	418	208	47	293	421	-6	29016	27188	1	1	-51	-29	-24	62	62
73/18: 4: 7	60 45.0	-173 6.0	420	209	49	295	421	-6	29020	27207	1	1	-50	-29	-26	62	62
73/18: 5: 7	60 38.5	-173 11.4	420	209	49	294	422	-6	29017	27227	1	1	-49	-28	-21	62	63
73/18: 6: 8	60 31.9	-173 16.9	421	210	58	293	424	-7	29017	27237	1	1	-50	-28	-5	62	63
73/18: 7: 9	60 25.4	-173 22.3	422	210	61	296	422	-8	29015	27250	1	1	-49	-28	-16	62	62
73/18: 8: 9	60 18.9	-173 27.7	423	211	64	295	425	-8	29026	27279	1	1	-49	-27	-4	61	62
73/18: 9: 10	60 12.3	-173 33.2	425	211	67	297	425	-9	29016	27291	1	1	-49	-28	-10	61	62
73/18:10: 10	60 5.7	-173 38.5	426	212	73	297	426	-9	29016	27314	1	0	-48	-27	-14	61	62
73/18:11: 11	59 59.0	-173 43.9	427	212	75	298	426	-10	29021	27336	1	1	-49	-27	-20	61	62
73/18:12: 12	59 52.4	-173 49.3	428	212	77	298	426	-10	29020	27361	1	1	-49	-27	-24	61	62
73/18:13: 12	59 45.8	-173 54.5	430	211	76	300	426	-10	29013	27379	1	0	-49	-27	-23	60	62
73/18:14: 13	59 39.0	-173 59.8	430	212	78	300	427	-10	29025	27419	1	0	-49	-27	-19	60	62
73/18:15: 14	59 32.2	-174 5.2	431	212	80	299	429	-10	29013	27435	1	0	-49	-26	-22	60	61
73/18:16: 14	59 25.6	-174 10.4	432	211	79	298	431	-10	29012	27451	1	0	-48	-26	-4	60	61
73/18:17: 15	59 18.8	-174 15.6	432	212	80	298	431	-10	29013	27483	1	0	-48	-26	-1	60	61
73/18:18: 15	59 12.1	-174 20.7	433	212	82	299	430	-10	29017	27514	1	0	-48	-26	0	60	61
73/18:19: 16	59 5.3	-174 25.9	434	213	88	301	428	-11	29018	27531	1	0	-48	-27	-4	60	61
73/18:20: 17	58 58.4	-174 31.1	435	213	92	299	433	-12	29027	27560	1	1	-49	-26	0	60	61
73/18:21: 17	58 51.7	-174 36.2	434	214	96	300	430	-12	29024	27584	1	0	-49	-26	8	59	61
73/18:22: 18	58 45.1	-174 30.1	503	81	126	311	413	9	29157	65	2	43	-49	-28	4	59	59
73/18:23: 19	58 50.5	-174 24.8	344	341	97	302	412	11	29082	66	2	32	-49	-28	7	59	60
73/18:24: 19	58 55.2	-174 16.2	490	70	92	298	423	8	28952	64	1	27	-49	-27	1	59	60
73/18:25: 20	58 55.7	-173 59.8	507	80	97	303	433	7	29012	60	1	0	-49	-26	-15	60	61
73/18:26: 20	58 56.0	-173 43.5	508	80	95	303	435	7	29012	61	1	0	-49	-26	2	59	60
73/18:27: 21	58 58.2	-173 28.9	440	29	100	301	432	12	28947	63	0	26	-48	-26	-30	60	61
73/18:28: 22	59 4.3	-173 27.8	357	333	87	298	426	8	28984	1024	1	1	-49	-27	4	60	60
73/18:29: 22	59 10.1	-173 50.4	392	2	85	300	424	11	29018	80	1	26	-49	-27	2	60	61
73/18:30: 23	59 16.4	-173 25.3	410	13	92	299	426	12	28932	27428	1	1	-49	-27	2	60	60
73/18:31: 24	59 22.6	-173 19.3	414	15	91	299	426	12	28976	27406	1	0	-49	-27	-3	60	60
73/18:32: 24	59 28.7	-173 13.1	414	14	92	298	426	12	28977	27381	1	0	-49	-28	-8	60	60
73/18:33: 25	59 34.9	-173 6.8	414	15	90	297	424	12	28988	27369	1	1	-49	-28	-1	60	63
73/18:34: 25	59 41.0	-173 0.5	414	15	89	296	422	12	28987	27344	1	0	-49	-28	0	60	61
73/18:35: 26	59 47.3	-172 54.1	415	15	85	296	423	11	28999	27348	1	1	-49	-27	-1	60	60
73/18:36: 27	59 53.4	-172 47.7	417	16	85	296	424	11	28986	27309	1	1	-49	-27	-3	60	61
73/18:37: 27	59 59.6	-172 41.2	418	17	79	296	424	10	28989	27302	1	1	-49	-28	-4	60	61
73/18:38: 28	60 5.8	-172 34.6	418	17	77	295	422	10	28979	27277	1	1	-49	-27	-1	60	60
73/18:39: 29	60 12.1	-172 28.0	420	18	72	297	425	9	28988	27271	1	1	-49	-28	-4	60	61
73/18:40: 29	60 18.3	-172 21.3	422	18	69	295	424	9	28982	27254	1	0	-49	-28	2	60	61
73/18:41: 30	60 24.5	-172 14.6	423	19	67	291	421	9	28989	27242	1	1	-49	-28	-8	60	62
73/18:42: 30	60 30.7	-172 7.9	425	19	63	288	419	8	28987	27218	1	1	-49	-28	-10	61	61
73/18:43: 31	60 37.1	-172 0.9	427	20	61	292	424	8	29006	27217	1	0	-50	-29	-28	61	61
73/18:44: 32	60 43.4	-171 53.8	429	20	62	289	423	8	28981	27184	1	1	-50	-28	-13	61	61
73/18:45: 32	60 49.7	-171 46.9	429	20	60	289	424	8	28996	27176	1	0	-50	-29	-20	61	61
73/18:46: 33	60 56.0	-171 39.8	431	21	58	287	423	7	28986	27156	1	1	-50	-29	-26	61	61
73/18:47: 34	61 2.4	-171 32.6	432	21	56	285	424	7	28993	27152	1	1	-50	-29	-28	61	62
73/18:48: 34	61 8.7	-171 25.4	433	21	55	284	423	6	28997	27144	1	1	-51	-30	-19	61	62
73/18:49: 35	61 15.2	-171 18.0	435	22	54	282	423	7	28983	27119	1	0	-51	-29	-16	61	62
73/18:50: 35	61 21.5	-171 10.7	436	22	51	282	424	6	28994	27114	1	1	-51	-29	-6	61	62
73/18:51: 36	61 27.9	-171 3.3	437	22	51	281	424	6	28997	27111	0	1	-51	-29	-10	61	62
73/18:52: 37	61 34.3	-170 55.7	439	23	46	278	425	5	28990	27100	1	1	-51	-30	-8	61	60
73/18:53: 37	61 40.7	-170 48.2	439	23	47	276	423	5	28995	27090	1	1	-51	-30	-8	62	62
73/18:54: 38	61 47.2	-170 40.4	440	23	47	278	424	5	28994	27080	1	0	-51	-29	-7	62	62



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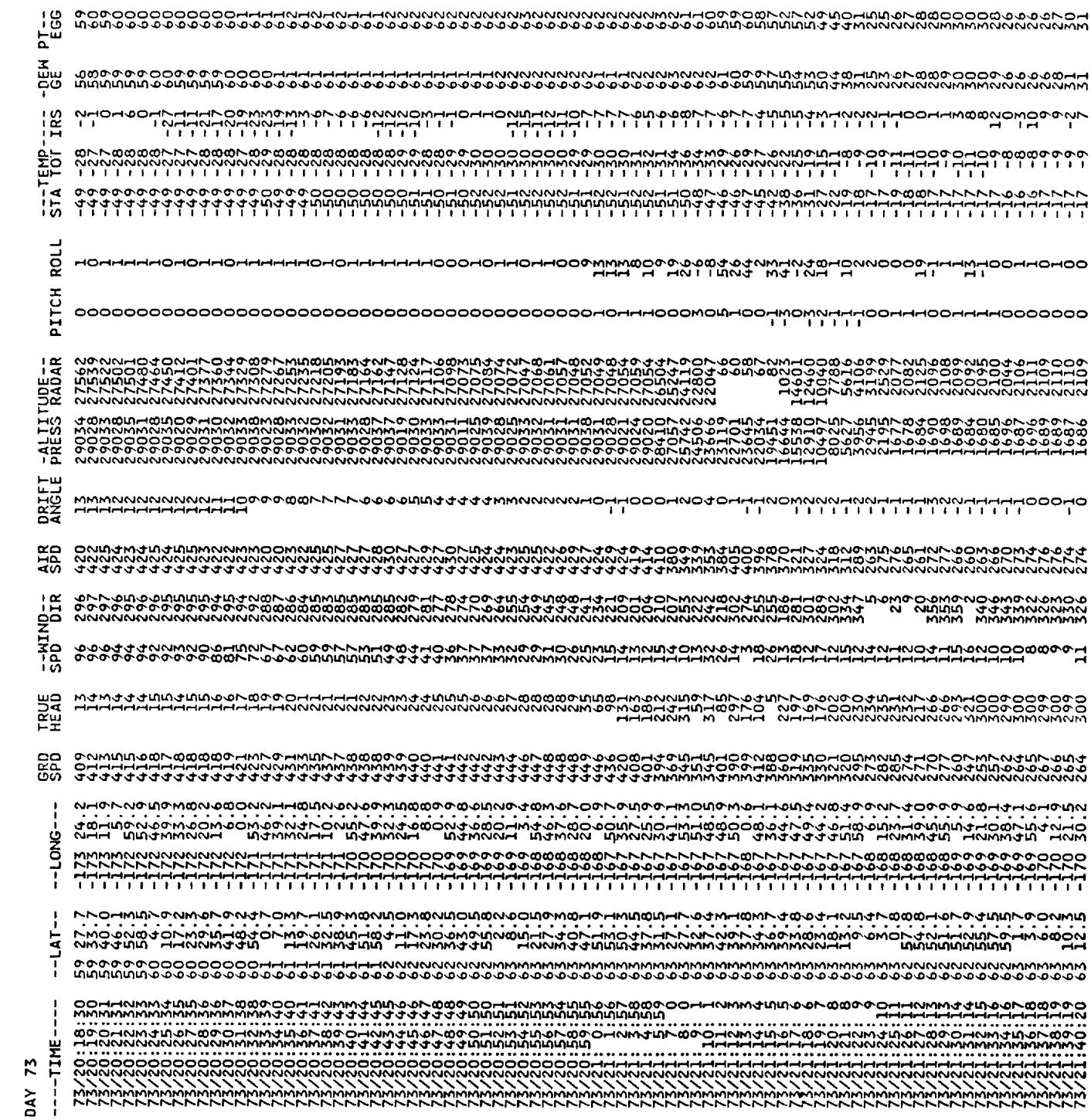

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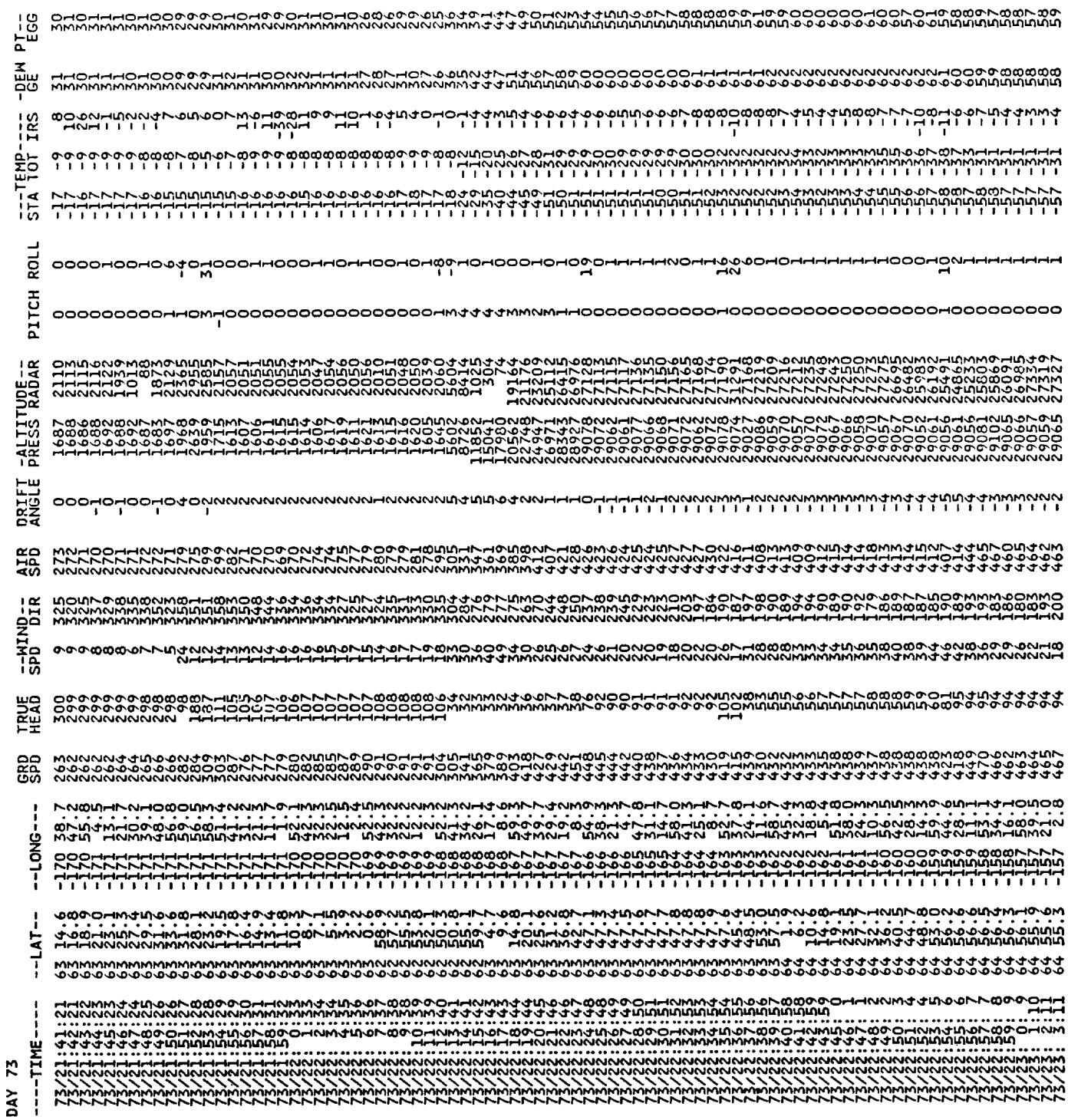

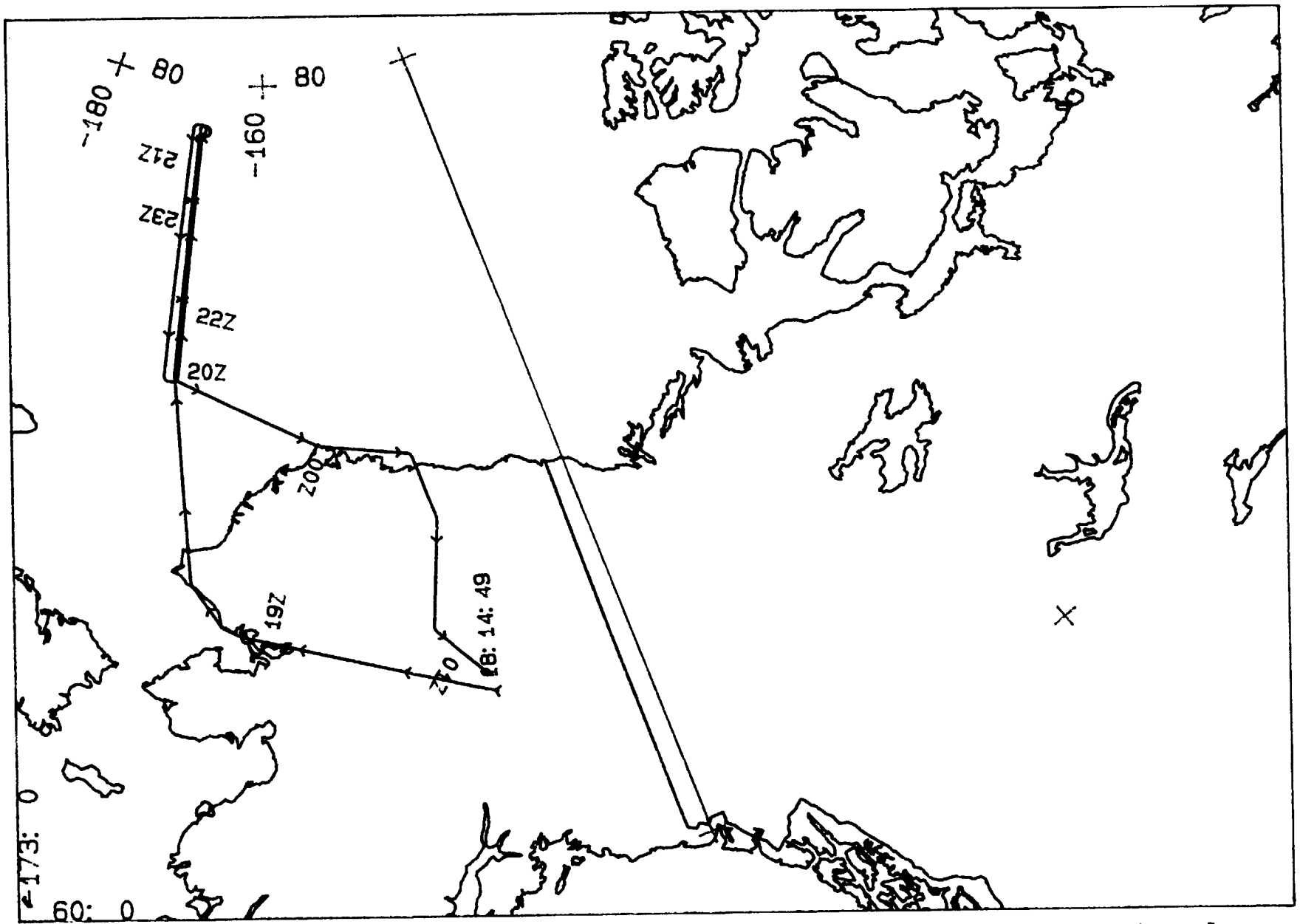

Sea Ice Flight #6 March 14 1988 Fairbanks Local

6.FLT

18: 14: 39 TO 1: 17: 09 UT SCALE 1: 1.50E+07 TIME TIC EVERY 20.00 MINUTES

DC-8 Mission Director Log

Mission Name: Sea Ice
Flight Number: 6 (14 Mar 88)

18:16:36 | today is march 14,1988

18:17:44 | INS at ramp was 64-48.6 n and 147-52.7 w

18:18:03 | take off was at 18-12-04

19:11:39 | >>>> Start of run: Chukchi sea trans

Altitude: 31080 Latitude: +67 10.6
Longitude: -163 48.5

19:21:19 | >>>> End of run: Chukchi sea trans

Altitude: 31105 Latitude: +68 4.4
Longitude: -165 36.3

19:40:59 | >>>> Start of run: INS check

Altitude: 31078 Latitude: +70 30.3
Longitude: -166 36.4

20:01:02 | >>>> Start of run: Chukchi sea #2 Wp 4

Altitude: 31067 Latitude: +73 3.7
Longitude: -167 51.5

20:19:14 | >>>> Start of run:

Altitude: 31087 Latitude: +75 13.6
Longitude: -167 51.4

20:47:55 | >>>> End of run: Chukchi sea #2 Wp 5

Altitude: 31082 Latitude: +78 37.9
Longitude: -167 51.3

20:56:18 | >>>> Start of run: Chukchi sea #3 Wp 6

```
          |      Altitude: 31053                          Latitude:  +78 37.9
          |                                               Longitude: -168 43.6
--------------
21:28:10 | P3 under DC8
--------------
21:29:24 | INS 2 has been selected for EU conversions.
--------------
21:29:32 | INS 1 has been selected for EU conversions.
--------------
          |
-------------------------------------------------------------------------
21:31:07 | >>>> Start of run:  practice
          |
          |      Altitude: 31075                          Latitude:  +74 32.2
          |                                               Longitude: -168 43.3
--------------
21:31:24 | >>>> End of run:  practice
          |
          |      Altitude: 31084                          Latitude:  +74 30.4
          |                                               Longitude: -168 43.3
-------------------------------------------------------------------------
          |
--------------
21:44:07 | >>>> End of run:  Chukchi #2
          |
          |      Altitude: 31086                          Latitude:  +73  0.0
          |                                               Longitude: -168 43.2
-------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------
21:50:10 | >>>> Start of run:  Chukchi Sea #4
          |
          |      Altitude: 31084                          Latitude:  +73 10.5
          |                                               Longitude: -167 34.5
--------------
22:20:43 | JPL switched their #10 taperecorder from 400 Hz to 60
          | Hz because the recorder was getting hot.
--------------
22:21:58 | The switch was made 20 min ago. So far no heating
          | problem
--------------
22:36:16 | >>>> End of run:
          |
          |      Altitude: 31082                          Latitude:  +78 37.3
          |                                               Longitude: -167 34.1
-------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------
22:44:18 | >>>> Start of run:  Chukchi Sea #5 Wp 5
          |
          |      Altitude: 31095                          Latitude:  +78 38.9
          |                                               Longitude: -167 52.0
--------------
23:32:10 | >>>> End of run:  Chukchi Sea #5 Wp 4
```

	Altitude: 31091	Latitude: +73 0.0 Longitude: -167 52.1
23:42:16	Cavalieri decided to count a run between Wp 4 and Wp 4'	
23:42:48	>>>> Start of run: Cavalieri run	
	Altitude: 31104	Latitude: +72 23.4 Longitude: -163 37.1
23:49:03	heading on this course is 117.7	
00:01:38	>>>> End of run: Cavalieri run	
	Altitude: 31083	Latitude: +71 20.4 Longitude: -156 55.3
00:02:37	>>>> End of run: Cavalieri run	
	Altitude: 31077	Latitude: +71 15.7 Longitude: -156 3.9
00:03:42	>>>> Start of run: Pt. Barrow	
	Altitude: 31093	Latitude: +71 14.4 Longitude: -155 40.6
00:19:28	>>>> End of run: Pt. Barrow Wp 5'	
	Altitude: 31086	Latitude: +70 48.6 Longitude: -150 9.7
00:21:24	>>>> Start of run: Wp 5'	
	Altitude: 31107	Latitude: +70 36.3 Longitude: -149 53.1
00:33:00	>>>> End of run: Wp 6'	
	Altitude: 31094	Latitude: +69 10.9 Longitude: -149 11.8

```
          |
--------------
          |
-------------------------------------------------------------------------
00:34:28  | >>>> Start of run:  Wp 6'
          |
          |       Altitude: 31104                          Latitude:  +69  0.0
          |                                               Longitude: -149 17.2
          |
--------------
00:54:24  | >>>> End of run:  Wp 7'
          |
          |       Altitude: 31084                          Latitude:  +66 42.4
          |                                               Longitude: -150 48.0
          |
-------------------------------------------------------------------------
          |
--------------
??:??:??  | touchdown at 01-27-09
--------------
00:11:41  | INS #1 at ramp  64-47.0 n  147-52.0 w
--------------
??:??:??  | INS #2 at ramp  64-50.9 n  147-46.5 w
--------------
00:19:59  | ※
--------------
```

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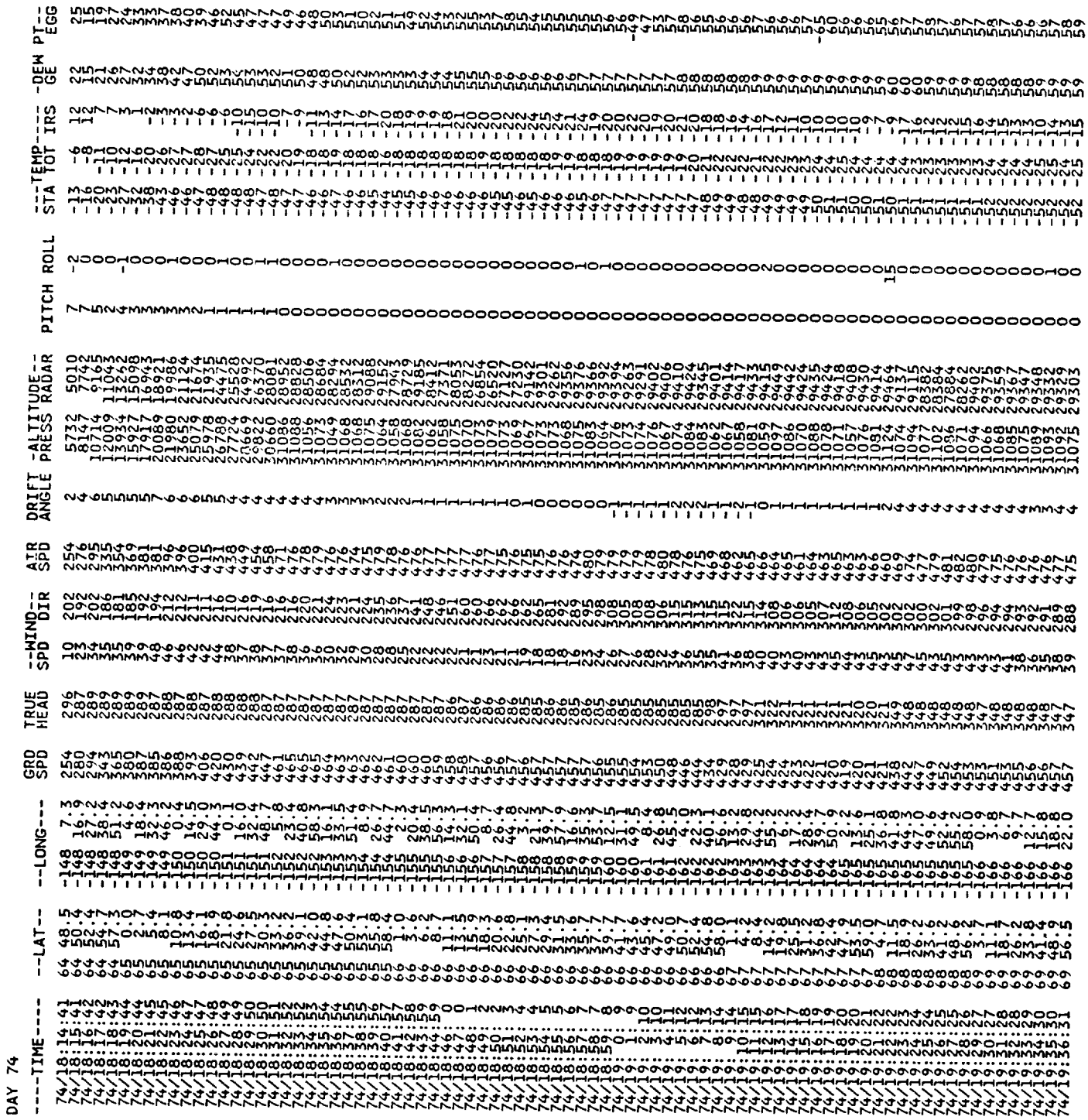

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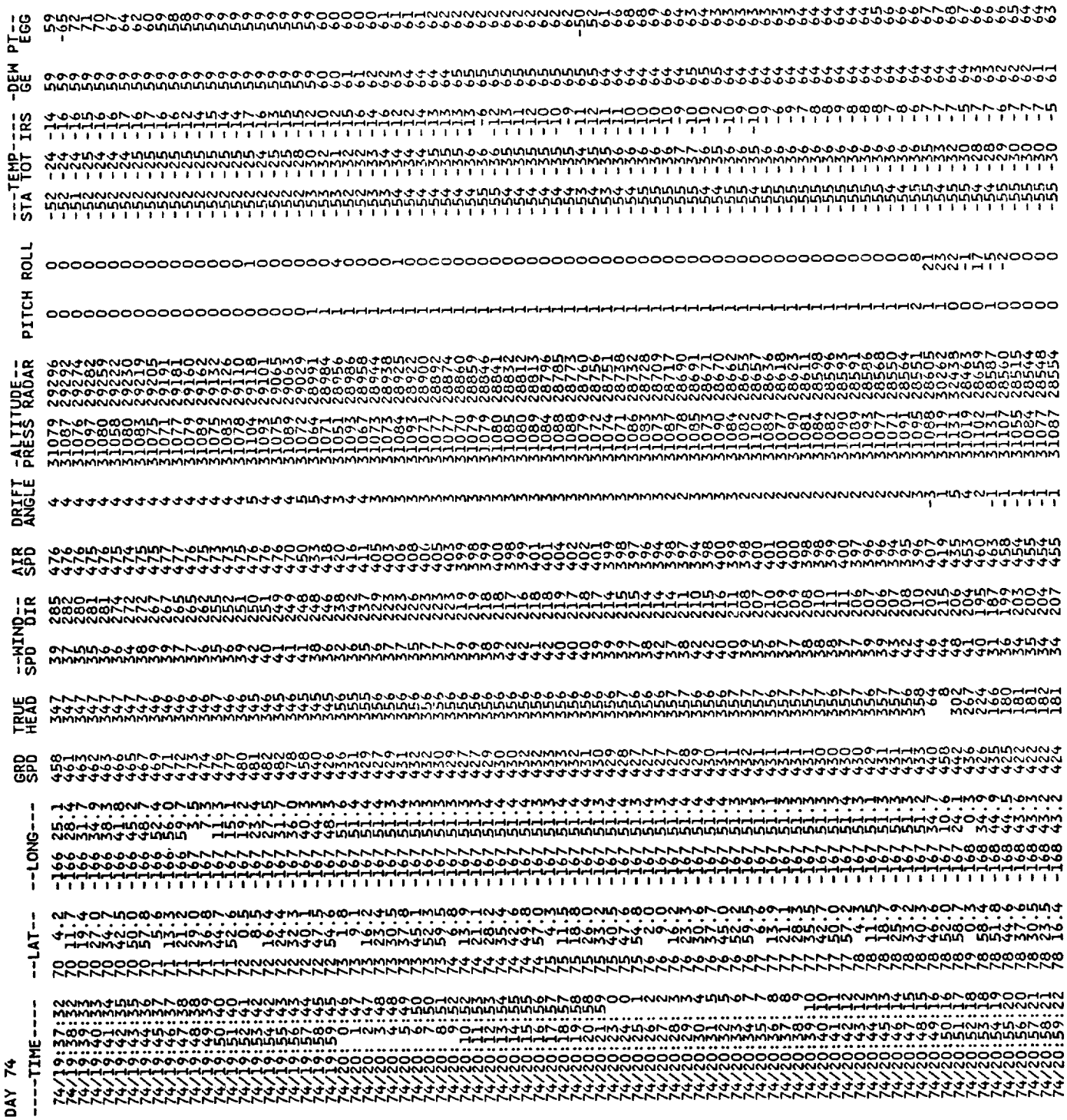

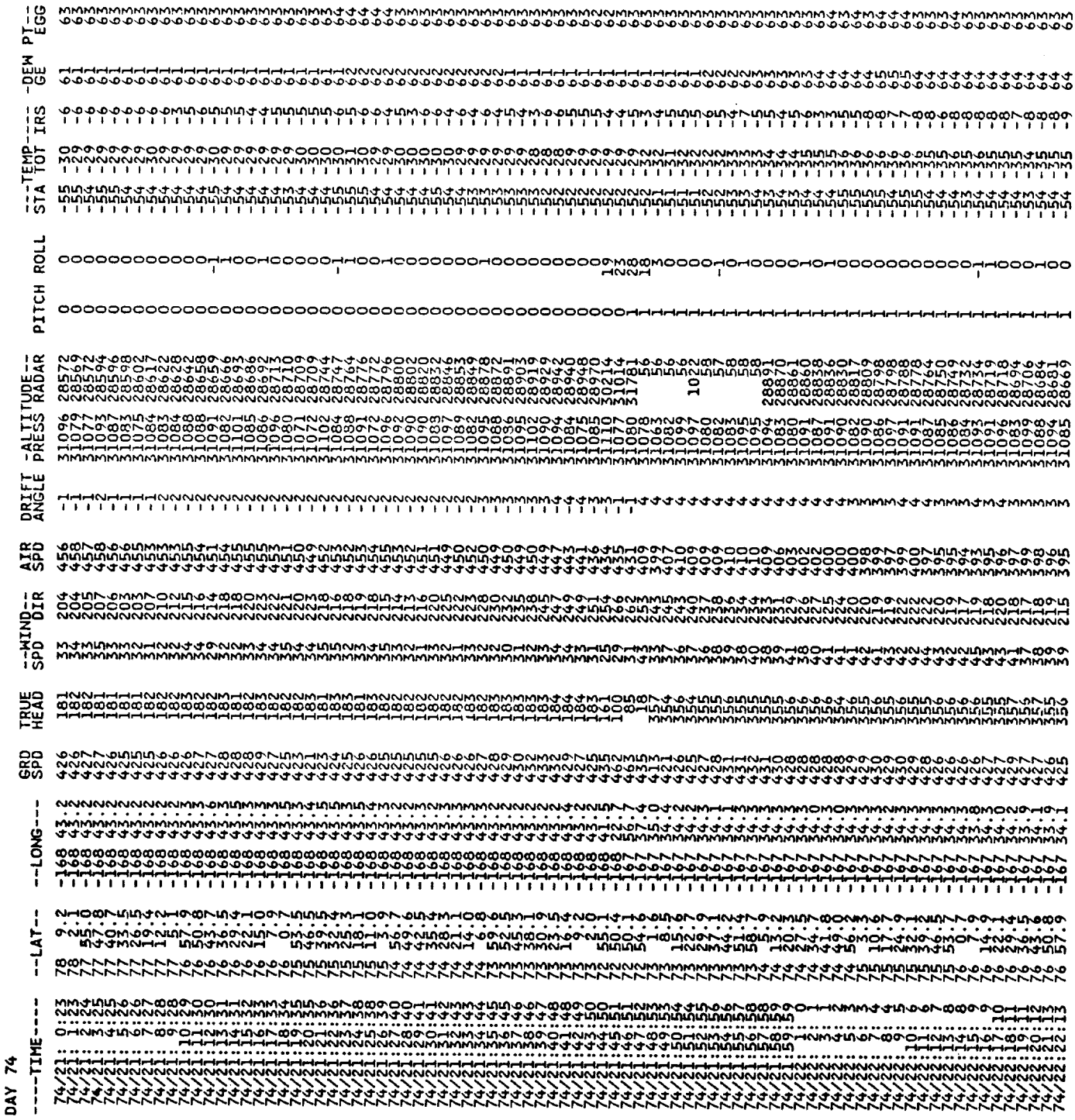

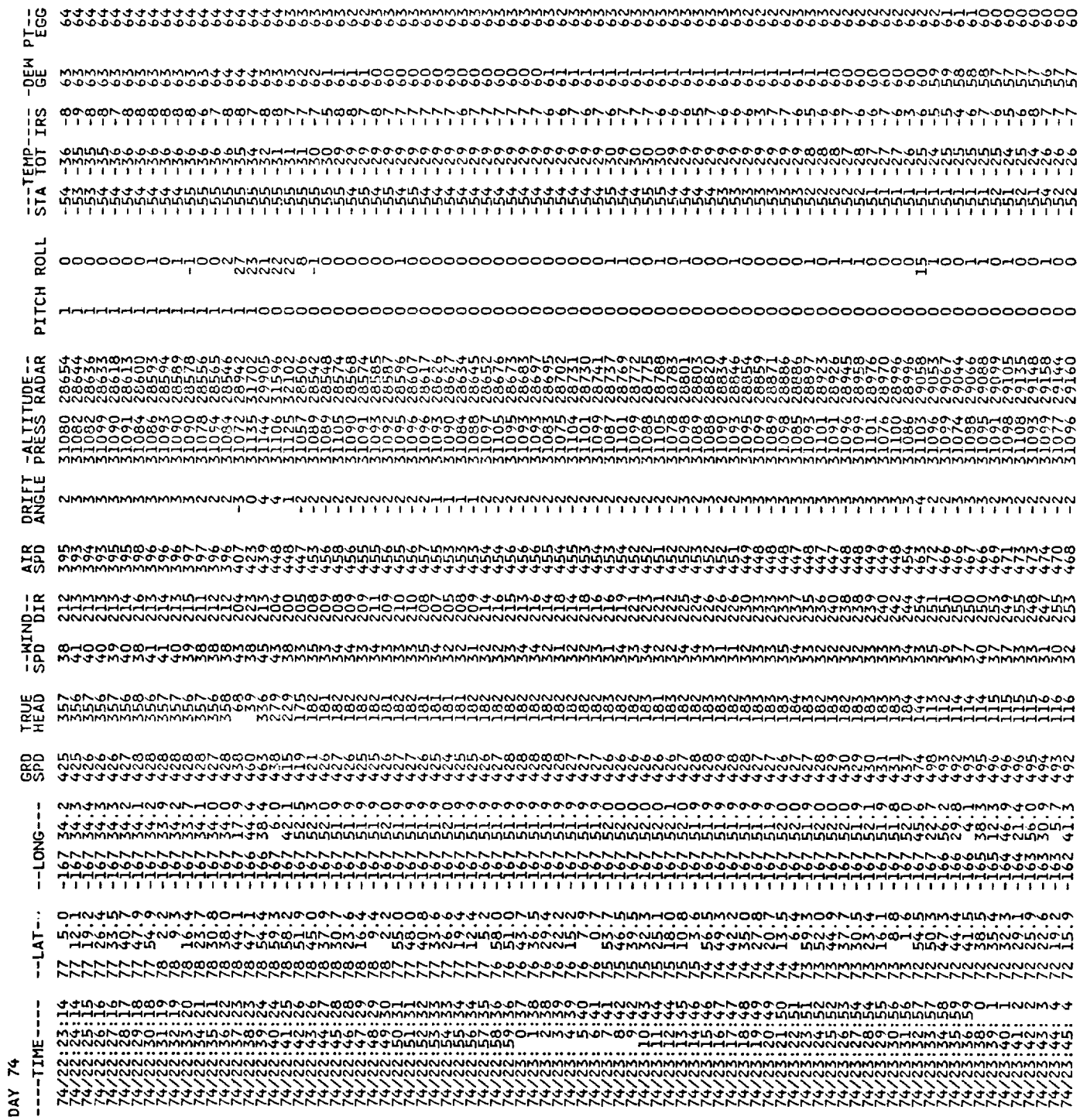

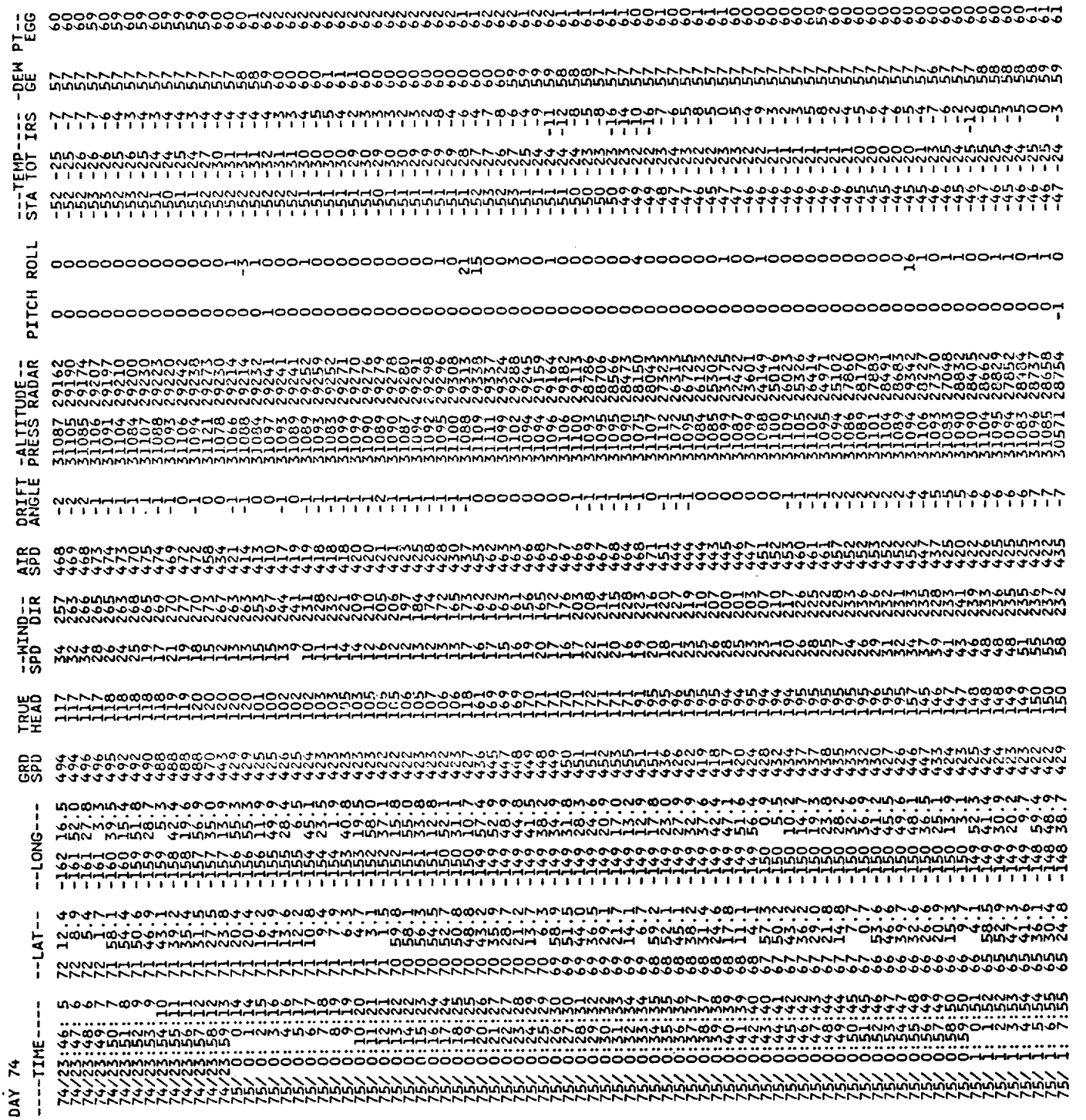

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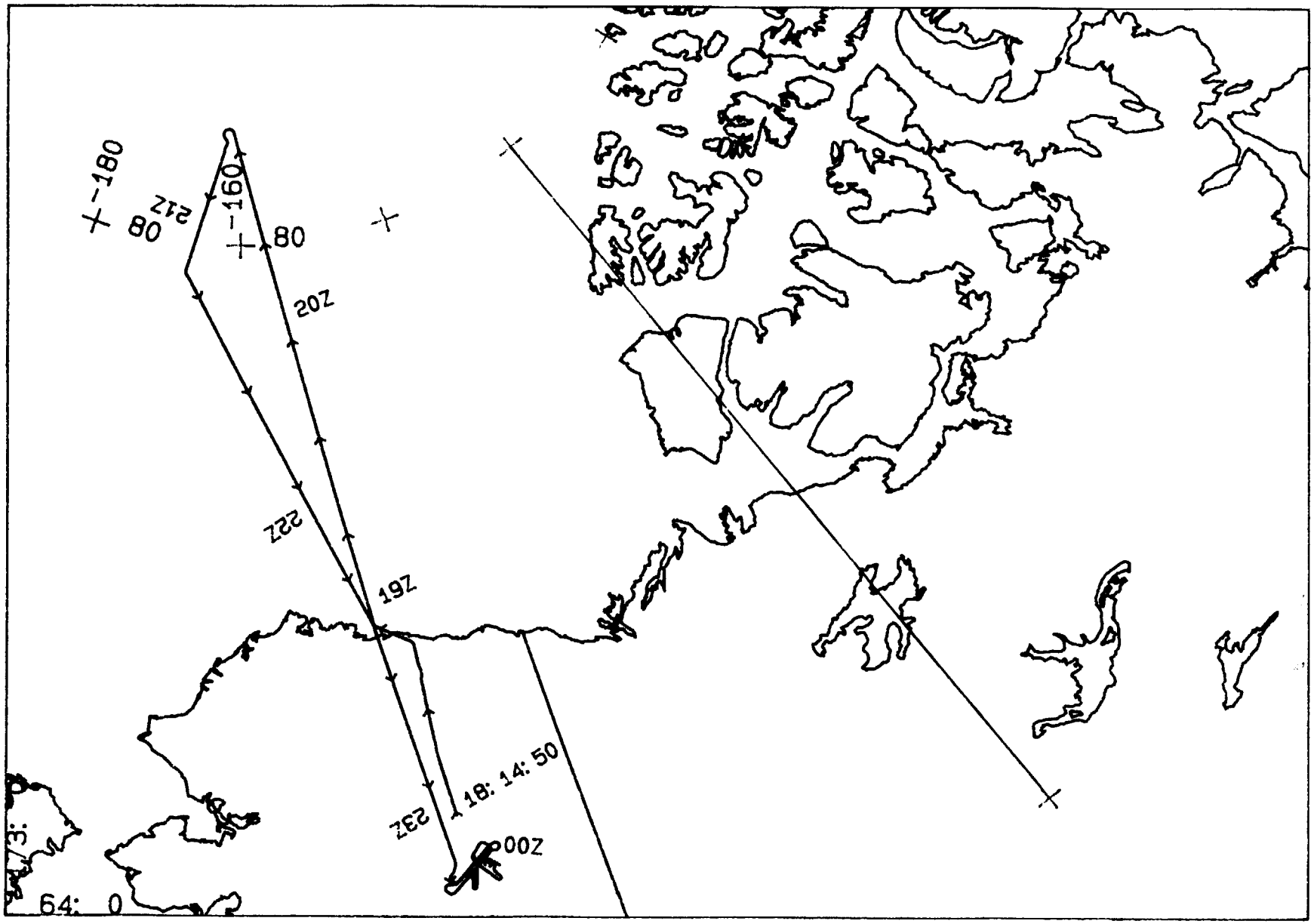
DAY 75

----TIME-----	--LAT--	--LONG---	GRD SPD	TRUE HEAD	--WIND-- SPD	DIR	AIR SPD	DRIFT ANGLE	-ALTITUDE-- PRESS	RADAR	PITCH	ROLL	---TEMP---- STA	TOT	IRS	-DEW PT-- GE	EGG
75/ 1: 8:56	65 18.7	-148 35.5	355	220	69	240	420	-3	29704	29274	0	45	-46	-25	-5	59	-61
75/ 1: 9:57	65 22.3	-148 41.0	465	53	63	206	404	-1	26958	76	6	63	-45	-26	0	58	-57
75/ 1:10:57	65 18.5	-148 33.9	385	167	55	224	413	-7	26271	59	1	28	-45	-25	-1	59	53
75/ 1:11:58	65 17.6	-148 20.6	444	25	75	243	384	4	26745	1020	0	44	-46	-28	-5	59	60



Sea Ice Flight #7 March 17 1988 Fairbanks Local
7.FLT
18: 14: 40 TO 0: 37: 00 UT SCALE 1: 1.50E+07 TIME TIC EVERY 20.00 MINUTES

DC-8 Mission Director Log — Mission Name: Sea Ice 88
Flight Number: 7 (17 Mar 88)

18:07:23	Today is 3-17-88
18:07:47	take off was 18-01-14
18:08:25	the PRT-5 was turned off - not working right
18:11:28	new radio alt. R/T unit installed this flight
18:11:48	radio alt not
18:12:51	radio alt on MD console not bouncing around like last flight
18:15:00	>>>> Start of run: INS check Altitude: 28132 — Latitude: +66 3.0, Longitude: -148 10.2
18:49:52	>>>> Start of run: cameras Altitude: 31065 — Latitude: +70 17.7, Longitude: -148 49.1
18:58:00	>>>> Start of run: Prudhoe Bay coast W Altitude: 31050 — Latitude: +70 54.4, Longitude: -150 54.2
19:04:50	GPS reported he has 4 sat. He did a altitude check and reported agreement between his altitude and our radio altitude to within 50 ft
19:47:01	>>>> Start of run: INS check Altitude: 31063 — Latitude: +76 37.7, Longitude: -153 40.6
19:55:19	GPS is +4 sec faster than aircraft or JPL
20:40:39	>>>> End of run: Prudhoe Bay #1 Wp4 Altitude: 31064 — Latitude: +82 39.8, Longitude: -161 17.3

```
          |
--------------
          |
-------------------------------------------------------------------------
20:47:23  | >>>> Start of run:  Prudhoe Bay #2 Wp4
          |
          |      Altitude: 31062                      Latitude:  +82  9.2
          |                                          Longitude: -162 57.1
--------------
20:51:21  | JPL just turned P band transmitter off
--------------
21:10:00  | >>>> End of run:  Prudhoe Bay #2 Wp5
          |
          |      Altitude: 31071                      Latitude:  +79 27.5
          |                                          Longitude: -166 58.8
-------------------------------------------------------------------------
          |
--------------
          |
----------|--------------------------------------------------------------
21:13:31  | >>>> Start of run:  Prudhoe Bay #3 Wp5
          |
          |      Altitude: 31075                      Latitude:  +79  3.7
          |                                          Longitude: -166 14.0
--------------
21:36:10  | The following 60 Hz power is recorded
--------------
21:36:44  | sta 1 ESMR = 2.5amps
--------------
21:37:19  | sta 2 photo = 2.5 amps
--------------
21:37:56  | sta 8 JPL (recorder) =2.5 amps
--------------
21:38:24  | sta 9 test eq. = 0
--------------
21:39:14  | sta 10 JPL (opt. rec.) = 3 amps
--------------
21:39:31  | MD = 0
--------------
21:40:30  | sta 11 printer/AMMR = 2.5 amps
--------------
21:40:57  | sta 12 AMMR =2 amps
--------------
21:41:27  | sta 14 Nav < 0
--------------
21:41:47  | sta 18 GPS 2 amps
--------------
21:42:15  | sta 19 test eq =0
--------------
21:42:31  | sta 20 test eq = 0
--------------
21:42:49  | sta 21 test eq = 0
--------------
21:43:12  | sta 22 JPL computer = 7.5 amps
--------------
21:43:39  | sta F1 photo < 0
--------------
21:44:14  | sta F2 JPL preamp. < 0
```

```
--------------
21:44:44 | HSKP = 5 amps
--------------
21:45:01 | DADS = 6 amps
--------------
21:45:48 | total converter #1 = 15 amps
--------------
21:46:17 | total converter #2 = 22 amps
--------------
21:46:36 | The following is 400 Hz power
--------------
21:46:59 | left A phase = 12 amps
--------------
21:47:21 | left B phase = 12 amps
--------------
21:47:39 | left C phase = 8 amps
--------------
21:47:56 | right a phase = 9 amps
--------------
21:48:20 | right B phase = 7 amps
--------------
21:48:37 | right C phase = 10 amps
--------------
22:03:50 | temps in forward cargo ;  #1=54.8 , #2 = 57.0  #3 =
         | 53.9 #4 =64.8 , #5 = 52.2
--------------
22:26:36 | >>>> End of run:  Prudhoe Bay #3 Wp3
         |
         |      Altitude: 31078                    Latitude:  +70 48.0
         |                                        Longitude: -150 54.0
-------------------------------------------------------------------------
         |
--------------
22:42:32 | JPL is transmitting on H polarization on P band
--------------
23:13:39 | >>>> End of run:  FAI #1
         |
         |      Altitude: 31067                    Latitude:  +64 53.9
         |                                        Longitude: -148 50.0
-------------------------------------------------------------------------
         |
--------------
23:14:32 | cancell above
--------------
         |
-------------------------------------------------------------------------
23:20:07 | >>>> Start of run:  FAI #1
         |
         |      Altitude: 31054                    Latitude:  +64 33.7
         |                                        Longitude: -148 38.5
--------------
23:26:40 | >>>> End of run:  FAI #1
         |
         |      Altitude: 31066                    Latitude:  +65  1.2
         |                                        Longitude: -147  9.7
-------------------------------------------------------------------------
         |
--------------
```

```
          |
-------------------------------------------------------------------
23:35:09  | >>>> Start of run:  FAI #2 Gatto
          |
          |       Altitude: 31068                    Latitude:  +65  1.0
          |                                         Longitude: -147 13.2
--------------
23:43:20  | >>>> End of run:  FAI #2 Gatto
          |
          |       Altitude: 31068                    Latitude:  +64 29.4
          |                                         Longitude: -148 55.3
-------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------
23:51:44  | >>>> Start of run:  FAI #3 Cimino
          |
          |       Altitude: 31066                    Latitude:  +64 26.1
          |                                         Longitude: -148 40.3
--------------
23:58:39  | >>>> End of run:  FAI #3 Cimino
          |
          |       Altitude: 31069                    Latitude:  +64 55.7
          |                                         Longitude: -147  3.9
-------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------
00:09:18  | >>>> Start of run:  FAI #4 Gatto
          |
          |       Altitude: 31070                    Latitude:  +64 41.8
          |                                         Longitude: -147 29.8
--------------
00:13:20  | >>>> End of run:  FAI #4 Gatto
          |
          |       Altitude: 31049                    Latitude:  +64 20.0
          |                                         Longitude: -146 49.3
-------------------------------------------------------------------
          |
--------------
05:26:12  | touchdown at 00-45-10
--------------
05:26:48  | INS #1 at TD 64 48.5 n  147 44.1 w
--------------
??:??:??  | INS #2 at TD 64 48.7 n  147 48.5 w
--------------
??:??:??  | JPL    at TD 64.50.7 n  147 48.0 w
--------------
```

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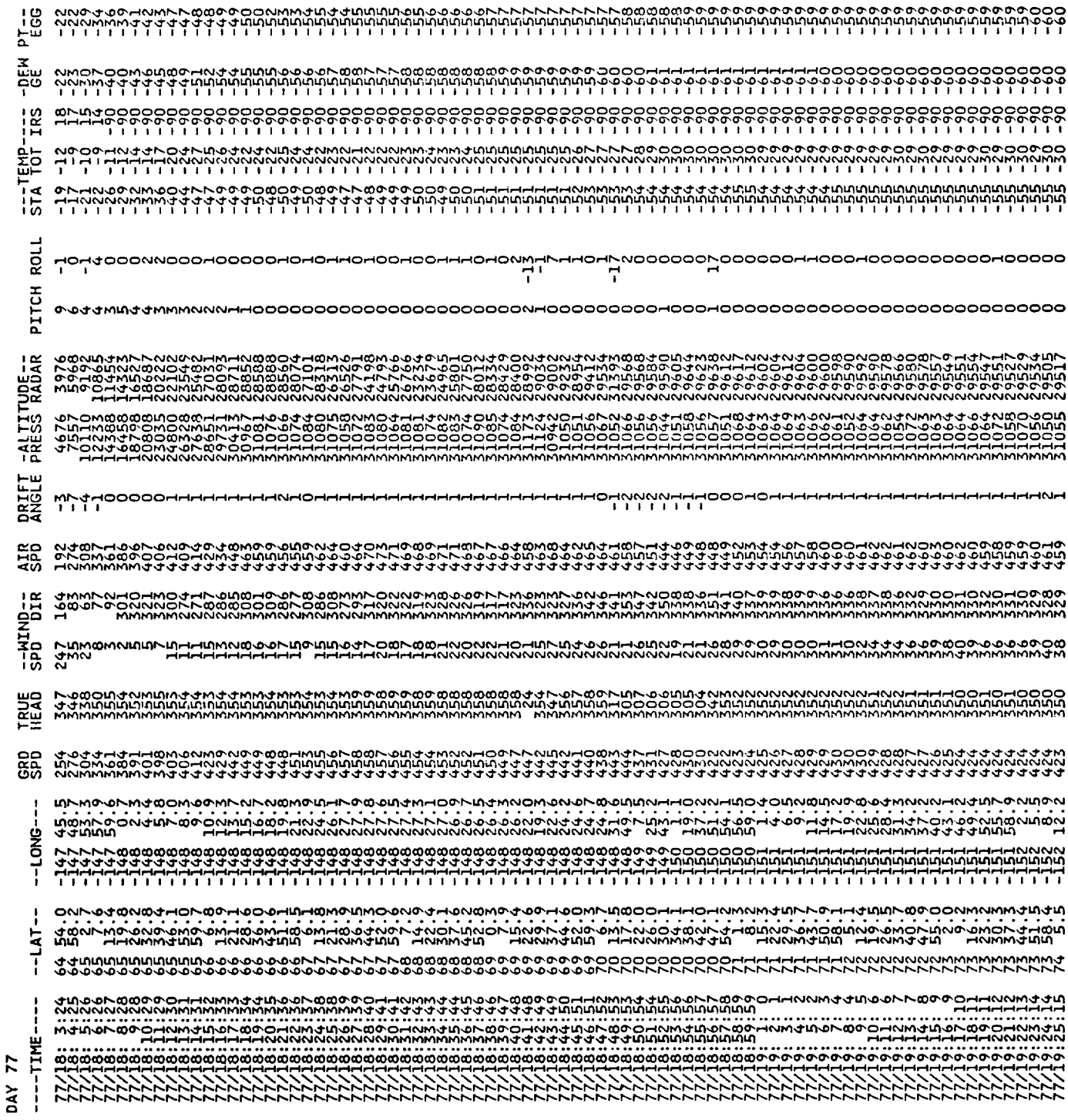

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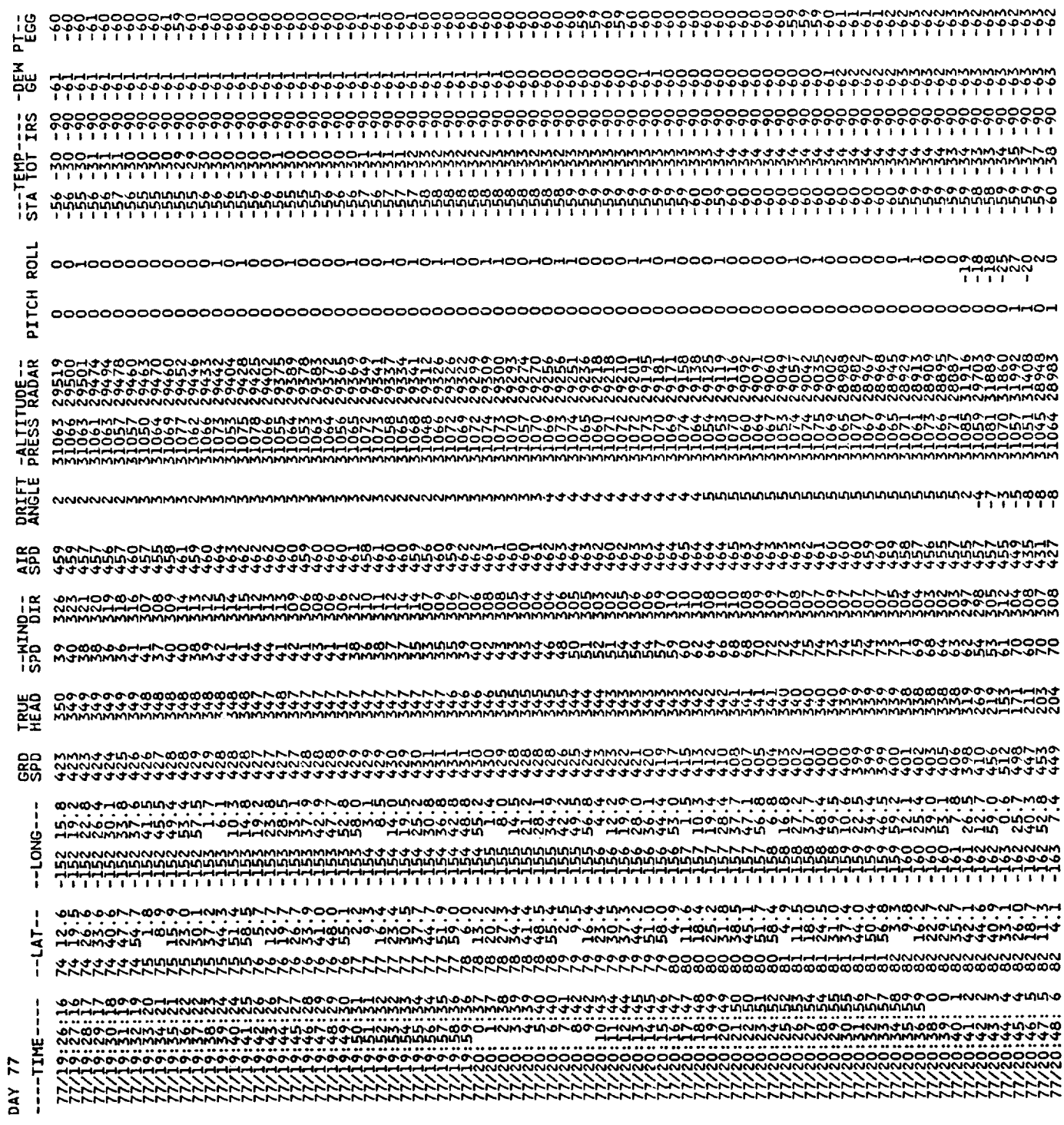

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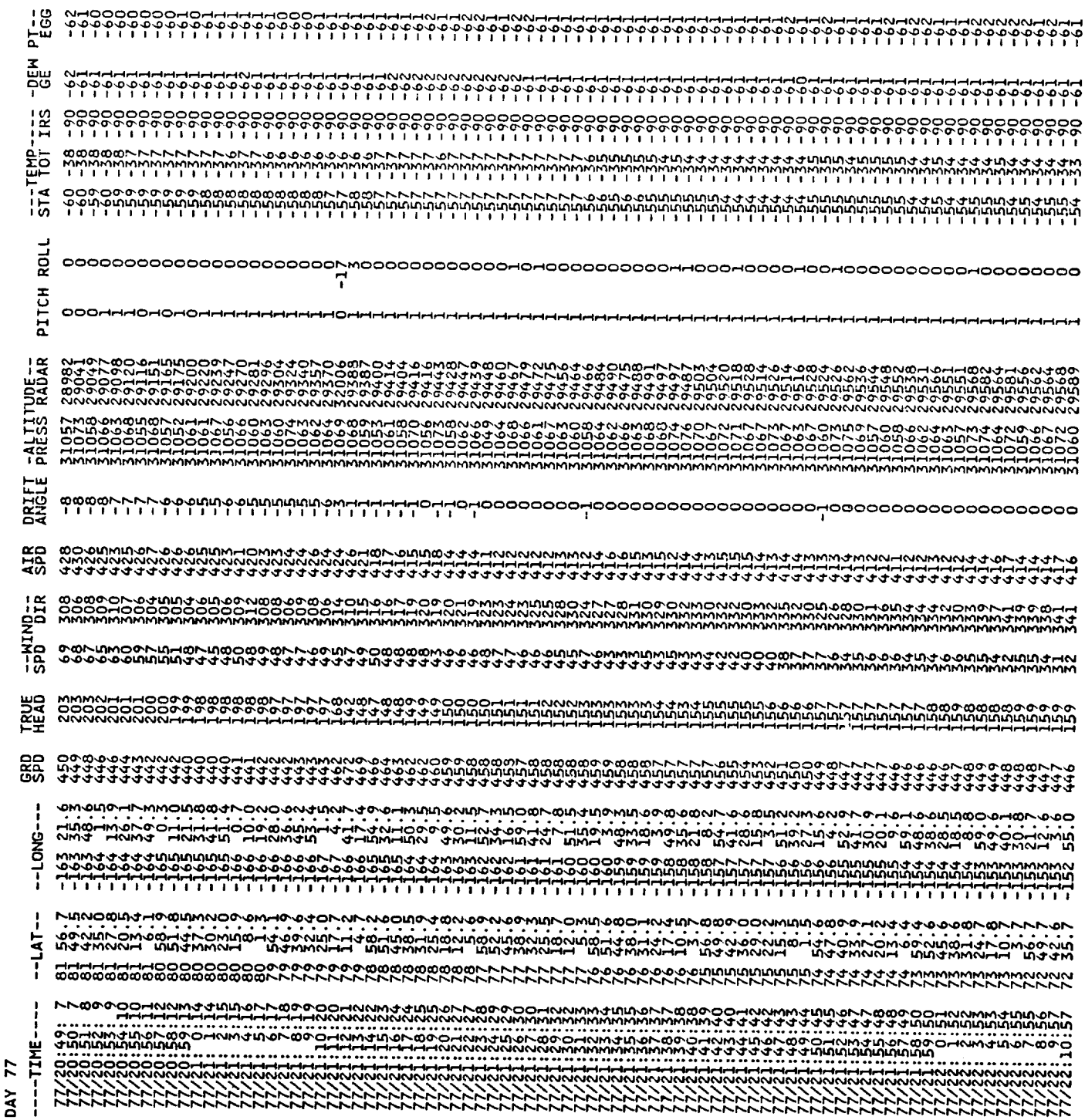

DAY 77

----TIME----	--LAT--	--LONG---	GRD SPD	TRUE HEAD	--WIND-- SPD	--WIND-- DIR	AIR SPD	DRIFT ANGLE	-ALTITUDE- PRESS	-ALTITUDE- RADAR	PITCH	ROLL	--TEMP---- STA	--TEMP---- TOT	--TEMP---- IRS	-DEW PT- GE	-DEW PT- EGG
77/23:34:49	65.2	-147.9	391	223	19	239	411	0	31073	27725	1	1	-51	-31	-90	-63	-62
77/23:35:00	64.5	-147.7	393	225	22	227	417	0	31007	28358	1	0	-51	-30	-90	-63	-62
77/23:35:10	64.3	-147.6	393	225	22	227	418	0	31007	28904	1	0	-51	-31	-90	-63	-62
77/23:35:20	64.1	-147.4	395	225	22	227	418	0	31067	28516	1	0	-51	-29	-90	-62	-62
77/23:35:30	64.0	-147.3	396	225	22	229	418	0	31063	28996	1	0	-51	-29	-90	-62	-62
77/23:35:40	63.8	-147.1	398	225	22	229	418	0	31063	29317	1	0	-51	-29	-90	-62	-62
77/23:35:50	63.7	-147.0	399	225	22	234	418	0	31063	29383	1	0	-51	-29	-90	-62	-62
77/23:36:00	63.5	-146.8	400	225	22	242	420	0	31063	29340	1	0	-51	-29	-90	-62	-62
77/23:36:10	63.4	-146.7	400	225	22	237	420	0	31063	29155	1	0	-51	-29	-90	-62	-62
77/23:36:20	63.2	-146.5	400	227	22	237	420	0	31063	29320	1	0	-51	-30	-90	-62	-62
77/23:36:30	63.1	-146.4	398	227	22	210	417	0	31079	29134	2	2	-51	-29	-90	-62	-62
77/23:36:40	62.9	-146.2	398	227	22	243	417	0	31076	29338	2	2	-50	-29	-90	-62	-62
77/23:36:50	62.8	-146.1	397	227	22	243	417	0	31076	29277	2	2	-50	-29	-90	-62	-62
77/23:37:00	62.6	-145.9	396	227	22	243	416	0	31068	29443	2	2	-50	-29	-90	-62	-62
77/23:37:10	62.5	-145.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:37:20	62.3	-145.6	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:37:30	62.2	-145.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:37:40	62.0	-145.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:37:50	61.9	-145.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:38:00	61.7	-145.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:38:10	61.6	-144.9	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:38:20	61.4	-144.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:38:30	61.3	-144.6	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:38:40	61.1	-144.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:38:50	61.0	-144.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:39:00	60.8	-144.1	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:39:10	60.7	-144.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:39:20	60.5	-143.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:39:30	60.4	-143.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:39:40	60.2	-143.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:39:50	60.1	-143.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:40:00	59.9	-143.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:40:10	59.8	-143.1	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:40:20	59.6	-142.9	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:40:30	59.5	-142.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:40:40	59.3	-142.6	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:40:50	59.2	-142.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:41:00	59.0	-142.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:41:10	58.9	-142.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:41:20	58.7	-142.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
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77/23:42:20	57.8	-141.1	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:42:30	57.7	-141.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:42:40	57.5	-140.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:42:50	57.4	-140.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:43:00	57.2	-140.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:43:10	57.1	-140.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:43:20	56.9	-140.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
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77/23:45:50	54.7	-138.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:46:00	54.5	-137.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:46:10	54.4	-137.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
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77/23:47:40	53.0	-136.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:47:50	52.9	-136.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:48:00	52.7	-136.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:48:10	52.6	-135.9	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:48:20	52.4	-135.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
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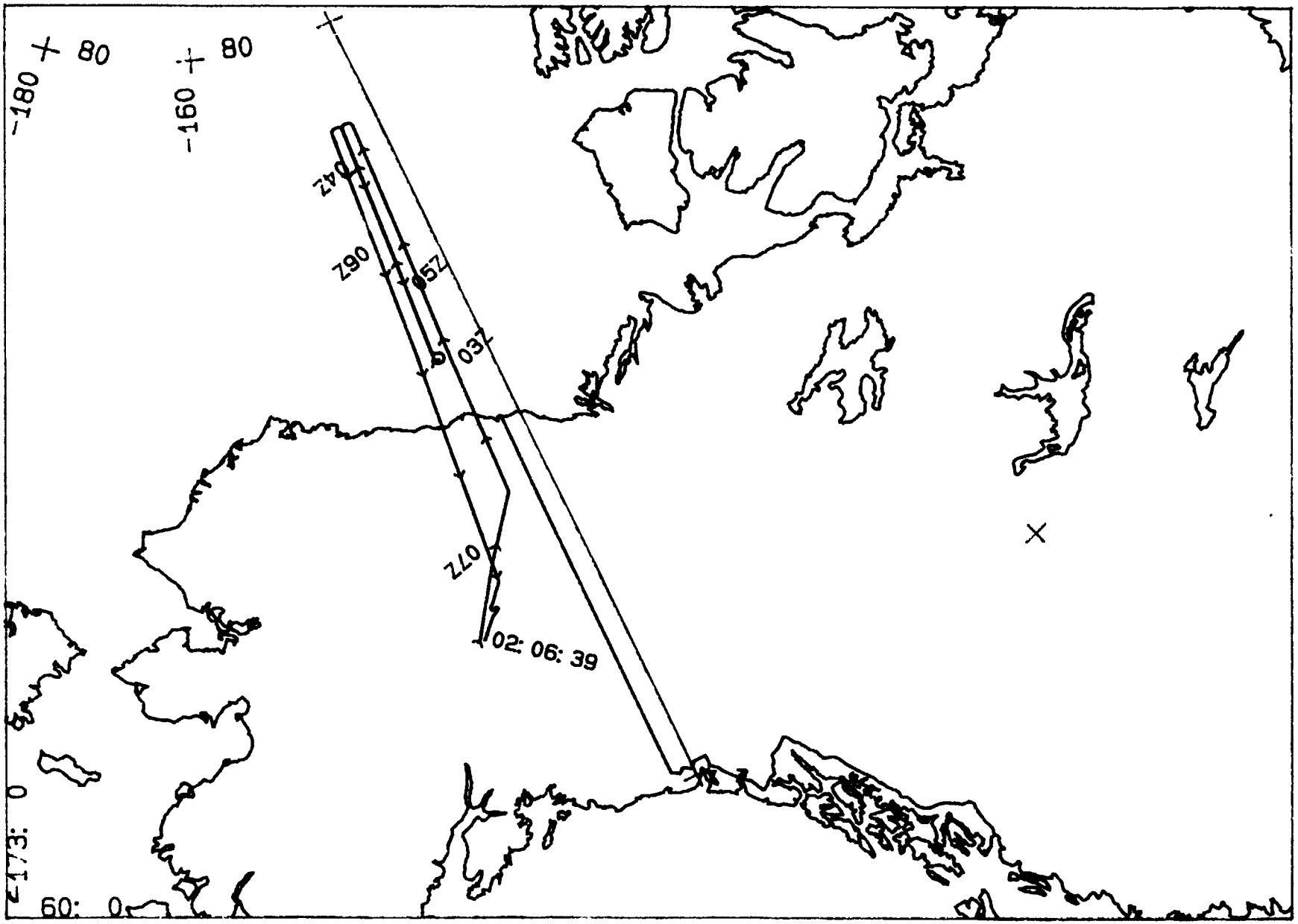
77/23:49:20	51.5	-134.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:49:30	51.4	-134.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:49:40	51.2	-134.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:49:50	51.1	-134.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:50:00	50.9	-134.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:50:10	50.8	-134.1	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:50:20	50.6	-133.9	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:50:30	50.5	-133.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:50:40	50.3	-133.6	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:50:50	50.2	-133.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:51:00	50.0	-133.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:51:10	49.9	-133.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:51:20	49.7	-133.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:51:30	49.6	-132.9	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:51:40	49.4	-132.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:51:50	49.3	-132.6	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:52:00	49.1	-132.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:52:10	49.0	-132.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:52:20	48.8	-132.1	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:52:30	48.7	-132.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:52:40	48.5	-131.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:52:50	48.4	-131.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:53:00	48.2	-131.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:53:10	48.1	-131.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:53:20	47.9	-131.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:53:30	47.8	-131.1	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:53:40	47.6	-130.9	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:53:50	47.5	-130.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:54:00	47.3	-130.6	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:54:10	47.2	-130.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:54:20	47.0	-130.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:54:30	46.9	-130.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:54:40	46.7	-130.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:54:50	46.6	-129.9	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:55:00	46.4	-129.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:55:10	46.3	-129.6	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:55:20	46.1	-129.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:55:30	46.0	-129.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:55:40	45.8	-129.1	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:55:50	45.7	-129.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:56:00	45.5	-128.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:56:10	45.4	-128.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:56:20	45.2	-128.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:56:30	45.1	-128.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:56:40	44.9	-128.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:56:50	44.8	-128.1	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:57:00	44.6	-127.9	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:57:10	44.5	-127.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:57:20	44.3	-127.6	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:57:30	44.2	-127.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:57:40	44.0	-127.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:57:50	43.9	-127.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:58:00	43.7	-127.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:58:10	43.6	-126.9	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:58:20	43.4	-126.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:58:30	43.3	-126.6	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:58:40	43.1	-126.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:58:50	43.0	-126.3	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:59:00	42.8	-126.1	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:59:10	42.7	-126.0	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:59:20	42.5	-125.8	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:59:30	42.4	-125.7	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:59:40	42.2	-125.5	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
77/23:59:50	42.1	-125.4	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62
78/00:00:00	41.9	-125.2	396	227	22	243	416	0	31068	29295	2	2	-50	-29	-90	-62	-62



Sea Ice Flight #8 March 18 1988 Fairbanks Local

8.FLT

2: 06: 29 TO 7: 27: 30 UT SCALE 1: 1.50E+07 TIME TIC EVERY 20.00 MINUTES

DC-8 Mission Director Log

Mission Name: Sea Ice 88
Flight Number: 8 (18Mar88)

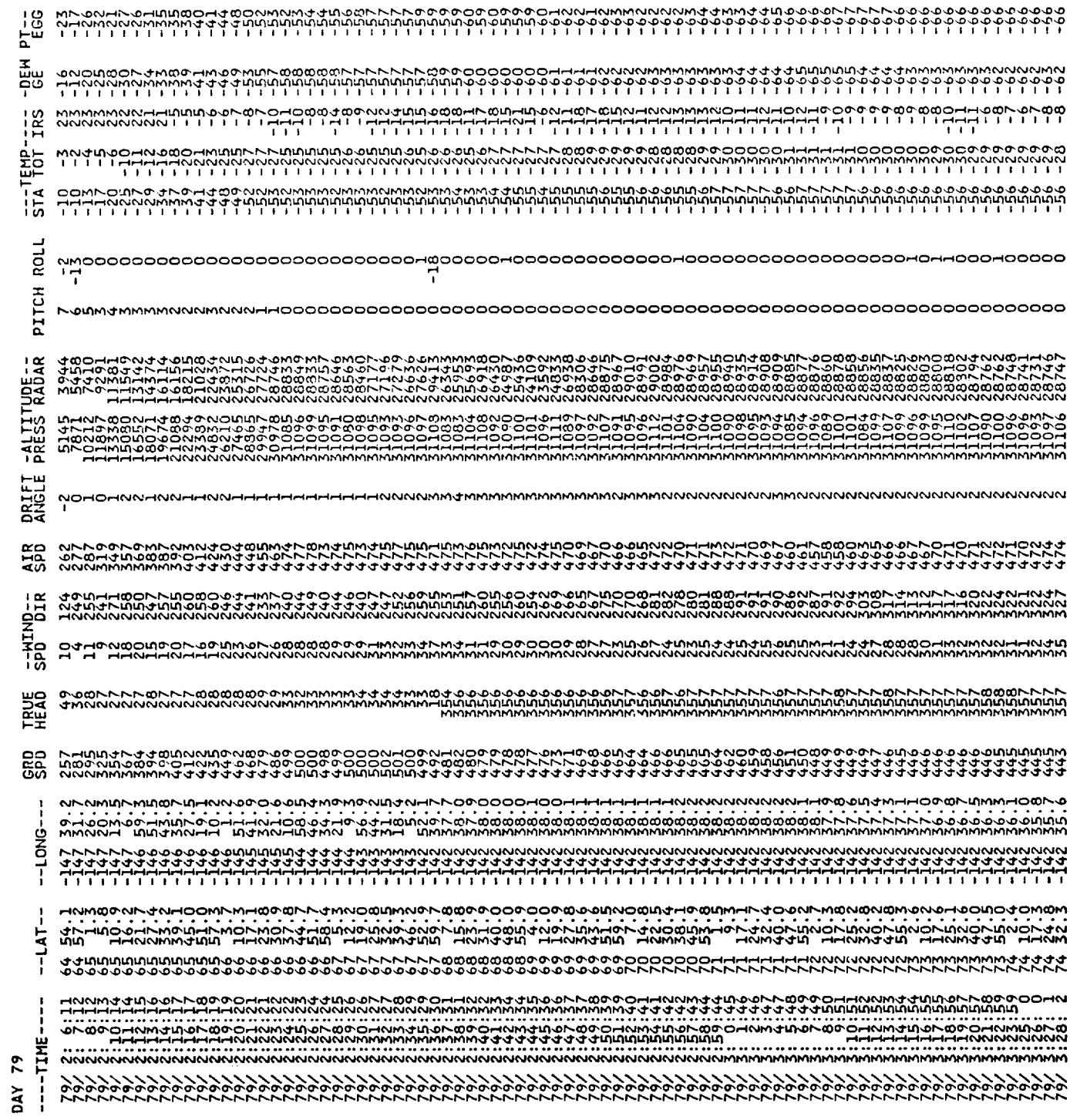
01:20:39	Today is 3-18-88
01:21:05	This is the first night flight
01:22:11	INS #1 and 2 at ramp are 64-48.6 n and 147-52.7 w
02:07:50	take off at 02-03-50
03:06:50	>>>> Start of run: ice camp #1 Wp3
	Altitude: 31094 Latitude: +71 55.4 Longitude: -142 38.1
03:42:06	GPS now tracking 4 sat
03:42:45	GPS alt comparison with aircraft 40 ft
03:42:59	start INS
03:44:59	>>>> Start of run: INS
	Altitude: 31108 Latitude: +76 36.7 Longitude: -142 35.5
03:49:59	sar doing 4 segments per track ,each segment 55 n miles long seperated by 30 miles
03:51:39	>>>> End of run: ice camp #1 Wp#5
	Altitude: 31102 Latitude: +77 25.3 Longitude: -142 35.4
03:57:12	>>>> Start of run: ice camp #2 Wp6
	Altitude: 31094 Latitude: +77 20.7 Longitude: -143 48.6
04:04:33	>>>> End of run: sar segment
	Altitude: 31094 Latitude: +76 25.8 Longitude: -143 48.6

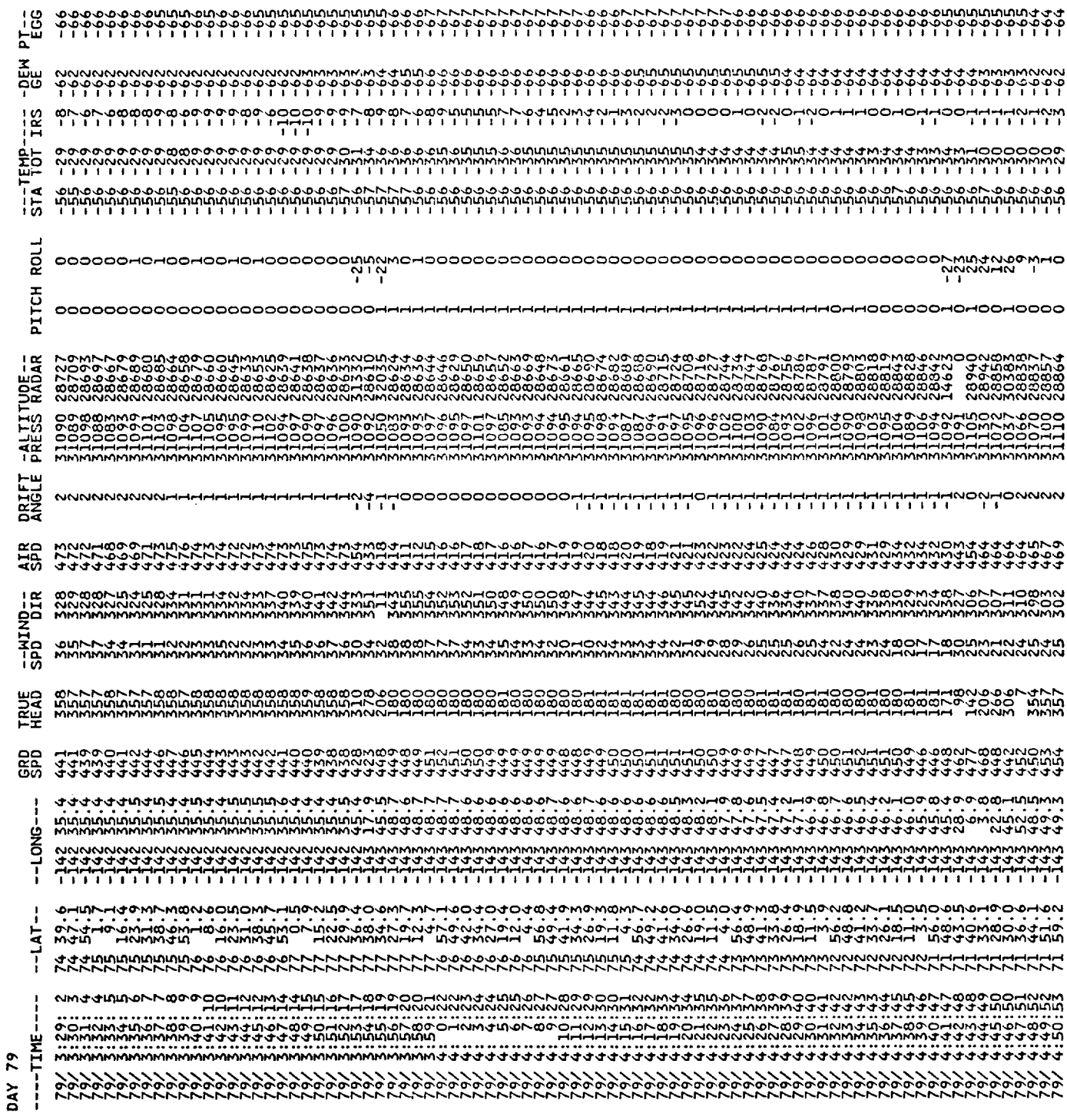
```
04:05:38 | opt recorder taking Ph and Lh data
---------- |
-------------------------------------------------------------------
04:08:39 | >>>> Start of run:  sar segment
         |
         |      Altitude: 31094                    Latitude:  +75 55.3
         |                                        Longitude: -143 48.6
---------- |
04:16:14 | >>>> End of run:  sar segment
         |
         |      Altitude: 31097                    Latitude:  +74 58.9
         |                                        Longitude: -143 48.6
-------------------------------------------------------------------
         |
---------- |
-------------------------------------------------------------------
04:20:24 | >>>> Start of run:  sar segment
         |
         |      Altitude: 31102                    Latitude:  +74 27.8
         |                                        Longitude: -143 48.4
---------- |
04:38:40 | >>>> End of run:  sar segment
         |
         |      Altitude: 31091                    Latitude:  +72 11.7
         |                                        Longitude: -143 46.0
-------------------------------------------------------------------
         |
---------- |
04:39:53 | Time check done with the NADC P3 and they are 4
         | seconds ahead of our time.
---------- |
04:41:34 | >>>> End of run:   WP 1'
         |
         |      Altitude: 31098                    Latitude:  +71 50.2
         |                                        Longitude: -143 45.7
-------------------------------------------------------------------
         |
---------- |
04:43:56 | The last end of run was really at WP 8
---------- |
-------------------------------------------------------------------
04:49:54 | >>>> Start of run:  ice camp #3 Wp
         |
         |      Altitude: 31100                    Latitude:  +71 51.9
         |                                        Longitude: -143 49.3
---------- |
-------------------------------------------------------------------
04:52:04 | >>>> Start of run:  sar
         |
         |      Altitude: 31101                    Latitude:  +72  8.1
         |                                        Longitude: -143 49.2
---------- |
04:59:33 | >>>> End of run:  sar segment
         |
```

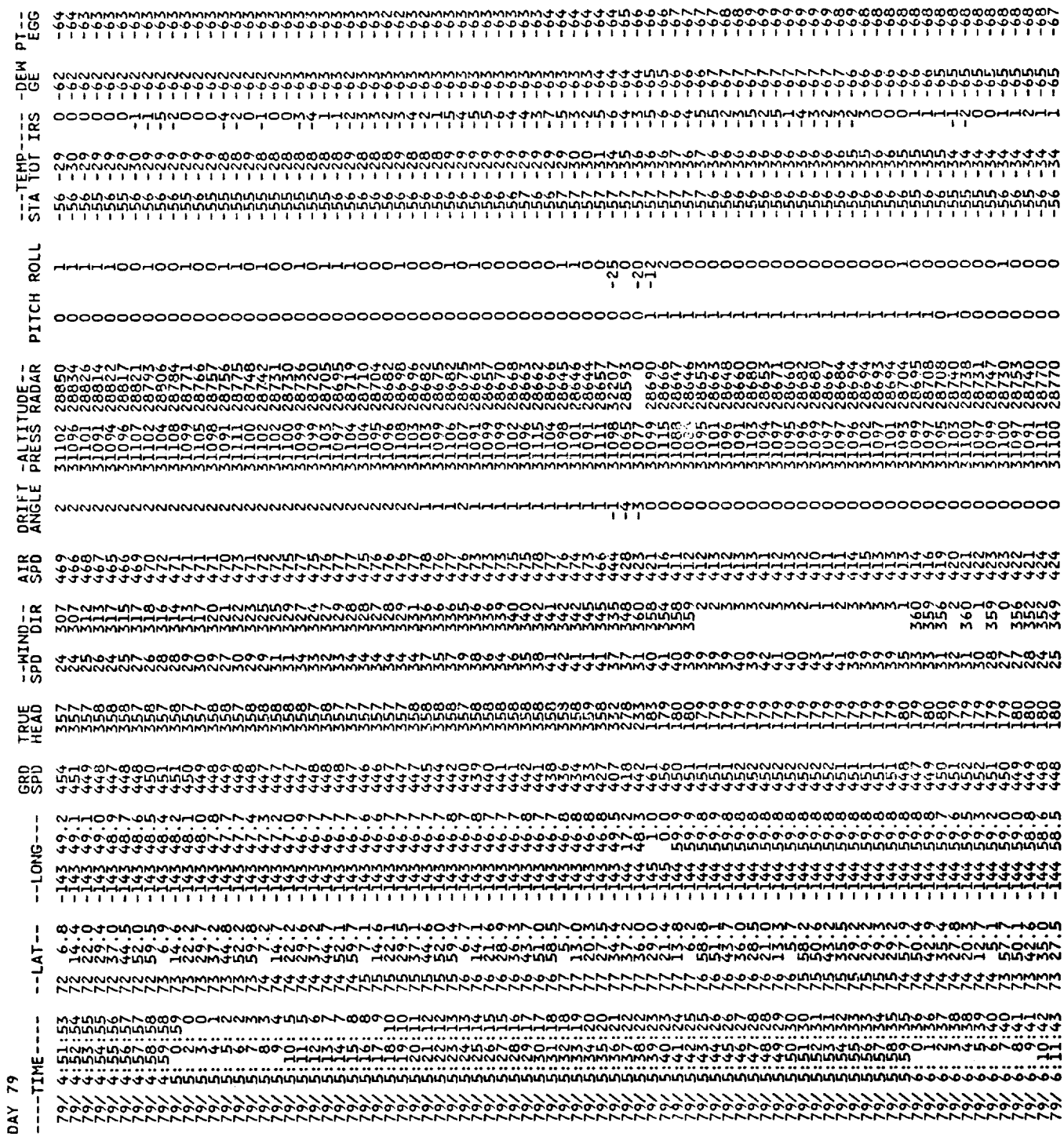
	Altitude: 31110	Latitude: +73 3.9 Longitude: -143 48.4
05:02:58	>>>> Start of run:	
	Altitude: 31107	Latitude: +73 29.4 Longitude: -143 48.0
05:03:24	>>>> Start of run: sar	
	Altitude: 31097	Latitude: +73 32.6 Longitude: -143 47.9
05:07:17	GPS units now: Top unit is GMT + 4 seconds the bottom unit is + 3.	
05:14:57	Reconfirned the P3 time with new results. It appears that their aircraft time is exactly the same as ours and their GPS time is 4 to 4 and one half seconds ahead.	
05:15:40	>>>> Start of run: SAR run	
	Altitude: 31102	Latitude: +75 3.6 Longitude: -143 46.7
05:23:01	>>>> End of run: SAR run	
	Altitude: 31101	Latitude: +75 57.9 Longitude: -143 46.7
05:27:44	>>>> Start of run: SAR run	
	Altitude: 31104	Latitude: +76 32.4 Longitude: -143 46.7
05:35:44	>>>> End of run: ice camp #3 Wp3'	
	Altitude: 31109	Latitude: +77 30.3 Longitude: -143 46.7
05:40:01	>>>> Start of run: ice camp #4 Wp4'	

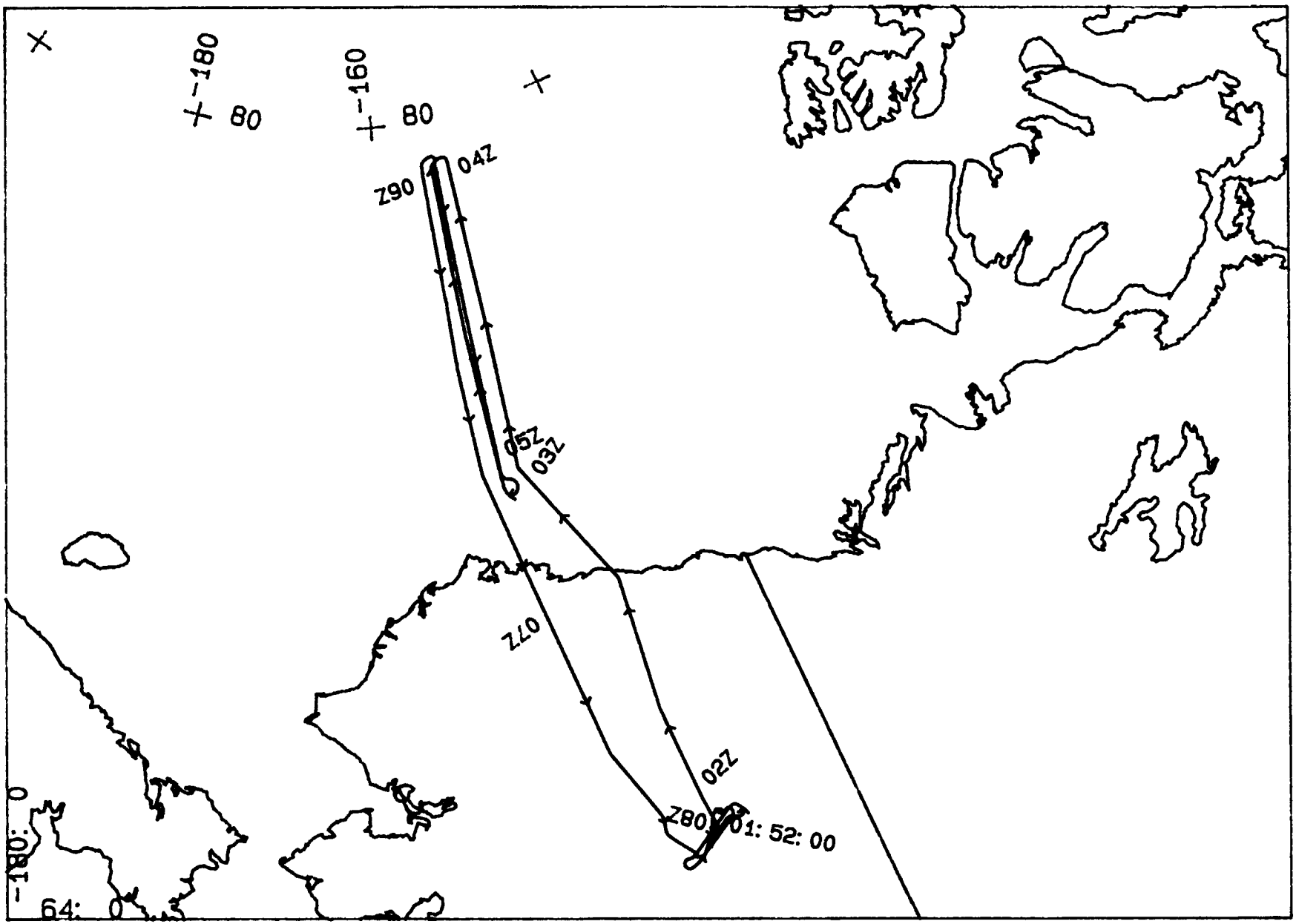
```
          |
          |      Altitude: 31113                          Latitude:  +77 24.2
          |                                              Longitude: -145  0.5
--------------
          |
-------------------------------------------------------------------------
05:42:00  | >>>> Start of run:  INS check
          |
          |      Altitude: 31090                          Latitude:  +77  9.3
          |                                              Longitude: -144 59.9
--------------
05:47:01  | >>>> End of run:  sar segment
          |
          |      Altitude: 31096                          Latitude:  +76 31.8
          |                                              Longitude: -144 59.8
-------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------
05:50:00  | >>>> Start of run:  INS check
          |
          |      Altitude: 31102                          Latitude:  +76  9.4
          |                                              Longitude: -144 59.8
--------------
          |
-------------------------------------------------------------------------
05:51:14  | >>>> Start of run:  sar
          |
          |      Altitude: 31102                          Latitude:  +76  0.2
          |                                              Longitude: -144 59.8
--------------
06:34:44  | [B
--------------
06:35:30  | ▓
--------------
06:37:50  | ▓
--------------
06:40:10  | the grid crashed
--------------
06:42:12  | the ports were switched after the grid was reloaded ,
          | that seemed to work
--------------
          |
-------------------------------------------------------------------------
06:55:00  | >>>> Start of run:  INS check
          |
          |      Altitude: 31091                          Latitude:  +67 55.7
          |                                              Longitude: -145 12.2
--------------
          |
-------------------------------------------------------------------------
07:02:24  | >>>> Start of run:
          |
          |      Altitude: 31093                          Latitude:  +66 59.2
          |                                              Longitude: -145 15.1
--------------
07:03:08  | SAR start run over the Yukon River.
```

```
--------------
00:16:29 | touchdown at 07-39-46
--------------
00:17:11 | INS #1 at ramp  64-50.6 n  147-47.5
--------------
??:??:?? | INS #2 at ramp  64-47.6 n  147-53.7
--------------
??:??:?? | JPL    at ramp  64-50.6 n  147-49.1
--------------
00:20:07 | GPS    at ramp  64-48.59 n  147-52.79
--------------
```









Sea Ice Flight #9 March 19 1988 Fairbanks Local

9.FLT

1: 51: 50 TO 8: 41: 19 UT SCALE 1: 1.25E+07 TIME TIC EVERY 20.00 MINUTES

DC-8 Mission Director Log

Mission Name: Sea Ice 88
Flight Number: 9 (19Mar88)

01:23:44	today is 3-19-88
01:24:15	#1 INS 64-48.6 n 147. 52.7 w
01:24:23	INS #2 same
01:55:10	take off at 01-50-06
01:59:48	just after take off fluid was dripping out of power station box #11. The cause of the fluid was cleaning fluid in the over head storage was not secure and spilled over.
02:01:53	This is the Beauford Sea mosaic
02:47:30	SAR P band is in-operative right now .Switching problem . May be related to the removal of the P-band polarization switch.
03:00:28	SAR just got P-band h up and will be taking some P-band data
03:05:51	>>>> Start of run: Beau Sea #1 Altitude: 31097 Latitude: +72 56.8 Longitude: -152 31.8
03:13:12	>>>> End of run: sar segment Altitude: 31090 Latitude: +73 42.7 Longitude: -152 28.5
03:24:48	SAR started another segment however we didn't catch the start time
03:26:58	>>>> End of run: Beau Sea #1 Altitude: 31108 Latitude: +75 9.4 Longitude: -152 21.5
03:27:57	error in above title . should read end of SAR segment
03:28:23	now tracking 4 GPS sat

```
03:29:00 | >>>> Start of run:  INS check
         |
         |      Altitude: 31091                          Latitude:  +75 22.3
         |                                              Longitude: -152 20.3
-------------
         |
-------------------------------------------------------------------------
03:33:50 | >>>> Start of run:  SAR segment
         |
         |      Altitude: 31098                          Latitude:  +75 52.9
         |                                              Longitude: -152 18.7
-------------
03:36:40 | GPS ahead 4 sec of aircraft and JPL
-------------
03:41:54 | >>>> End of run:  SAR segment
         |
         |      Altitude: 31107                          Latitude:  +76 44.6
         |                                              Longitude: -152 18.7
-------------------------------------------------------------------------
         |
-------------
         |
-------------------------------------------------------------------------
03:48:08 | >>>> Start of run:  SAR segement
         |
         |      Altitude: 31103                          Latitude:  +77 24.9
         |                                              Longitude: -152 18.9
-------------
03:55:40 | >>>> End of run:  SAR segement
         |
         |      Altitude: 31094                          Latitude:  +78 14.0
         |                                              Longitude: -152 18.8
-------------------------------------------------------------------------
         |
-------------
         |
-------------------------------------------------------------------------
04:00:00 | >>>> Start of run:  INS check
         |
         |      Altitude: 31101                          Latitude:  +78 42.5
         |                                              Longitude: -152 18.8
-------------
04:02:41 | >>>> End of run:  Beau Sea #1 Wp5
         |
         |      Altitude: 31099                          Latitude:  +79  0.2
         |                                              Longitude: -152 18.7
-------------------------------------------------------------------------
         |
-------------
         |
-------------------------------------------------------------------------
04:08:13 | >>>> Start of run:  Beau Sea #2 Wp6
         |
         |      Altitude: 31109                          Latitude:  +78 51.3
         |                                              Longitude: -153 41.9
-------------
         |
-------------------------------------------------------------------------
```

```
04:11:38 | >>>> Start of run:  sar
         |
         |      Altitude: 31102                          Latitude:  +78 20.9
         |                                              Longitude: -153 41.7
--------------
04:18:50 | >>>> End of run:  sar
         |
         |      Altitude: 31100                          Latitude:  +77 15.7
         |                                              Longitude: -153 41.8
-------------------------------------------------------------------------
         |
--------------
         |
-------------------------------------------------------------------------
04:23:38 | >>>> Start of run:  sar segment
         |
         |      Altitude: 31101                          Latitude:  +76 32.0
         |                                              Longitude: -153 41.8
--------------
04:28:12 | temps in the forward cargo bay
--------------
04:28:24 | #1 =58.0
--------------
04:28:44 | #2 = 60.3
--------------
04:28:56 | #3 = 57.2
--------------
04:29:11 | #4 = 67.8
--------------
04:29:24 | #5 = 54.8
--------------
04:30:07 | >>>> End of run:  sar segment
         |
         |      Altitude: 31106                          Latitude:  +75 33.0
         |                                              Longitude: -153 41.8
-------------------------------------------------------------------------
         |
--------------
         |
-------------------------------------------------------------------------
04:32:32 | >>>> Start of run:  sar
         |
         |      Altitude: 31093                          Latitude:  +75 10.9
         |                                              Longitude: -153 41.9
--------------
         |
-------------------------------------------------------------------------
04:44:59 | >>>> Start of run:  INS check
         |
         |      Altitude: 31104                          Latitude:  +73 17.2
         |                                              Longitude: -153 42.1
--------------
04:48:20 | >>>> End of run:   Track #2 WP #8
         |
         |      Altitude: 31081                          Latitude:  +72 46.6
         |                                              Longitude: -153 42.0
-------------------------------------------------------------------------
         |
```

```
--------------
          |
-------------------------------------------------------------------------
04:55:41  | >>>> Start of run:  Beau Sea #3 Wp1'
          |
          |      Altitude: 31093                      Latitude:  +72 33.6
          |                                          Longitude: -153 43.4
--------------
          |
-------------------------------------------------------------------------
04:57:45  | >>>> Start of run:  SAR run
          |
          |      Altitude: 31115                      Latitude:  +72 47.1
          |                                          Longitude: -153 45.2
--------------
05:05:15  | >>>> End of run:  sar
          |
          |      Altitude: 31101                      Latitude:  +73 35.7
          |                                          Longitude: -153 50.4
-------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------
05:11:54  | >>>> Start of run:  SAR segment
          |
          |      Altitude: 31096                      Latitude:  +74 18.9
          |                                          Longitude: -153 55.4
--------------
05:19:33  | >>>> End of run:  SAR segment
          |
          |      Altitude: 31098                      Latitude:  +75  9.2
          |                                          Longitude: -154  1.9
-------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------
05:25:42  | >>>> Start of run:  SAR segment
          |
          |      Altitude: 31097                      Latitude:  +75 50.0
          |                                          Longitude: -154  6.2
--------------
05:39:51  | the terminal at the MD console died at 05-30 . Russ
          | patched his terminal to MD console
--------------
          |
-------------------------------------------------------------------------
05:39:59  | >>>> Start of run:  sar
          |
          |      Altitude: 31095                      Latitude:  +77 25.2
          |                                          Longitude: -154  6.3
--------------
05:47:26  | >>>> End of run:  sar
          |
          |      Altitude: 31099                      Latitude:  +78 15.6
          |                                          Longitude: -154  6.4
-------------------------------------------------------------------------
```

```
          |
-------------
          |
-------------------------------------------------------------------------
05:49:28  | >>>> Start of run:  INS
          |
          |      Altitude: 31105                        Latitude:  +78 29.4
          |                                            Longitude: -154  6.4
-------------
          |
-------------------------------------------------------------------------
05:51:14  | >>>> Start of run:  ins
          |
          |      Altitude: 31105                        Latitude:  +78 41.6
          |                                            Longitude: -154  6.4
-------------
05:52:57  | >>>> End of run:  Beau Sea #3 Wp3'
          |
          |      Altitude: 31073                        Latitude:  +78 53.4
          |                                            Longitude: -154  6.4
-------------------------------------------------------------------------
          |
-------------
06:26:00  | the start of Beau #4 Wp4' was at 06-00-01
-------------
06:26:49  | lat was 78-57.4 n  155-09.4
-------------
06:28:26  | during the run from Wp4' to 6' the aircraft rolled 8
          | degrees or so several times
-------------
06:32:21  | >>>> End of run:  SAR segment
          |
          |      Altitude: 31194                        Latitude:  +74  9.8
          |                                            Longitude: -155  5.6
-------------------------------------------------------------------------
          |
-------------
          |
-------------------------------------------------------------------------
06:34:27  | >>>> Start of run:  sar
          |
          |      Altitude: 31189                        Latitude:  +73 50.7
          |                                            Longitude: -155  3.1
-------------
06:40:54  | >>>> End of run:  Beau Sea #4 Wp6'
          |
          |      Altitude: 31180                        Latitude:  +72 51.3
          |                                            Longitude: -154 55.9
-------------------------------------------------------------------------
          |
-------------
          |
-------------------------------------------------------------------------
06:43:15  | >>>> Start of run:  INS check
          |
          |      Altitude: 31200                        Latitude:  +72 30.2
          |                                            Longitude: -154 40.9
-------------
```

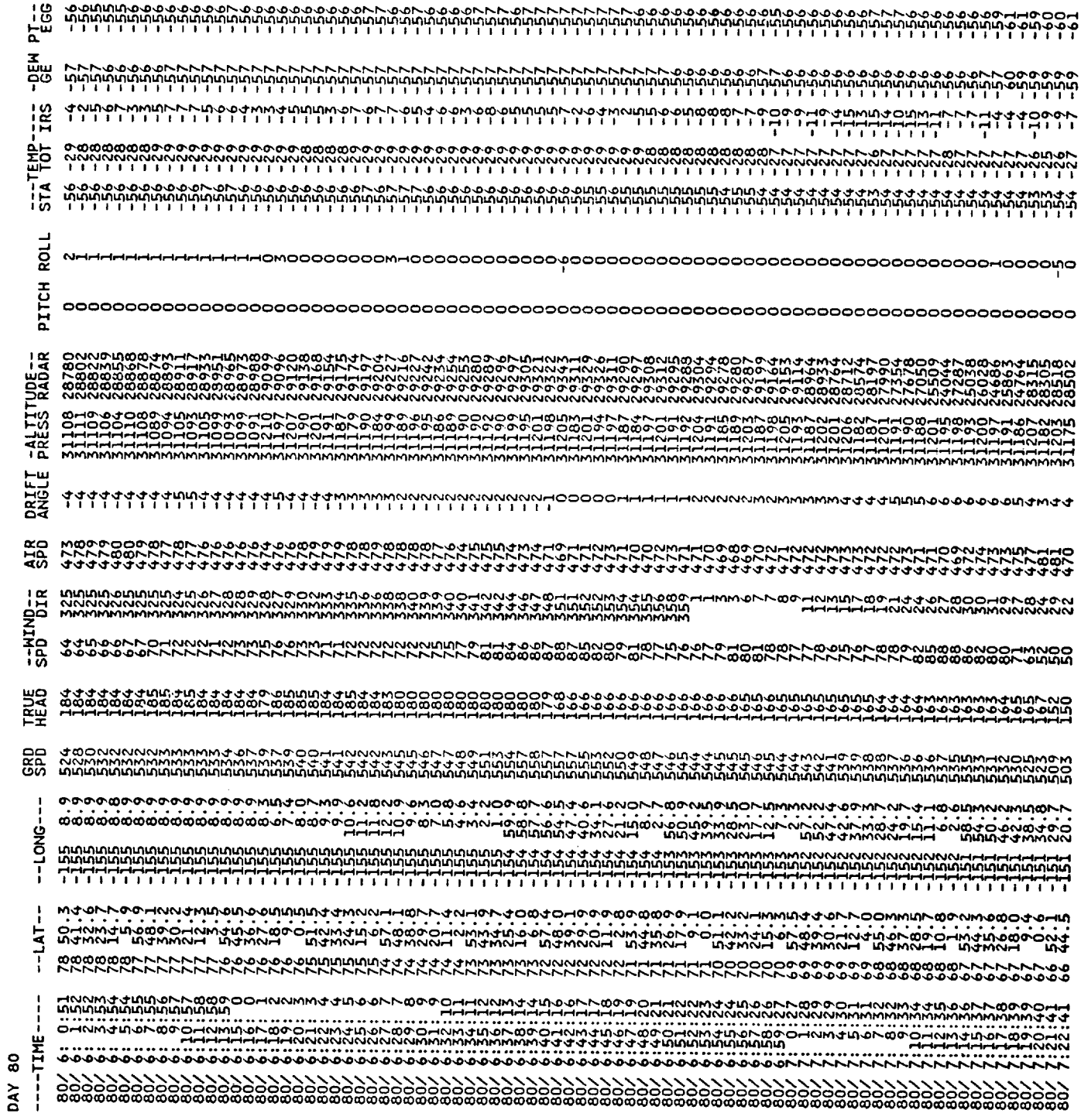
```
          |
----------|-----------------------------------------------------------
06:44:59  | >>>> Start of run:  INS check
          |
          |      Altitude: 31184                        Latitude:  +72 14.6
          |                                            Longitude: -154 29.6
--------------
          |
----------|-----------------------------------------------------------
07:33:44  | >>>> Start of run:  INS check
          |
          |      Altitude: 31172                        Latitude:  +65 22.2
          |                                            Longitude: -149 54.5
--------------
          |
----------|-----------------------------------------------------------
07:46:40  | >>>> Start of run:  Cimino #1 Wp1''
          |
          |      Altitude: 31183                        Latitude:  +64 42.6
          |                                            Longitude: -148  0.3
--------------
07:50:23  | >>>> End of run:  Cimino #1 Wp2''
          |
          |      Altitude: 31189                        Latitude:  +64 58.2
          |                                            Longitude: -147  9.4
----------|-----------------------------------------------------------
          |
--------------
          |
----------|-----------------------------------------------------------
07:58:29  | >>>> Start of run:  Cimino #2 Wp3''
          |
          |      Altitude: 31201                        Latitude:  +65  7.3
          |                                            Longitude: -147  3.1
--------------
08:07:00  | >>>> End of run:  Cimino #2 Wp4''
          |
          |      Altitude: 31191                        Latitude:  +64 33.6
          |                                            Longitude: -148 52.4
----------|-----------------------------------------------------------
          |
--------------
          |
----------|-----------------------------------------------------------
08:14:41  | >>>> Start of run:  Cimino #3 Wp5''
          |
          |      Altitude: 31184                        Latitude:  +64 27.0
          |                                            Longitude: -148 40.3
--------------
08:21:14  | >>>> End of run:  Cimino # Wp6''
          |
          |      Altitude: 31191                        Latitude:  +64 55.3
          |                                            Longitude: -147  5.1
----------|-----------------------------------------------------------
          |
--------------
00:25:35  | touchdown at 08-46-22
--------------
```

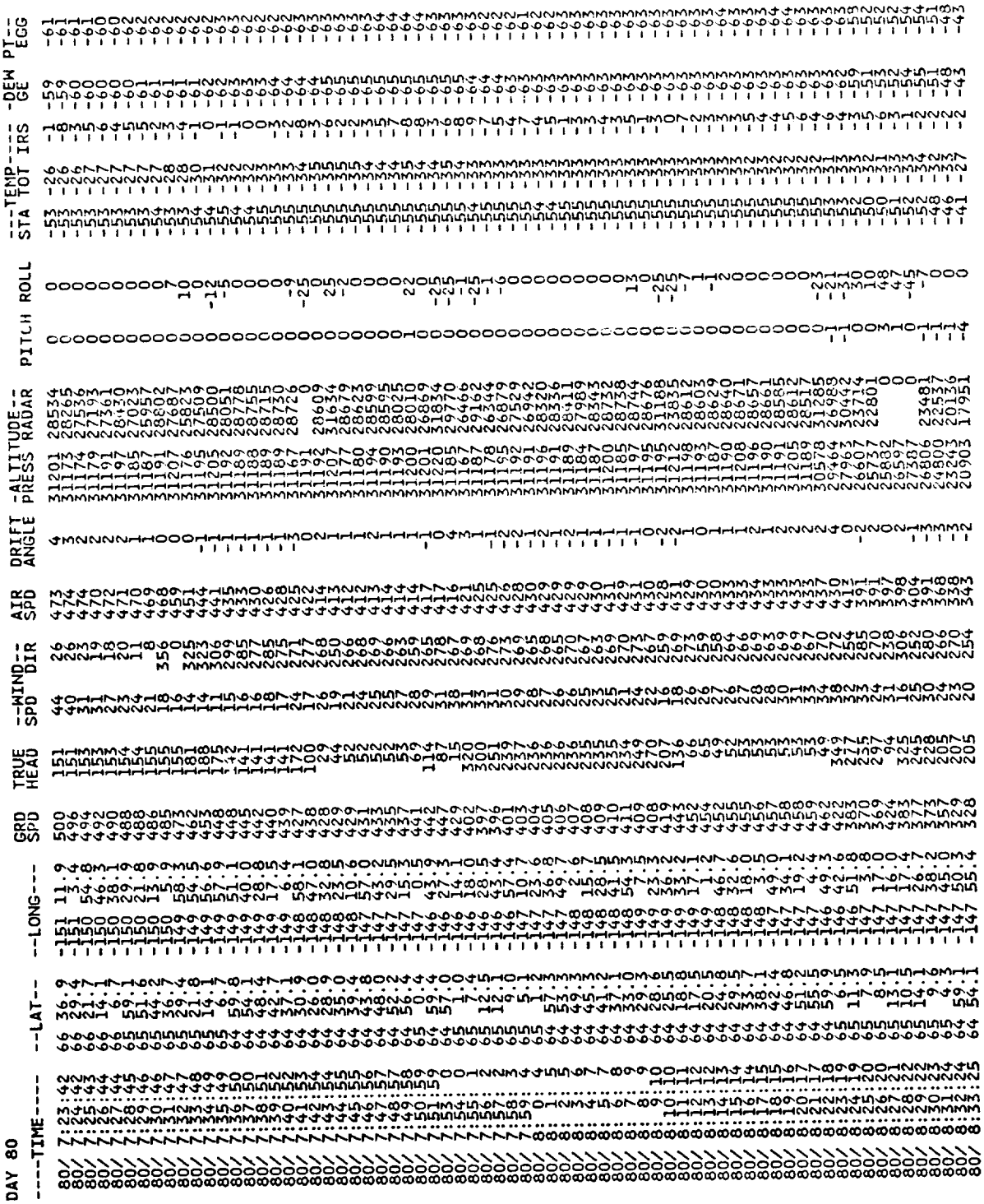
```
00:26:25 | INS #1   64-49.3 n   147.47.9
--------------
00:27:08 | INS #2   64-50.8 n   147.50.5
--------------
00:27:57 | JPL      64-50.6 n   147.47.3
--------------
```

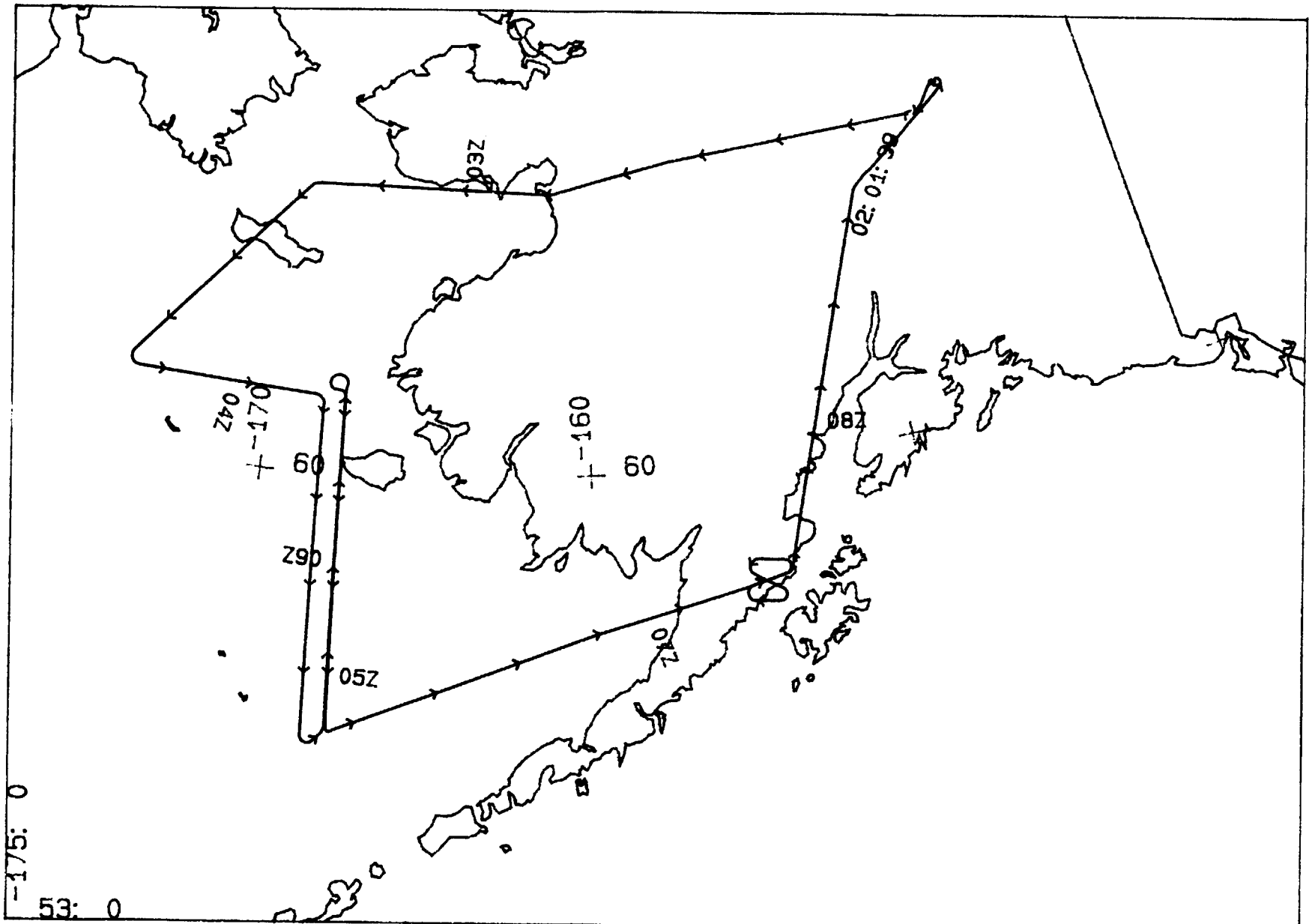
DAY 80

----TIME----	--LAT--	--LONG---	GRD SPD	TRUE HEAD	--WIND-- SPD	DIR	AIR SPD	DRIFT ANGLE	-ALTITUDE-- PRESS	RADAR	PITCH	ROLL	---TEMP---- STA	TOT	IRS	-DEW PT-- GE	EGG
80/ 3:15: 9	73 54.9	-152 27.6	378	359	87	352	466	1	31093	29073	0	1	-54	-28	-9	-54	-54
80/ 3:16:10	74 1.3	-152 27.1	379	358	87	350	466	2	31104	29070	0	1	-54	-28	-9	-55	-54
80/ 3:17:10	74 7.5	-152 26.7	379	358	87	349	465	2	31093	29060	0	1	-54	-28	-8	-55	-54
80/ 3:18:11	74 14.0	-152 26.2	380	359	87	349	465	2	31100	29073	0	1	-54	-28	-9	-55	-54
80/ 3:19:11	74 20.3	-152 25.6	380	358	87	348	466	2	31102	29051	0	1	-54	-28	-7	-55	-54
80/ 3:20:12	74 26.7	-152 25.2	381	358	89	348	468	2	31099	29045	0	1	-54	-28	-7	-55	-55
80/ 3:21:13	74 33.1	-152 24.7	380	358	88	346	467	2	31101	29041	0	1	-54	-28	-7	-55	-55
80/ 3:22:13	74 39.4	-152 24.1	380	358	88	347	467	2	31108	29044	0	1	-55	-28	-6	-55	-54
80/ 3:23:14	74 45.8	-152 23.5	381	358	87	346	467	2	31099	29033	0	1	-54	-28	-6	-55	-54
80/ 3:24:15	74 52.2	-152 23.0	381	358	87	346	467	2	31102	29027	0	1	-55	-28	-6	-55	-55
80/ 3:25:15	74 58.5	-152 22.4	382	358	87	345	467	3	31088	29023	0	1	-55	-28	-5	-55	-55
80/ 3:26:16	75 5.0	-152 21.9	382	358	89	344	467	3	31093	29009	0	1	-54	-28	-6	-55	-55
80/ 3:27:16	75 11.3	-152 21.4	382	358	89	343	467	3	31095	29011	0	1	-54	-28	-6	-55	-55
80/ 3:28:17	75 17.7	-152 20.8	382	357	89	343	467	3	31099	29006	0	1	-55	-28	-5	-55	-55
80/ 3:29:18	75 24.2	-152 20.1	382	357	89	342	468	3	31097	29011	0	0	-55	-28	-6	-55	-54
80/ 3:30:18	75 30.5	-152 19.6	383	357	89	341	467	3	31089	28980	0	0	-55	-28	-4	-55	-54
80/ 3:31:19	75 37.0	-152 19.0	383	357	88	341	468	3	31082	28983	0	1	-55	-28	-6	-55	-55
80/ 3:32:20	75 43.4	-152 18.7	381	355	88	340	467	3	31106	29000	0	1	-54	-28	-6	-55	-55
80/ 3:33:20	75 49.8	-152 18.8	383	356	87	339	466	3	31084	28969	0	1	-54	-28	-4	-55	-55
80/ 3:34:21	75 56.2	-152 18.8	384	356	86	338	466	3	31094	28979	0	1	-54	-28	-5	-56	-55
80/ 3:35:21	76 2.6	-152 18.9	385	356	87	338	467	4	31105	28978	0	2	-54	-28	-5	-56	-55
80/ 3:36:22	76 9.1	-152 18.8	386	356	88	337	468	4	31089	28963	0	1	-54	-28	-4	-56	-55
80/ 3:37:23	76 15.6	-152 18.8	386	355	87	337	468	4	31108	28972	0	1	-54	-28	-5	-56	-55
80/ 3:38:23	76 22.0	-152 18.8	386	355	87	336	468	4	31104	28958	0	1	-54	-28	-4	-56	-55
80/ 3:39:24	76 28.5	-152 18.7	388	356	87	336	469	4	31084	28923	0	0	-54	-28	-3	-56	-55
80/ 3:40:25	76 35.0	-152 18.8	388	355	87	335	469	4	31099	28938	0	1	-54	-28	-4	-56	-55
80/ 3:41:25	76 41.5	-152 18.7	388	355	87	334	468	4	31097	28929	0	1	-54	-28	-2	-56	-56
80/ 3:42:26	76 48.0	-152 18.7	389	355	87	333	469	4	31090	28922	0	0	-54	-28	-2	-56	-55
80/ 3:43:26	76 54.5	-152 18.8	389	355	87	332	468	4	31093	28910	0	1	-55	-28	-1	-56	-56
80/ 3:44:27	77 1.0	-152 18.8	390	355	87	332	469	5	31099	28910	0	1	-55	-28	0	-56	-56
80/ 3:45:28	77 7.6	-152 18.8	390	354	87	331	469	5	31106	28904	0	1	-55	-28	0	-56	-55
80/ 3:46:28	77 14.1	-152 18.8	391	354	87	331	468	5	31100	28892	0	0	-55	-28	-1	-56	-56
80/ 3:47:29	77 20.7	-152 18.8	392	355	86	330	468	5	31086	28872	0	1	-55	-28	0	-56	-55
80/ 3:48:30	77 27.3	-152 18.9	392	354	87	330	469	5	31099	28855	0	2	-54	-28	-1	-56	-55
80/ 3:49:30	77 33.8	-152 18.8	392	354	86	329	468	5	31103	28857	0	0	-55	-28	0	-56	-55
80/ 3:50:31	77 40.4	-152 18.8	392	354	87	328	468	5	31096	28854	0	1	-55	-28	0	-56	-55
80/ 3:51:31	77 46.9	-152 18.7	392	354	87	328	468	5	31102	28852	0	0	-55	-28	0	-56	-55
80/ 3:52:32	77 53.5	-152 18.7	393	354	85	327	468	5	31097	28840	0	0	-55	-28	0	-56	-55
80/ 3:53:33	78 0.2	-152 18.8	394	354	86	326	468	5	31096	28831	0	1	-55	-28	0	-56	-55
80/ 3:54:33	78 6.7	-152 18.8	394	353	86	326	468	5	31096	28822	0	0	-55	-28	-3	-55	-55
80/ 3:55:34	78 13.3	-152 18.8	395	354	86	326	468	5	31095	28807	0	0	-55	-28	-4	-55	-55
80/ 3:56:35	78 20.0	-152 18.7	396	354	85	325	469	6	31095	28806	0	0	-55	-28	-3	-56	-55
80/ 3:57:35	78 26.6	-152 18.8	397	354	86	325	469	6	31091	28790	0	1	-55	-28	-4	-56	-55
80/ 3:58:36	78 33.3	-152 18.8	397	353	86	323	469	6	31099	28786	0	1	-55	-28	-6	-56	-55
80/ 3:59:36	78 39.9	-152 18.8	397	353	87	322	470	6	31093	28765	0	0	-55	-28	-6	-56	-55
80/ 4: 0:37	78 46.5	-152 18.9	397	353	88	322	470	6	31099	28763	0	1	-55	-28	-5	-56	-55
80/ 4: 1:38	78 53.3	-152 18.8	398	353	88	323	470	6	31098	28731	0	1	-55	-28	-5	-56	-55
80/ 4: 2:38	78 59.8	-152 18.7	398	353	87	323	470	6	31099	28749	0	0	-55	-28	-7	-56	-55
80/ 4: 3:39	79 6.5	-152 19.8	393	347	87	322	471	5	31078	28815	0	-16	-55	-28	-7	-56	-55
80/ 4: 4:39	79 11.2	-152 40.5	402	290	77	319	468	-5	31070	29970	0	-22	-55	-29	-8	-56	-55
80/ 4: 5:40	79 10.5	-153 17.5	437	259	73	322	465	-9	31117	32005	0	-22	-55	-29	-8	-56	-55
80/ 4: 6:41	79 4.7	-153 44.7	513	200	71	328	466	-7	31124	0	0	-26	-55	-29	-6	-56	-55
80/ 4: 7:41	78 55.9	-153 41.7	531	182	80	326	465	-4	31127	28831	0	15	-55	-29	-5	-56	-56
80/ 4: 8:42	78 47.0	-153 41.7	531	184	78	328	467	-5	31108	28813	0	1	-55	-29	-6	-56	-56
80/ 4: 9:43	78 38.1	-153 41.8	537	185	79	329	472	-5	31100	28825	0	0	-55	-28	-5	-56	-56
80/ 4:10:43	78 29.1	-153 41.7	541	185	83	330	473	-5	31106	28843	0	0	-55	-28	-6	-56	-57
80/ 4:11:44	78 20.0	-153 41.7	542	184	83	331	472	-4	31099	28841	0	1	-55	-28	-5	-57	-57
80/ 4:12:45	78 10.8	-153 41.7	545	184	83	332	474	-4	31113	28878	0	1	-55	-28	-5	-57	-56
80/ 4:13:45	78 1.7	-153 41.7	547	104	83	333	475	-4	31090	28878	0	1	-55	-28	-2	-57	-56
80/ 4:14:46	77 52.6	-153 41.7	547	184	83	334	474	-4	31124	28918	0	2	-55	-28	-4	-57	-57
80/ 4:15:46	77 43.5	-153 41.8	547	184	83	334	474	-4	31113	28922	0	1	-55	-28	-4	-57	-56
80/ 4:16:47	77 34.3	-153 41.7	547	184	82	335	474	-4	31091	28899	0	1	-55	-28	-5	-57	-57
80/ 4:17:48	77 25.0	-153 41.7	547	183	82	336	473	-4	31107	28941	0	1	-55	-28	-5	-57	-56
80/ 4:18:48	77 15.9	-153 41.8	547	183	82	337	474	-4	31100	28942	0	0	-55	-28	-4	-57	-57
80/ 4:19:49	77 6.8	-153 41.6	548	183	82	337	474	-3	31106	28962	0	1	-55	-28	-5	-57	-56
80/ 4:20:49	76 57.7	-153 41.7	548	183	82	338	473	-3	31110	28972	0	1	-55	-28	-5	-57	-56
80/ 4:21:50	76 48.4	-153 41.8	549	183	84	340	471	-3	31092	28971	0	0	-55	-28	-4	-56	-56
80/ 4:22:51	76 39.2	-153 41.8	550	183	85	340	472	-3	31086	28986	0	0	-55	-28	-7	-56	-56
80/ 4:23:51	76 30.0	-153 41.7	550	183	84	341	472	-3	31115	29019	0	1	-55	-28	-7	-56	-56
80/ 4:24:52	76 20.8	-153 41.8	550	183	83	341	472	-3	31094	29010	0	0	-55	-28	-7	-56	-56
80/ 4:25:53	76 11.5	-153 41.8	550	183	85	342	471	-3	31091	29022	0	1	-55	-28	-8	-56	-56
80/ 4:26:53	76 2.4	-153 41.9	550	182	84	343	470	-3	31104	29035	0	1	-55	-29	-8	-56	-56
80/ 4:27:54	75 53.1	-153 41.8	550	182	84	343	470	-3	31104	29046	0	1	-55	-29	-7	-56	-56
80/ 4:28:54	75 44.0	-153 41.8	550	182	84	345	469	-2	31094	29051	0	0	-55	-29	-7	-56	-56
80/ 4:29:55	75 34.8	-153 41.8	550	182	83	346	470	-2	31095	29061	0	0	-55	-28	-8	-56	-55
80/ 4:30:56	75 25.5	-153 41.8	550	182	85	346	469	-2	31102	29062	0	1	-55	-29	-7	-56	-55
80/ 4:31:56	75 16.4	-153 41.9	550	182	85	347	470	-2	31095	29069	0	1	-55	-28	-7	-56	-55
80/ 4:32:57	75 7.1	-153 41.8	551	182	85	347	469	-2	31112	29101	0	2	-55	-29	-8	-56	-55
80/ 4:33:58	74 57.9	-153 41.9	551	182	85	347	469	-2	31102	29103	0	0	-55	-29	-6	-56	-55
80/ 4:34:58	74 48.7	-153 41.9	551	182	85	348	468	-2	31090	29089	0	0	-55	-29	-3	-56	-55
80/ 4:35:59	74 39.4	-153 41.9	551	182	85	349	468	-2	31096	29094	0	1	-55	-29	-3	-56	-55
80/ 4:36:59	74 30.3	-153 42.0	551	181	85	350	469	-1	31104	29123	0	1	-55	-28	-7	-56	-55

ORIGINAL PAGE IS
OF POOR QUALITY







Sea Ice Flight #10 March 21 1988 Fairbanks Local
10.FLT
2: 01: 29 TO 8: 56: 29 UT SCALE 1: 1.00E+07 TIME TIC EVERY 10.00 MINUTES

DC-8 Mission Director Log

Mission Name: Sea Ice 88
Flight Number: 10 (21Mar88)

02:05:27 | today is 3-21-88

02:05:52 | Take off was at 02-00-00 z

02:06:09 | really

02:52:28 | >>>> Start of run: Norton Sound WP #2

Altitude: 27017 Latitude: +64 20.4
Longitude: -161 15.9

02:59:01 | >>>> End of run: sar segment

Altitude: 27002 Latitude: +64 23.0
Longitude: -163 9.8

02:59:47 | GPS how tracking 4 sat.

03:04:26 | >>>> Start of run: sar

Altitude: 27021 Latitude: +64 24.0
Longitude: -164 45.4

03:09:29 | >>>> End of run: sar

Altitude: 27035 Latitude: +64 24.0
Longitude: -166 14.9

03:14:00 | >>>> Start of run: sar segment

Altitude: 27030 Latitude: +64 23.2
Longitude: -167 34.1

03:18:59 | >>>> End of run: sar segment

Altitude: 27003 Latitude: +64 21.6
Longitude: -169 1.3

```
03:21:50 | >>>> Start of run:
         |
         |      Altitude: 27012                          Latitude:  +64  9.4
         |                                              Longitude: -169 41.8
-------------
         |
-------------------------------------------------------------------------
03:25:26 | >>>> Start of run:  sar segment
         |
         |      Altitude: 27012                          Latitude:  +63 47.1
         |                                              Longitude: -170 24.2
-------------
         |
-------------------------------------------------------------------------
03:31:31 | >>>> Start of run:  sar interfer eff
         |
         |      Altitude: 27030                          Latitude:  +63  8.7
         |                                              Longitude: -171 33.5
-------------
03:40:23 | >>>> End of run:  sar segment
         |
         |      Altitude: 27016                          Latitude:  +62 12.7
         |                                              Longitude: -173  7.7
-------------------------------------------------------------------------
         |
-------------
03:47:23 | >>>> End of run:  Wp 5
         |
         |      Altitude: 26997                          Latitude:  +61 27.1
         |                                              Longitude: -174 19.1
-------------------------------------------------------------------------
         |
-------------
         |
-------------------------------------------------------------------------
03:52:25 | >>>> Start of run:
         |
         |      Altitude: 27026                          Latitude:  +61 14.9
         |                                              Longitude: -173 19.6
-------------
         |
-------------------------------------------------------------------------
03:58:30 | >>>> Start of run:  INS check
         |
         |      Altitude: 27003                          Latitude:  +61 14.6
         |                                              Longitude: -171 42.0
-------------
         |
-------------------------------------------------------------------------
04:13:28 | >>>> Start of run:  Bering Sea #1 Wp6
         |
         |      Altitude: 26996                          Latitude:  +60 50.2
         |                                              Longitude: -168 15.0
-------------
         |
-------------------------------------------------------------------------
04:16:22 | >>>> Start of run:  INS check
         |
```

```
          |      Altitude: 27022                          Latitude:  +60 27.7
          |                                               Longitude: -168 14.9
--------------
04:18:52  | >>>> End of run:  sar
          |
          |      Altitude: 27015                          Latitude:  +60  8.4
          |                                               Longitude: -168 14.9
-------------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------------
04:21:36  | >>>> Start of run:  sar
          |
          |      Altitude: 27005                          Latitude:  +59 47.4
          |                                               Longitude: -168 14.9
--------------
04:26:00  | >>>> End of run:  sar segment
          |
          |      Altitude: 27026                          Latitude:  +59 13.5
          |                                               Longitude: -168 14.7
-------------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------------
04:27:47  | >>>> Start of run:  sar
          |
          |      Altitude: 27019                          Latitude:  +58 59.8
          |                                               Longitude: -168 14.6
--------------
04:33:00  | >>>> End of run:  sar
          |
          |      Altitude: 27023                          Latitude:  +58 19.7
          |                                               Longitude: -168 14.4
-------------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------------
04:38:21  | >>>> Start of run:  SAR
          |
          |      Altitude: 27023                          Latitude:  +57 38.7
          |                                               Longitude: -168 14.3
--------------
04:48:34  | >>>> End of run:  SAR
          |
          |      Altitude: 27020                          Latitude:  +56 21.3
          |                                               Longitude: -168 14.1
-------------------------------------------------------------------------------
          |
--------------
04:50:39  | >>>> End of run:  SAR
          |
          |      Altitude: 27013                          Latitude:  +56  5.5
          |                                               Longitude: -168 14.0
-------------------------------------------------------------------------------
          |
```

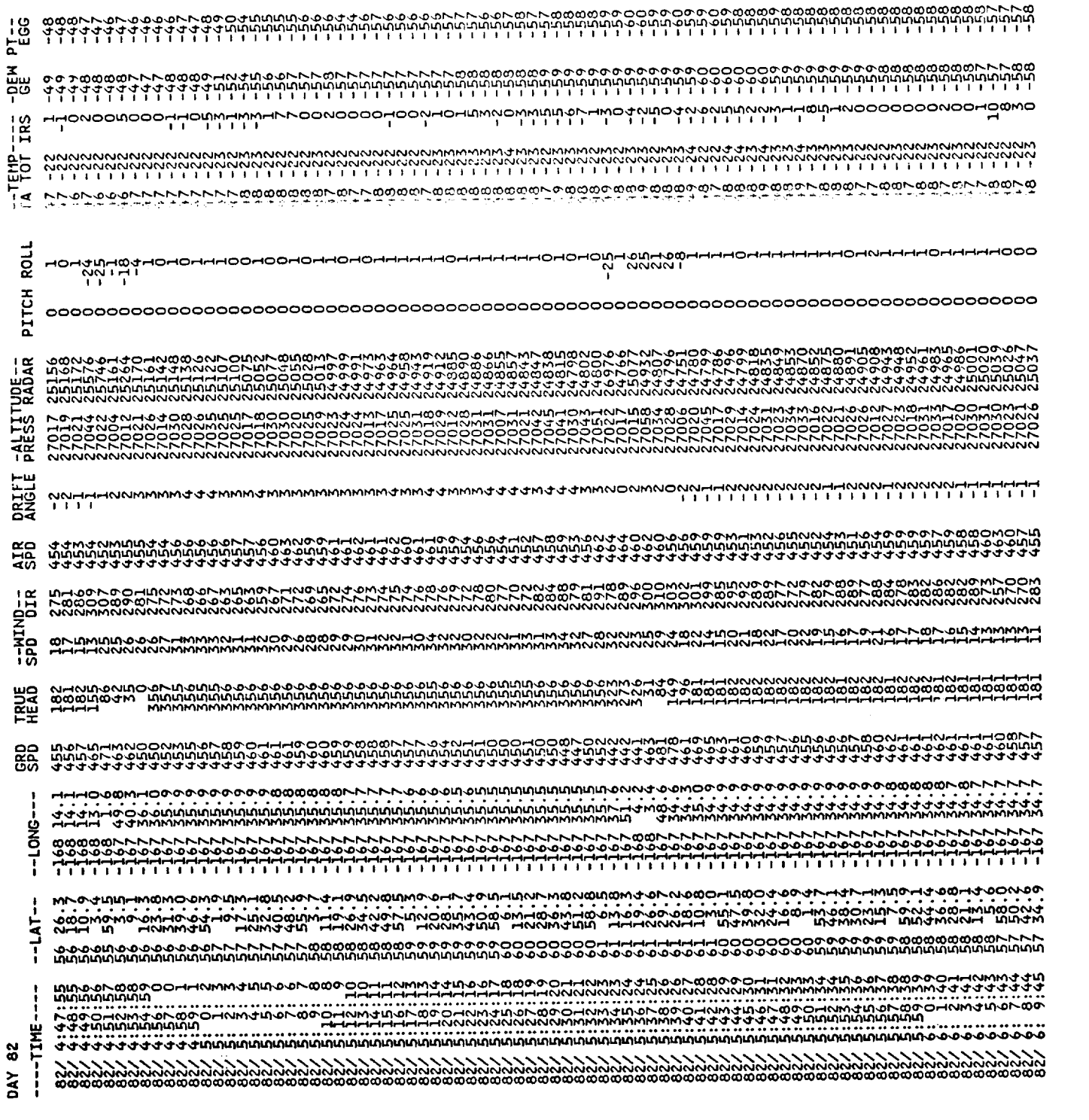
```
-------------
04:51:00 | This also ended the track
-------------
04:58:54 | Bering Sea run #2 start at 04-57-01  56-31.9n
         | 167-36.4w
-------------
04:59:35 | start of #2 run at Wp 2'
-------------
         |
-------------------------------------------------------------------------
04:59:56 | >>>> Start of run:  INS check
         |
         |      Altitude: 27028                        Latitude:  +56 53.5
         |                                            Longitude: -167 35.9
-------------
05:07:38 | >>>> End of run:  sar
         |
         |      Altitude: 27025                        Latitude:  +57 52.3
         |                                            Longitude: -167 35.8
-------------------------------------------------------------------------
         |
-------------
         |
-------------------------------------------------------------------------
05:11:51 | >>>> Start of run:  SAR segment
         |
         |      Altitude: 27023                        Latitude:  +58 24.4
         |                                            Longitude: -167 35.7
-------------
05:17:41 | >>>> End of run:  SAR segment
         |
         |      Altitude: 27025                        Latitude:  +59  8.8
         |                                            Longitude: -167 35.6
-------------------------------------------------------------------------
         |
-------------
         |
-------------------------------------------------------------------------
05:29:10 | >>>> Start of run:  SAR segment
         |
         |      Altitude: 27029                        Latitude:  +60 35.0
         |                                            Longitude: -167 35.5
-------------
05:33:50 | >>>> End of run:  Bering Sea #2 Wp 5'
         |
         |      Altitude: 27049                        Latitude:  +61  9.9
         |                                            Longitude: -167 35.5
-------------------------------------------------------------------------
         |
-------------
         |
-------------------------------------------------------------------------
05:41:33 | >>>> Start of run:  Bering Sea #3 Wp 6'
         |
         |      Altitude: 27007                        Latitude:  +61 10.1
         |                                            Longitude: -167 35.0
-------------
05:47:31 | >>>> End of run:  sar
```

```
          |
          |      Altitude: 27031                          Latitude:  +60 24.4
          |                                              Longitude: -167 34.9
-------------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------------
05:51:29  | >>>> Start of run:  SAR segment
          |
          |      Altitude: 27025                          Latitude:  +59 54.3
          |                                              Longitude: -167 34.9
--------------
05:56:31  | end
--------------
05:56:35  | >>>> End of run:  SAR segment
          |
          |      Altitude: 27011                          Latitude:  +59 15.6
          |                                              Longitude: -167 34.9
-------------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------------
05:58:36  | >>>> Start of run:  SAR segment
          |
          |      Altitude: 27030                          Latitude:  +59  0.2
          |                                              Longitude: -167 34.8
--------------
06:04:09  | >>>> End of run:  SAR segment
          |
          |      Altitude: 27026                          Latitude:  +58 17.6
          |                                              Longitude: -167 34.7
-------------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------------
06:09:02  | >>>> Start of run:  SAR segment
          |
          |      Altitude: 27024                          Latitude:  +57 40.3
          |                                              Longitude: -167 34.7
--------------
06:18:23  | >>>> End of run:  SAR segment
          |
          |      Altitude: 27020                          Latitude:  +56 29.6
          |                                              Longitude: -167 34.4
-------------------------------------------------------------------------------
          |
--------------
06:20:30  | >>>> End of run:  Bering sea #3
          |
          |      Altitude: 27007                          Latitude:  +56 13.6
          |                                              Longitude: -167 33.8
-------------------------------------------------------------------------------
          |
--------------
          |
```

```
06:24:56 | >>>> Start of run:  Bering Wp1''
         |
         |      Altitude: 27026                          Latitude:  +56 21.3
         |                                              Longitude: -166 40.0
---------
         |
06:27:01 | >>>> Start of run:  INS check
         |
         |      Altitude: 27029                          Latitude:  +56 27.4
         |                                              Longitude: -166 12.4
---------
         |
06:32:14 | >>>> Start of run:  SAR segment
         |
         |      Altitude: 27017                          Latitude:  +56 42.0
         |                                              Longitude: -165  3.1
---------
06:37:16 | >>>> End of run:  SAR segment
         |
         |      Altitude: 27021                          Latitude:  +56 55.4
         |                                              Longitude: -163 55.6
---------
         |
---------
         |
06:41:16 | >>>> Start of run:  SAR segment
         |
         |      Altitude: 27026                          Latitude:  +57  5.6
         |                                              Longitude: -163  1.4
---------
06:55:12 | >>>> End of run:  SAR segment
         |
         |      Altitude: 27013                          Latitude:  +57 37.6
         |                                              Longitude: -159 50.3
---------
         |
---------
         |
06:57:45 | >>>> Start of run:  SAR segment
         |
         |      Altitude: 27025                          Latitude:  +57 42.1
         |                                              Longitude: -159 14.6
---------
07:13:00 | >>>> End of run:  SAR segment
         |
         |      Altitude: 27034                          Latitude:  +58  5.8
         |                                              Longitude: -155 37.3
---------
         |
---------
         |
07:15:25 | >>>> Start of run:  run #4 Wp
```

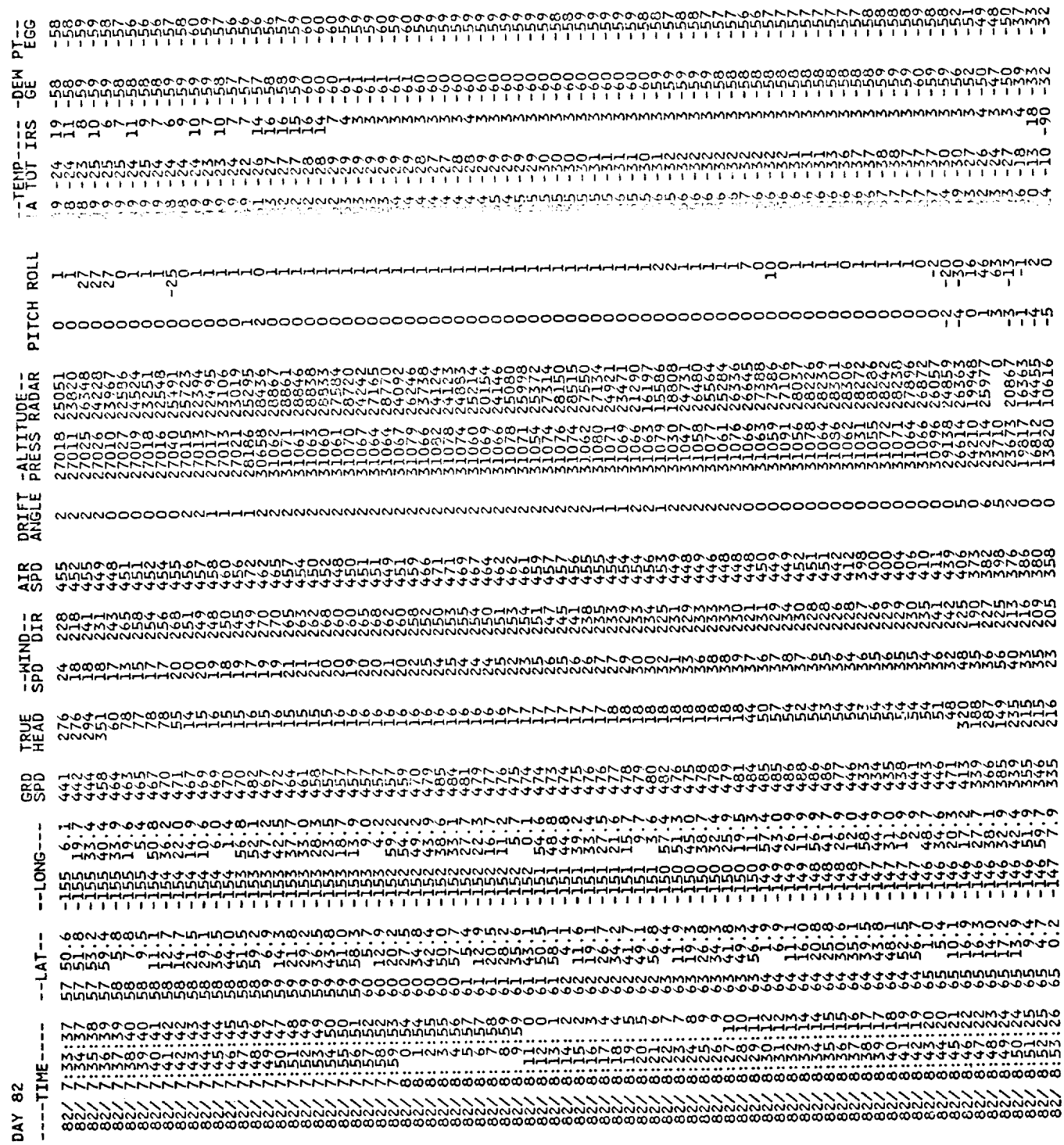
```
          |
          |      Altitude: 27019                          Latitude:  +58  9.8
          |                                              Longitude: -155  2.5
--------------
07:17:39  | >>>> End of run:  run #4 Wp
          |
          |      Altitude: 27020                          Latitude:  +58 13.4
          |                                              Longitude: -154 30.1
-------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------
07:26:03  | >>>> Start of run:  #5 Wp4''
          |
          |      Altitude: 27035                          Latitude:  +58 16.7
          |                                              Longitude: -155 25.6
--------------
07:29:32  | >>>> End of run:  #5 Wp 5''
          |
          |      Altitude: 27032                          Latitude:  +58  2.0
          |                                              Longitude: -154 43.5
-------------------------------------------------------------------------
          |
--------------
          |
-------------------------------------------------------------------------
07:38:16  | >>>> Start of run:  #4 Wp 2''
          |
          |      Altitude: 27011                          Latitude:  +58  7.2
          |                                              Longitude: -155 25.3
--------------
07:42:08  | >>>> End of run:  #4 Wp 3''
          |
          |      Altitude: 27015                          Latitude:  +58 13.4
          |                                              Longitude: -154 29.8
-------------------------------------------------------------------------
          |
--------------
07:43:19  | GPS said we were 2 miles off in latitude in the middle
          | of that run
--------------
          |
-------------------------------------------------------------------------
07:48:49  | >>>> Start of run:  INS check
          |
          |      Altitude: 28273                          Latitude:  +58 59.6
          |                                              Longitude: -153 51.8
--------------
          |
-------------------------------------------------------------------------
08:03:32  | >>>> Start of run:  INS check
          |
          |      Altitude: 31087                          Latitude:  +60 47.1
          |                                              Longitude: -152 40.6
--------------
08:13:51  | INS 2 has been selected for EU conversions.
--------------
```

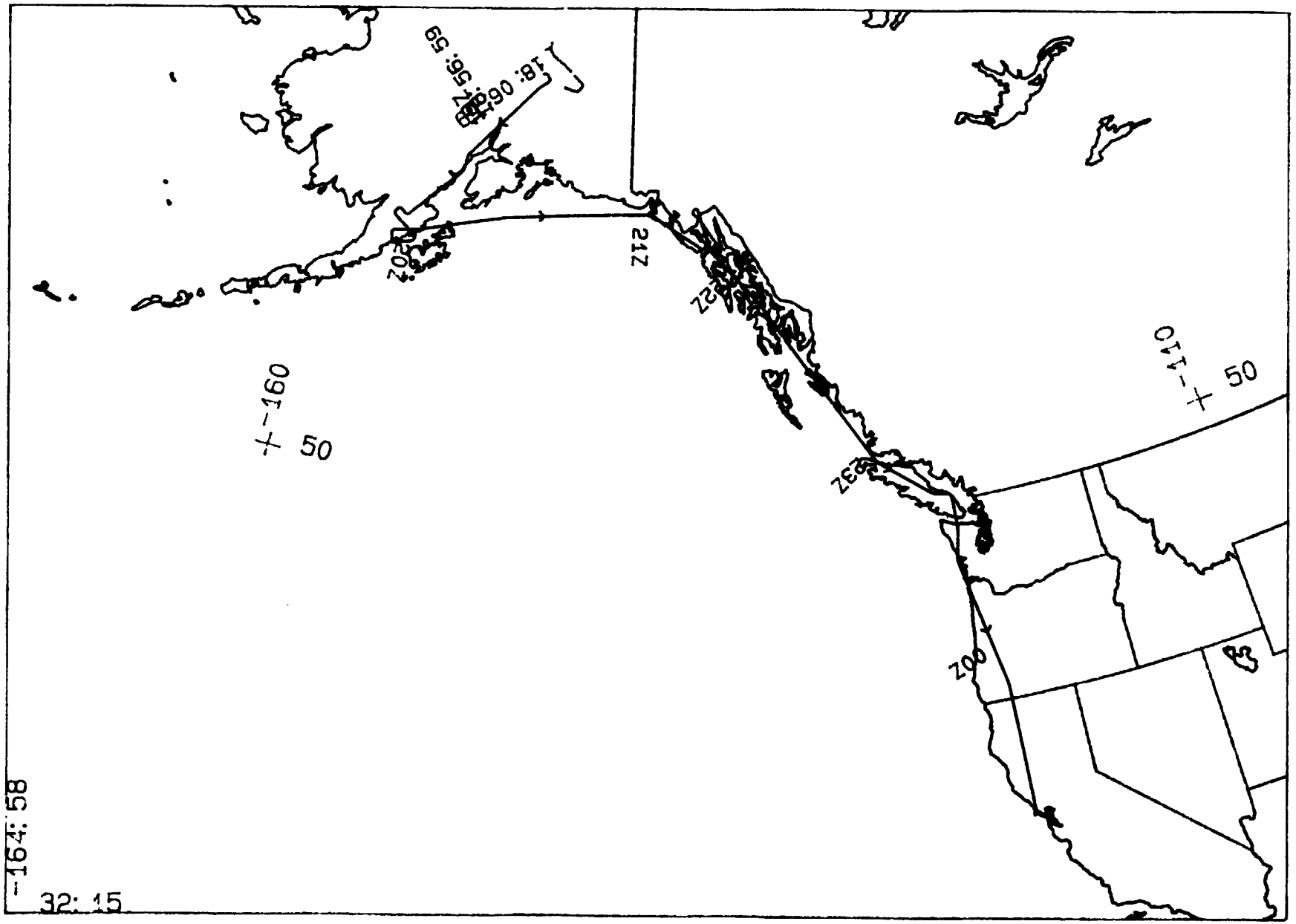
```
         |
---------------------------------------------------------------------
08:17:24 | >>>> Start of run:  SAR segment
         |
         |      Altitude: 31067                      Latitude:  +62 29.2
         |                                          Longitude: -151 25.6
--------------
08:22:51 | >>>> End of run:  SAR segment
         |
         |      Altitude: 31066                      Latitude:  +63  9.8
         |                                          Longitude: -150 52.8
---------------------------------------------------------------------
         |
--------------
         |
---------------------------------------------------------------------
08:26:40 | >>>> Start of run:  INS check
         |
         |      Altitude: 31073                      Latitude:  +63 38.1
         |                                          Longitude: -150 29.1
--------------
         |
---------------------------------------------------------------------
08:27:40 | >>>> Start of run:  INS check
         |
         |      Altitude: 31075                      Latitude:  +63 45.5
         |                                          Longitude: -150 22.7
--------------
         |
---------------------------------------------------------------------
08:34:23 | >>>> Start of run:  #6 Wp7''
         |
         |      Altitude: 31069                      Latitude:  +64 21.5
         |                                          Longitude: -148 54.4
--------------
08:42:09 | >>>> End of run:  #6 Wp8''
         |
         |      Altitude: 31073                      Latitude:  +64 56.0
         |                                          Longitude: -147  5.3
---------------------------------------------------------------------
         |
--------------
08:55:33 | SAR ran h polarization on P band
--------------
00:29:27 | touchdown at 09-02-30 z
--------------
00:29:18 | INS #1 at ramp  64-52.8n  147.49.6w
--------------
00:30:06 | INS #2 at ramp  64-49.8n  147-51.6w
--------------
00:30:44 | JPL    at ramp  64-49.4n  147-51.5w
--------------
```



DAY 82

----TIME----	--LAT--	--LONG---	GRD SPD	TRUE HEAD	--WIND-- SPD	DIR	AIR SPD	DRIFT ANGLE	-ALTITUDE-- PRESS	RADAR	PITCH	ROLL	--TEMP---- TA	TOT	IRS	-DEW GE	PT-- EGG
82/ 6:10:46	57 27.2	-167 34.6	457	181	13	282	455	-1	27031	25059	0	1	8	-23	0	-58	-57
82/ 6:11:46	57 19.6	-167 34.6	457	182	15	271	458	-1	27026	25077	0	1	8	-23	6	-58	-58
82/ 6:12:47	57 11.8	-167 34.6	456	182	17	257	459	-2	27038	25086	0	1	7	-22	0	-59	-58
82/ 6:13:48	57 4.2	-167 34.6	455	182	17	262	458	-2	27022	25086	0	1	8	-23	-3	-58	-58
82/ 6:14:48	56 56.7	-167 34.5	454	182	18	264	456	-2	27022	25097	0	1	7	-23	-2	-58	-58
82/ 6:15:49	56 49.0	-167 34.5	454	182	19	267	456	-2	27030	25109	0	1	8	-23	-4	-58	-57
82/ 6:16:49	56 41.4	-167 34.5	454	182	20	264	457	-2	27029	25119	0	1	8	-22	-4	-57	-56
82/ 6:17:50	56 33.7	-167 34.4	454	182	19	269	455	-2	27023	25122	0	1	7	-23	-3	-55	-52
82/ 6:18:51	56 26.1	-167 34.4	454	182	19	274	453	-2	27028	25138	0	1	7	-23	9	-53	-51
82/ 6:19:51	56 18.5	-167 34.3	455	180	19	270	456	-2	27054	25172	0	-2	7	-22	0	-50	-49
82/ 6:20:52	56 11.0	-167 32.3	469	141	14	334	455	-1	26927	0	-2	-48	7	-22	4	-50	-50
82/ 6:21:53	56 12.4	-167 19.8	467	65	21	264	447	1	27004	25140	0	13	7	-23	6	-50	-49
82/ 6:22:53	56 15.2	-167 6.8	469	66	24	278	449	1	27071	25192	0	0	7	-23	1	-49	-47
82/ 6:23:54	56 18.3	-166 53.7	473	65	24	285	455	1	27045	25165	0	1	7	-22	0	-48	-47
82/ 6:24:54	56 21.2	-166 40.5	476	66	23	290	459	1	27026	25141	0	1	7	-22	-1	-47	-46
82/ 6:25:55	56 24.2	-166 27.0	476	66	24	289	458	1	27024	25136	0	1	7	-22	-1	-47	-46
82/ 6:26:56	56 27.2	-166 13.5	475	66	24	292	457	2	27028	25129	0	1	7	-22	1	-47	-47
82/ 6:27:56	56 30.0	-166 0.2	474	66	24	295	459	2	27024	25129	0	1	7	-22	3	-47	-46
82/ 6:28:57	56 32.9	-165 46.8	472	66	25	298	457	2	27024	25121	0	1	7	-22	7	-47	-47
82/ 6:29:57	56 35.7	-165 33.5	472	67	23	295	456	2	27020	25116	0	1	7	-22	5	-47	-46
82/ 6:30:58	56 38.5	-165 20.0	471	67	20	290	456	1	27019	25115	0	1	7	-22	0	-48	-47
82/ 6:31:59	56 41.3	-165 6.4	470	68	21	287	454	1	27014	25105	0	1	7	-22	9	-48	-47
82/ 6:32: 59	56 44.0	-164 53.1	470	67	21	289	454	1	27021	25105	0	1	6	-22	12	-48	-46
82/ 6:34: 0	56 46.7	-164 39.6	471	68	21	286	454	1	27023	25101	0	1	6	-22	11	-48	-47
82/ 6:35: 1	56 49.5	-164 25.9	471	68	23	286	454	1	27026	25097	0	0	6	-22	12	-49	-48
82/ 6:36: 1	56 52.1	-164 12.4	472	68	21	289	456	1	27021	25094	0	1	7	-22	7	-50	-48
82/ 6:37: 2	56 54.8	-163 58.7	472	68	21	288	456	1	27022	25093	0	1	6	-22	12	-50	-49
82/ 6:38: 2	56 57.4	-163 45.2	471	68	22	292	455	1	27025	25092	0	1	6	-22	12	-52	-53
82/ 6:39: 3	57 0.0	-163 31.5	471	69	21	294	456	1	27020	25088	0	1	6	-22	12	-52	-53
82/ 6:40: 4	57 2.6	-163 17.7	470	69	21	299	456	1	27024	25091	0	0	6	-22	12	-53	-51
82/ 6:41: 4	57 5.1	-163 4.1	470	69	20	299	456	1	27011	25076	0	0	6	-22	12	-53	-51
82/ 6:42: 5	57 7.7	-162 50.2	469	69	19	298	456	1	27025	25085	0	0	6	-22	12	-53	-53
82/ 6:43: 6	57 10.2	-162 36.5	469	69	19	298	456	1	27020	25078	0	1	6	-22	12	-53	-53
82/ 6:44: 6	57 12.6	-162 22.9	469	70	18	297	457	1	27020	25076	0	1	6	-21	13	-53	-53
82/ 6:45: 7	57 15.1	-162 8.9	468	70	17	301	457	1	27026	25078	0	1	6	-21	13	-54	-53
82/ 6:46: 7	57 17.5	-161 55.3	468	70	16	298	456	1	27023	25073	0	1	6	-22	14	-54	-53
82/ 6:47: 8	57 19.9	-161 41.3	467	71	15	297	456	1	27022	25070	0	1	6	-21	14	-54	-54
82/ 6:48: 9	57 22.2	-161 27.5	467	71	16	297	456	1	27023	25066	0	1	6	-22	14	-54	-54
82/ 6:49: 9	57 24.6	-161 13.8	467	71	15	295	456	1	27015	25061	0	1	6	-21	10	-55	-54
82/ 6:50: 10	57 26.9	-160 59.8	466	71	13	295	456	1	27022	25064	0	1	6	-21	8	-55	-54
82/ 6:51: 11	57 29.2	-160 45.8	466	72	13	297	456	1	27018	25061	0	1	6	-21	6	-55	-54
82/ 6:52: 11	57 31.4	-160 32.0	465	72	14	298	456	1	27020	25057	0	0	6	-21	14	-55	-55
82/ 6:53: 12	57 33.6	-160 18.1	465	72	13	299	456	1	27024	25063	0	0	6	-21	8	-55	-54
82/ 6:54: 12	57 35.7	-160 4.3	465	75	12	301	456	1	27016	25055	0	0	6	-21	8	-55	-54
82/ 6:55: 13	57 37.6	-159 50.1	465	75	12	297	457	1	27013	25046	0	1	6	-21	5	-55	-54
82/ 6:56: 14	57 39.5	-159 35.8	465	75	12	294	456	0	27021	25042	0	1	6	-22	5	-55	-53
82/ 6:57: 14	57 41.2	-159 21.8	464	75	11	297	455	1	27023	25030	0	1	7	-22	5	-55	-54
82/ 6:58: 15	57 43.0	-159 7.6	464	76	12	299	455	1	27024	25032	0	1	7	-22	5	-55	-54
82/ 6:59: 16	57 44.8	-158 53.2	464	76	12	299	455	1	27021	25026	0	1	7	-22	5	-55	-54
82/ 7: 0: 16	57 46.4	-158 39.2	464	76	13	304	455	1	27016	25020	0	1	7	-22	5	-55	-54
82/ 7: 1: 17	57 48.1	-158 24.8	464	76	13	302	455	1	27015	25030	0	1	7	-22	5	-56	-57
82/ 7: 2: 17	57 49.8	-158 10.7	464	76	13	296	454	1	27014	25017	0	1	7	-22	5	-52	-56
82/ 7: 3: 18	57 51.4	-157 56.4	464	77	13	291	454	0	27025	25040	0	1	7	-23	5	-57	-56
82/ 7: 4: 19	57 53.0	-157 41.9	465	77	17	290	452	1	27019	25036	0	1	8	-23	5	-57	-56
82/ 7: 5: 19	57 54.6	-157 27.7	466	77	18	285	451	1	27019	24936	0	1	7	-23	6	-57	-55
82/ 7: 6: 20	57 56.2	-157 13.1	467	78	16	279	453	0	27021	24989	0	1	7	-23	6	-57	-55
82/ 7: 7: 21	57 57.7	-156 58.7	467	78	15	280	454	0	27023	24915	0	1	8	-24	6	-57	-55
82/ 7: 8: 21	57 59.2	-156 44.3	468	78	15	278	454	0	27022	25017	0	1	8	-24	3	-57	-56
82/ 7: 9: 22	58 0.7	-156 29.7	468	78	15	280	454	0	27025	25020	0	1	8	-24	5	-57	-56
82/ 7: 10: 22	58 2.1	-156 15.3	468	79	14	280	456	0	27018	25018	0	1	8	-23	3	-57	-55
82/ 7: 11: 23	58 3.5	-156 0.6	468	79	16	270	454	0	27011	23982	0	1	8	-24	7	-57	-55
82/ 7: 12: 24	58 4.9	-155 46.0	468	79	15	265	453	0	27023	22665	0	1	8	-24	7	-57	-55
82/ 7: 13: 24	58 6.5	-155 31.6	468	77	15	259	455	0	27023	23540	0	1	9	-24	3	-56	-55
82/ 7: 14: 25	58 8.2	-155 16.9	469	77	19	263	451	0	27015	22970	0	0	9	-25	8	-56	-55
82/ 7: 15: 26	58 9.8	-155 2.2	471	78	18	261	453	0	27019	23363	0	1	8	-24	9	-56	-55
82/ 7: 16: 26	58 11.4	-154 47.7	472	77	18	269	455	0	27020	23879	0	0	9	-24	12	-57	-55
82/ 7: 17: 27	58 12.0	-154 33.0	473	78	20	262	454	0	27019	22325	0	1	8	-24	9	-57	-56
82/ 7: 18: 27	58 16.8	-154 20.7	468	26	25	265	456	1	27010	26288	0	-24	8	-24	6	-58	-57
82/ 7: 19: 28	58 24.1	-154 21.9	448	317	26	238	453	2	27016	20284	0	-24	9	-24	3	-58	-59
82/ 7: 20: 29	58 26.8	-154 34.8	440	277	17	241	454	1	26984	23288	0	0	9	-24	6	-58	-58
82/ 7: 21: 29	58 27.9	-154 48.6	441	277	17	231	453	1	27008	21279	0	1	9	-24	3	-58	-57
82/ 7: 22: 30	58 29.0	-155 2.6	443	277	17	216	451	1	27013	24341	0	0	9	-25	7	-57	-56
82/ 7: 23: 30	58 30.2	-155 16.5	445	275	9	234	451	0	27010	26671	0	-23	8	-24	6	-57	-56
82/ 7: 24: 31	58 26.7	-155 28.4	446	217	8	224	454	0	26999	24123	0	1	8	-24	5	-56	-56
82/ 7: 25: 32	58 19.6	-155 30.4	453	156	4	236	453	-1	27038	22636	0	-23	9	-24	3	-56	-54
82/ 7: 26: 32	58 14.5	-155 19.9	460	127	11	251	454	-1	26992	22698	0	0	9	-24	5	-56	-54
82/ 7: 27: 33	58 10.1	-155 7.9	461	124	11	245	456	-1	27024	22726	0	0	8	-24	7	-55	-54
82/ 7: 28: 34	58 5.9	-154 55.5	462	121	11	265	453	0	27041	24981	0	9	9	-24	14	-56	-55
82/ 7: 29: 34	58 1.9	-154 43.1	463	121	13	255	454	-1	27034	25051	0	1	8	-24	16	-57	-55
82/ 7: 30: 35	57 56.4	-154 33.7	447	170	16	234	454	-1	27020	25158	0	26	8	-24	18	-58	-56
82/ 7: 31: 36	57 50.0	-154 38.9	436	237	18	230	455	1	27020	25160	0	26	8	-23	18	-58	-57
82/ 7: 32: 36	57 49.5	-154 52.2	440	275	21	224	453	2	27024	25061	0	3	9	-24	17	-58	-58





Sea Ice Flight #11 March 23 1988 Fairbanks to Moffett

11.FLT

18: 06: 49 TO 0: 50: 09 UT SCALE 1: 2.06E+07 TIME TIC EVERY 50.00 MINUTES

```
DC-8 Mission Director Log
                                        Mission  Name: Sea Ice 88
                                        Flight Number: 11 (23Mar88)
18:13:36 | today is 3-23-88
18:14:03 | This is the transit flifgt to Ames
18:14:48 | take off was at 18-02-58
18:19:27 | PRT -5 take off line
         |
18:25:32 | >>>> Start of run:   Black Rapids Wp3
         |
         |      Altitude: 29064                          Latitude:  +63 25.6
         |                                              Longitude: -145 17.3
18:33:38 | >>>> End of run:  Black Rapids Wp4
         |
         |      Altitude: 29052                          Latitude:  +63 40.7
         |                                              Longitude: -147 18.0
         |
         |
18:41:16 | >>>> Start of run:  West Fork
         |
         |      Altitude: 29065                          Latitude:  +63 34.0
         |                                              Longitude: -147 28.4
18:43:01 | >>>> End of run:  West Fork
         |
         |      Altitude: 29053                          Latitude:  +63 27.0
         |                                              Longitude: -147 49.6
         |
         |
19:27:36 | >>>> Start of run:  INS check
         |
         |      Altitude: 29058                          Latitude:  +59  9.3
         |                                              Longitude: -154 30.7
19:32:29 |  /c
         |
19:41:29 | >>>> Start of run:  Katmai #1 Wp7
         |
         |      Altitude: 29061                          Latitude:  +58 23.8
         |                                              Longitude: -155 44.1
```

19:46:56 | >>>> End of run: Katmai #1 Wp8

Altitude: 29072 Latitude: +58 2.3
Longitude: -154 45.8

19:59:49 | >>>> Start of run: Katmai #2 Wp1'

Altitude: 29041 Latitude: +58 5.0
Longitude: -155 44.7

20:05:32 | >>>> End of run: Katmai #2 Wp2''

Altitude: 29045 Latitude: +58 13.4
Longitude: -154 30.1

21:29:34 | >>>> Start of run: Glacier Bay #1 Wp 7

Altitude: 29067 Latitude: +58 36.6
Longitude: -135 33.9

21:35:54 | >>>> End of run: Glacier Bay #1 Wp8'

Altitude: 29061 Latitude: +59 17.2
Longitude: -136 23.7

21:38:25 | The two Glacier Bay runs are being done 5 miles right
of the track as define by wp 7',8',5'6'

21:44:51 | >>>> Start of run: Glacier Bay #2 Wp5'

Altitude: 29060 Latitude: +59 19.0
Longitude: -136 23.9

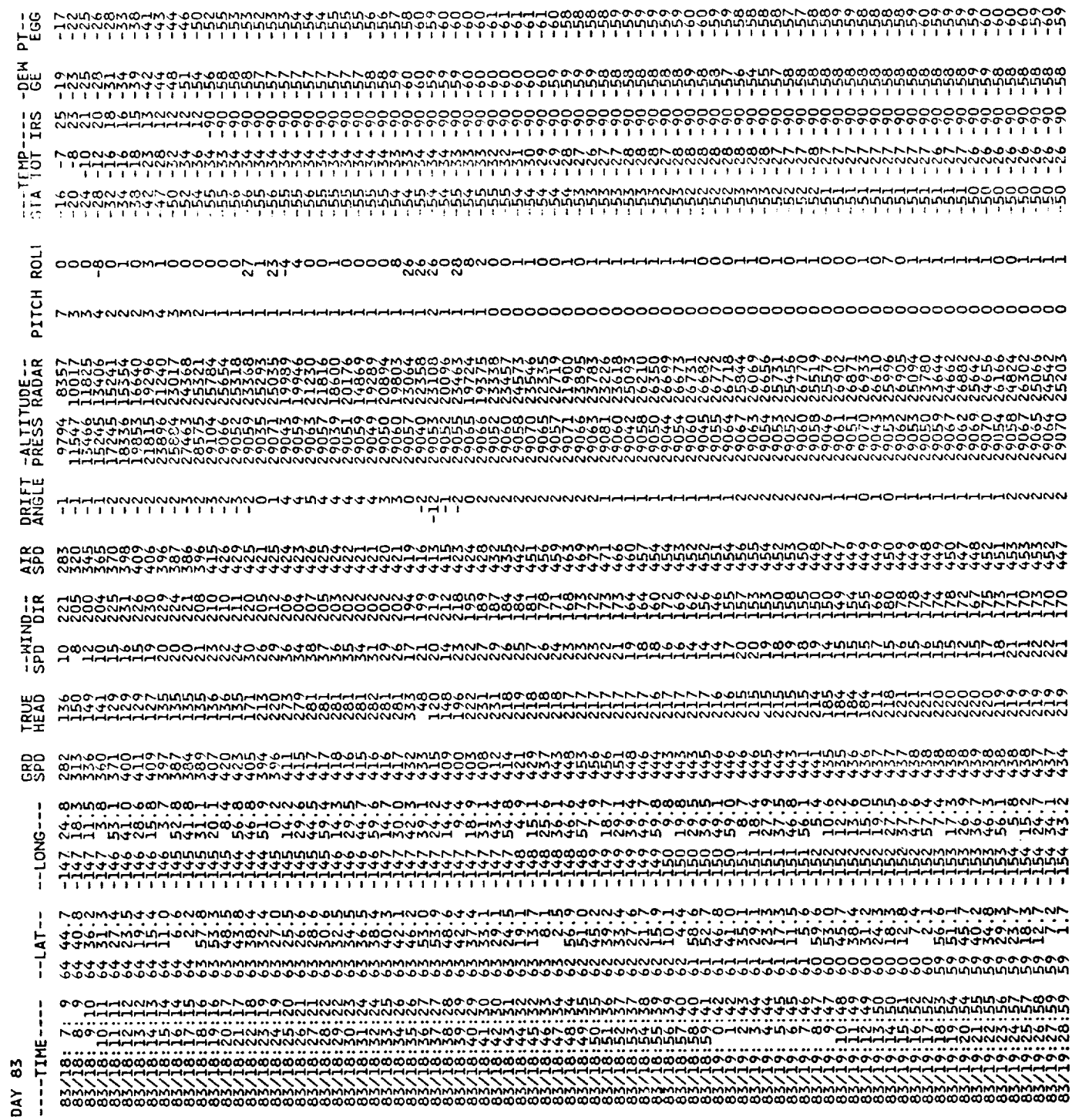
21:53:21 | >>>> End of run: Glacier Bay #2 Wp6'

Altitude: 29067 Latitude: +58 21.9
Longitude: -135 52.0

22:43:07 | climbed to37000

23:16:18 | decending to 33000 ft

```
-------------------------------------------------------------------
23:25:51 | >>>> Start of run:
         |
         |      Altitude: 33058                    Latitude:  +48 53.5
         |                                        Longitude: -123 49.7
--------------
23:30:18 | >>>> End of run:  Sook lake forest Wp
         |
         |      Altitude: 33065                    Latitude:  +48 19.1
         |                                        Longitude: -123 49.6
-------------------------------------------------------------------
         |
--------------
23:32:20 | asending to 37000 ft
--------------
         |
-------------------------------------------------------------------
23:51:04 | >>>> Start of run:  INS check
         |
         |      Altitude: 37113                    Latitude:  +45 25.6
         |                                        Longitude: -123 42.1
--------------
         |
-------------------------------------------------------------------
00:00:08 | >>>> Start of run:  INS check
         |
         |      Altitude: 37126                    Latitude:  +44  6.8
         |                                        Longitude: -123 20.3
--------------
         |
-------------------------------------------------------------------
00:03:46 | >>>> Start of run:  SAR segment
         |
         |      Altitude: 37107                    Latitude:  +43 35.2
         |                                        Longitude: -123 11.8
--------------
00:05:40 | >>>> End of run:  SAR segment
         |
         |      Altitude: 37103                    Latitude:  +43 18.4
         |                                        Longitude: -123  7.3
-------------------------------------------------------------------
         |
--------------
```



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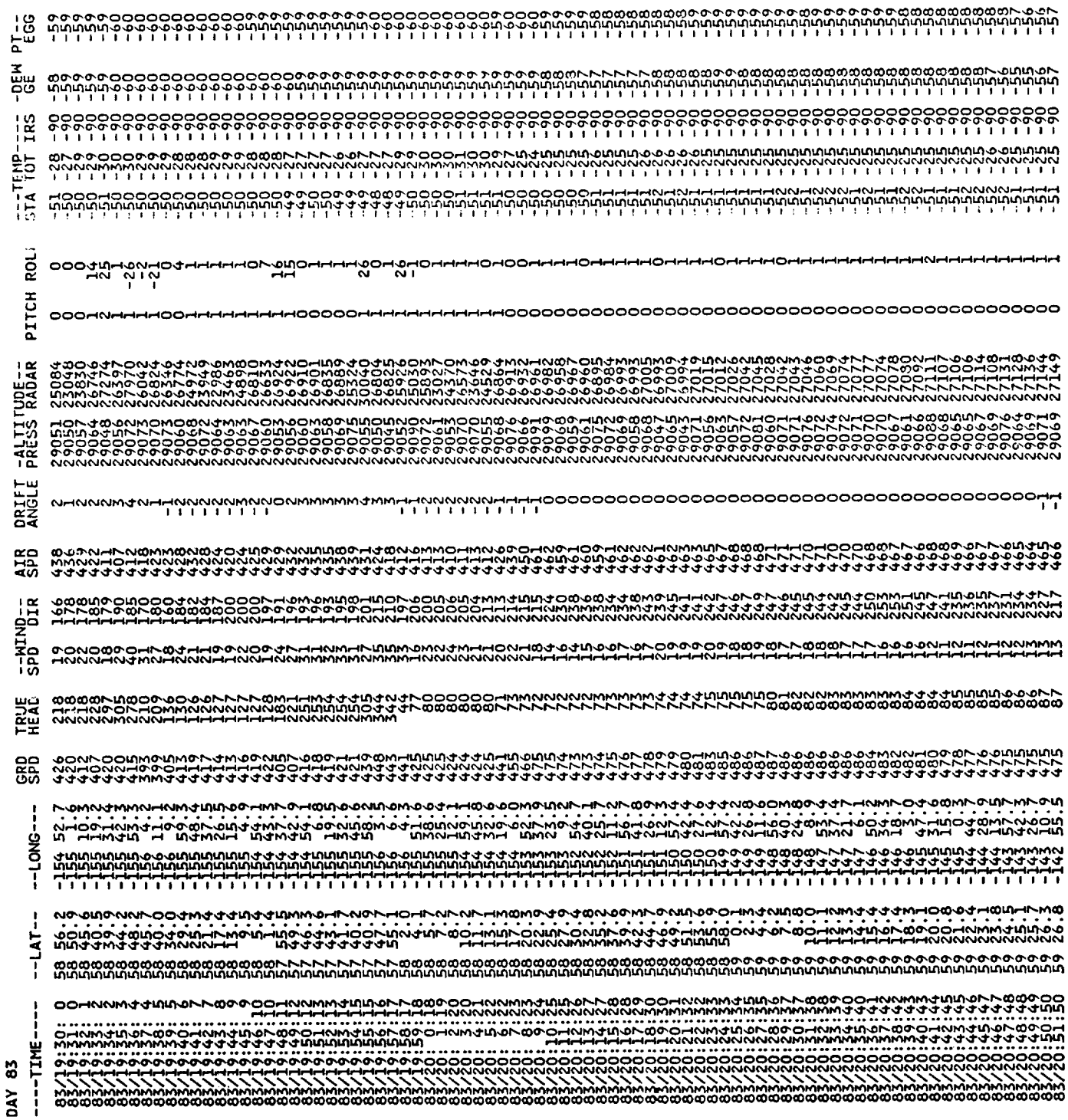

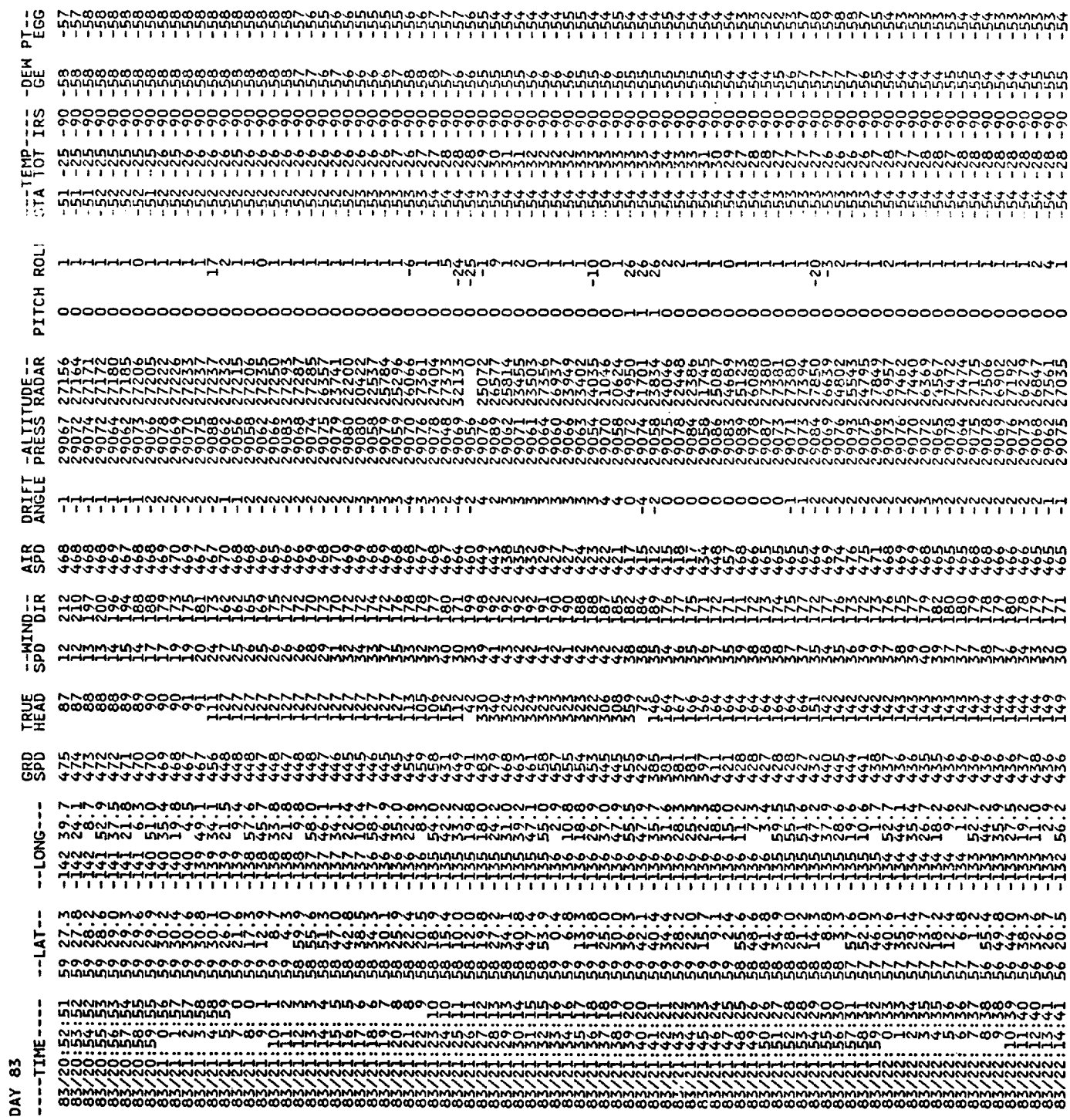

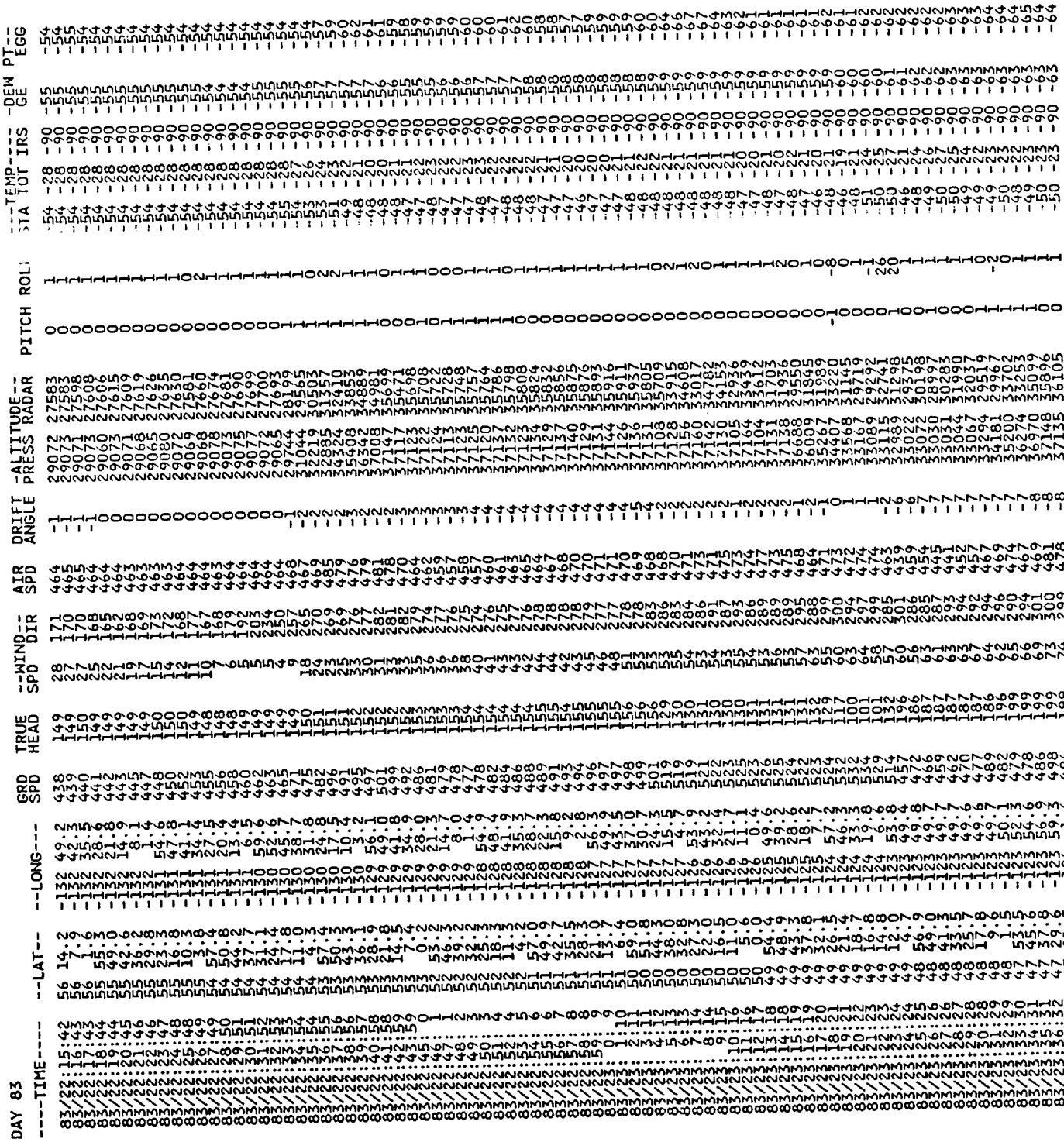

Appendix B
NASA DC-8 Film and Video Logs

SEA ICE '88 35 & 70 mm FILM LOG

EXPERIMENTER	DAY	TYPE	START TIME	STOP TIME
Cavalieri	054	70mm	1640 41.7	1947 54.7
	065	70mm	1939 37.3	2245 45.1
	071	70mm	1701 55.4	2011 14.0
	073	70mm	Not Before 2141460	2158 12.8
	073	70mm	2158 37.7	2200 02.1
	073	70mm	2200 17.0	2203 05.9
	073	70mm	2232 26.3	2250 20.3
	074	70mm	1911 43.3	0116 35.5
	077	70mm	1849 49.7	2229 46.2
	083	70mm	1830 35.1	1937 55.0
	069	35mm	1736 36.1	0017 32.6
	071	35mm	1706 57.6	1829 12.9
	073	35mm	Not Before 2146425	2210 10.9
	077	35mm	1850 24.6	2220 20.9
	077	35mm	2226 20.6	2326 31.8
	083	35mm	1851 37.9	1937 04.6
	083	35mm	2051 51.2	2053 35.0
Cimino	071	70mm	2255 07.3	2305 32.5
	073	70mm	2355 31.2	0011 39.7
	077	70mm	2350 51.5	2358 16.6
	077	35mm	2351 47.3	2358 30.9
Crawford	083	70mm	2325 51.6	0025 02.1
	083	35mm	2325 52.5	2330 03.0
Gatto	073	70mm	2344 54.5	2354 51.5
	077	70mm	2335 09.5	2343 16.1
	077	35mm	2335 09.4	2335 54.3
	078	70mm	0009 28.0	0030 47.2
	078	35mm	0009 28.0	0012 49.4
Farr	071	70mm	2320 54.8	2326 17.3
	073	70mm	2331 39.1	2338 57.8
	077	70mm	2320 59.0	2326 40.0
Mougnis-Mark	083	70mm	1941 28.7	2005 17.4
	083	35mm	1941 28.5	2005 16.7
Smith/Ranson	083	70mm	2108 11.6	2153 22.7
	083	35mm	2109 17.7	2153 39.0
	083	35mm	0022 04.4	0050 32.2

SEA ICE '88 VIDEO TAPE LOG

TAPE #	DAY	*ORIGINAL COPY	CONTENTS
1	069 3/09	*Cavalieri	Transit from Moffett to Fairbanks. Data runs over Colorado. High cirrus obscurred view. No patterns due to military exercise.
2	071 3/11 (1 of 3)	*Cavalieri	Ice observations on one track to Ellesmere Island and back. Audio unusable.
3	071 3/11 (2 of 3) 073 3/13 (4 of 4)	*Cimino Farr Gatto	071 - 2 data runs (Cimino and Farr). 073 - 2 data runs (Cimino and Gatto). All runs in the Fairbanks area. No Sea Ice data.
4	071 3/11 (3 of 3) 073 3/13 (1 of 4)	*Cavalieri	071 - Ice observations to Ellesmere and back 072 - Very dark due to clouds. Good audio. Tracks between St. Lawrence and St. Matthews Islands.
5	073 3/13 (2 of 4)	*Cavalieri	End of St. Lawrence/St. Matthews tracks. Good audio and visual.
6	073 3/13 (3 of 4)	*Cavalieri	Calibration turns. Low level runs south of St. Lawrence. Fairbanks run for Farr.
7	074 3/14 (1 of 3)	*Cavalieri	Kotzebue Sound. Chukchi Sea Mosaic.
8	074 3/14 (2 of 3)	*Cavalieri	Chukchi Sea Mosaic.
9	074 3/14 (3 of 3)	*Cavalieri	End Chukchi Mosaic. Coastline near Barrow. Alaska pipeline south of Barrow.
10	077 3/17 (1 of 3)	*Cavalieri	Chukchi Sea triangular pattern to investigate SSM/I anomaly.
11	077 3/17 (2 of 3)	*Cavalieri Farr, Gatto and Cimino	End Chukchi triangular pattern. 3 data runs near Fairbanks, (Cimino, Farr and Gatto).
12	077 3/17 (3 of 3)	*Gatto	River run south of Fairbanks for Gatto. Stopped early due to military exercise.
13	083 3/23 (1 of 2)	*Cavalieri Mougnis-Mark	Return to Moffett. Surging glacier for Cavalieri. Katmai for Mougnis-Mark.
14	083 3/23 (2 of 2)	*Smith and Ranson Crawford	Glacier Bay for Smith/Ranson. Sooke Lake for Crawford.

SEA ICE '88 35 & 70 mm FILM LOG

EXPERIMENTER	DAY	TYPE	START TIME	STOP TIME
Cavalieri	054	70mm	1640 41.7	1947 54.7
	065	70mm	1939 37.3	2245 45.1
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	077	70mm	1849 49.7	2229 46.2
	083	70mm	1830 35.1	1937 55.0
	069	35mm	1736 36.1	0017 32.6
	071	35mm	1706 57.6	1829 12.9
	073	35mm	Not Before 2146425	2210 10.9
	077	35mm	1850 24.6	2220 20.9
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	083	35mm	2051 51.2	2053 35.0
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	077	35mm	2351 47.3	2358 30.9
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	077	35mm	2335 09.4	2335 54.3
	078	70mm	0009 28.0	0030 47.2
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SEA ICE '88 VIDEO TAPE LOG

TAPE #	DAY	*ORIGINAL COPY	CONTENTS
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2	071 3/11 (1 of 3)	*Cavalieri	Ice observations on one track to Ellesmere Island and back. Audio unusable.
3	071 3/11 (2 of 3) 073 3/13 (4 of 4)	*Cimino Farr Gatto	071 - 2 data runs (Cimino and Farr). 073 - 2 data runs (Cimino and Gatto). All runs in the Fairbanks area. No Sea Ice data.
4	071 3/11 (3 of 3) 073 3/13 (1 of 4)	*Cavalieri	071 - Ice observations to Ellesmere and back 072 - Very dark due to clouds. Good audio. Tracks between St. Lawrence and St. Matthews Islands.
5	073 3/13 (2 of 4)	*Cavalieri	End of St. Lawrence/St. Matthews tracks. Good audio and visual.
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9	074 3/14 (3 of 3)	*Cavalieri	End Chukchi Mosaic. Coastline near Barrow. Alaska pipeline south of Barrow.
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14	083 3/23 (2 of 2)	*Smith and Ranson Crawford	Glacier Bay for Smith/Ranson. Sooke Lake for Crawford.

Appendix C
Weather Summary

SUMMARY OF ALASKAN REGION WEATHER SYSTEMS
March 9-23, 1988

During the deployment to Alaska two large scale weather patterns were observed. Early in period the entire region was much warmer than normal due to storms traversing the state. Once the storms resumed their usual track into the Gulf of Alaska cold Arctic air spread over the state including the Bering, Chukchi and Beaufort Seas.

March 9-13 A blocking ridge in the upper atmosphere caused storms to track from the Pacific Ocean into the Bering Sea and over Alaska. Record high temperatures were recorded at many locations, the greatest deviations from normal occurring over the northern half of the state. For the week of March 6-12 Fairbanks averaged 24 degrees above normal.

March 14-17 High pressure built into the Bering Sea from Siberia and moved slowly northeastward. Very cold temperatures, in the -10 to -20 degree range, were recorded in the northern Bering and southern Chukchi Seas.

March 18-19 Weakening High pressure was observed across northern Alaska and a weak disturbance crossed the Bering Sea which dissipated in northwestern Alaska.

March 20-21 A strong arctic Low pressure system and cold front swept across the North Slope leaving blowing snow and falling temperatures in its wake. Cold temperatures persisted in the Bering Sea as a cold front pushed southward.

March 22-23 High pressure built over northern Alaska and with a storm in the Gulf of Alaska maintained a cold northerly flow over the Bering Sea. For the week March 20-26 St. Paul Island (in the central Bering Sea) was 14 degrees below normal with the remainder of the Bering, Chukchi and Beaufort Sea stations reporting temperatures near 10 degrees below normal.

Appendix D
Navy/NOAA JIC Charts

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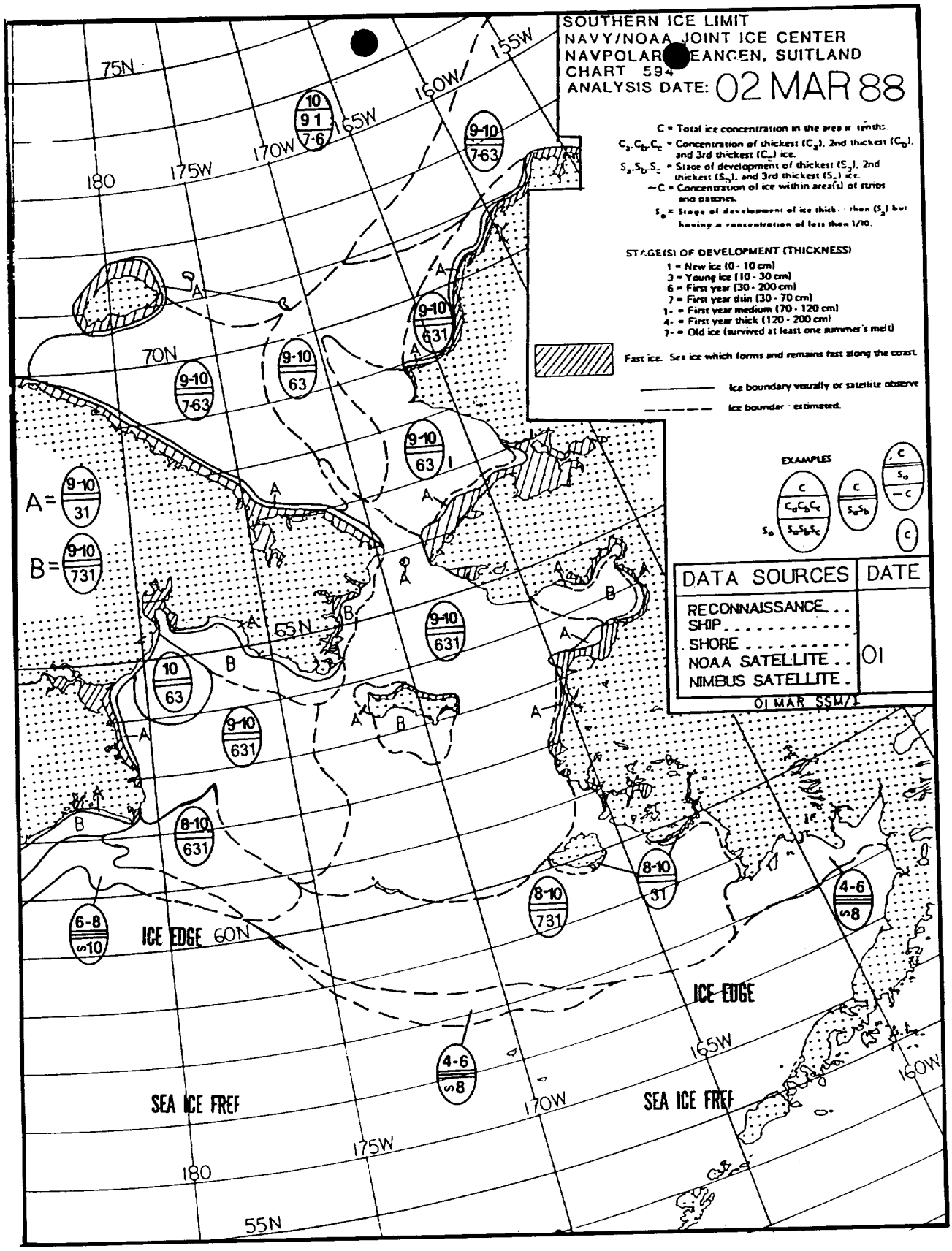

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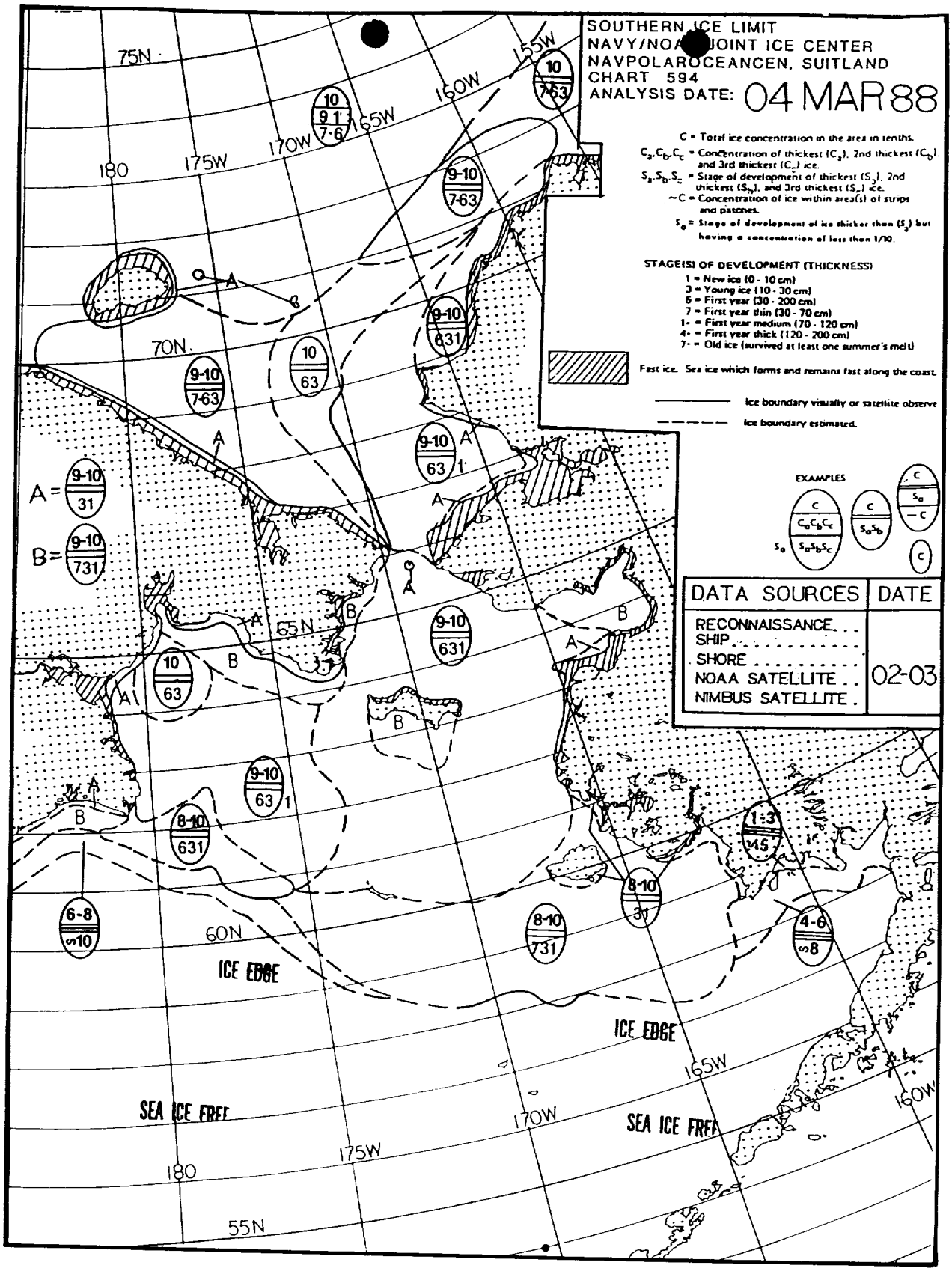
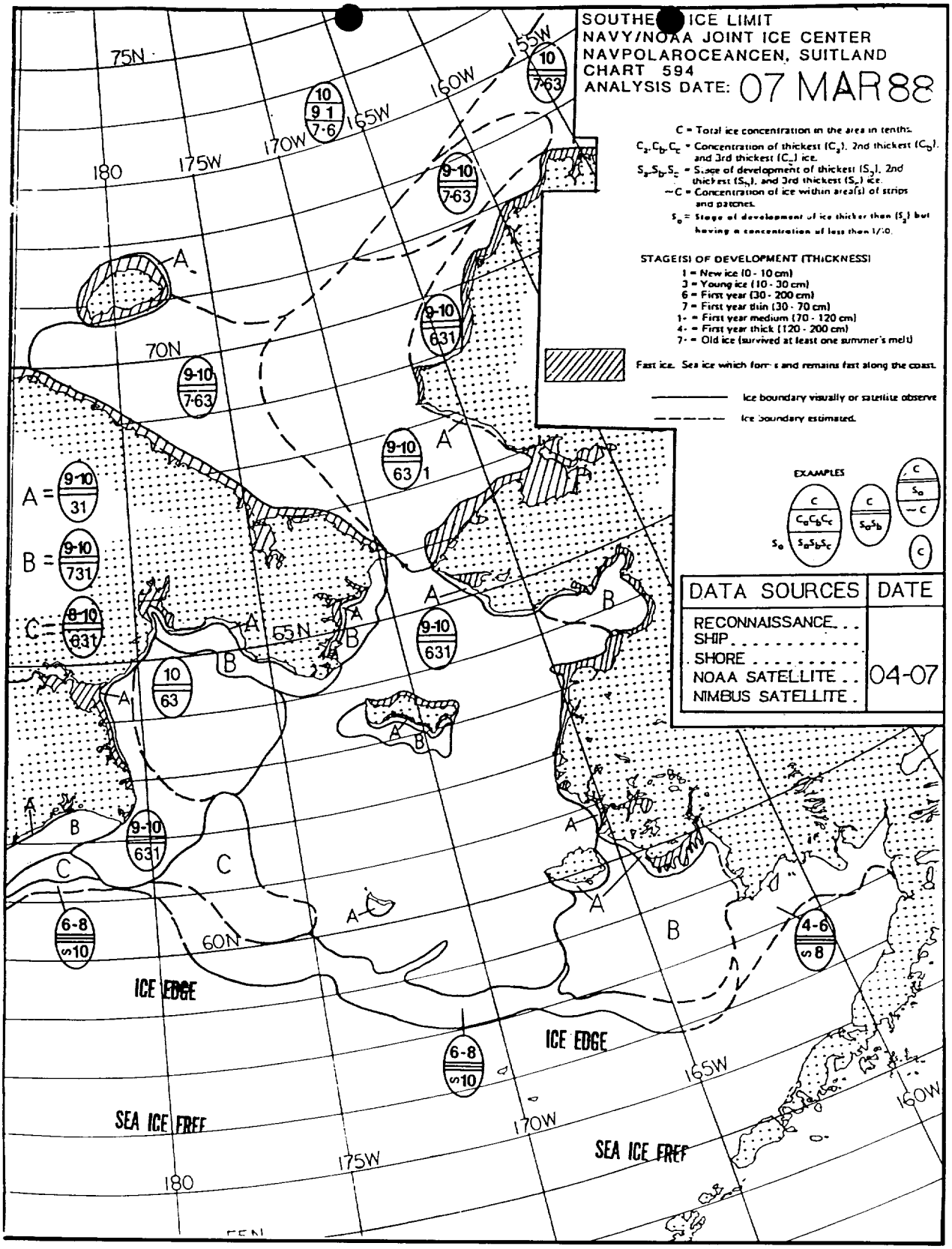
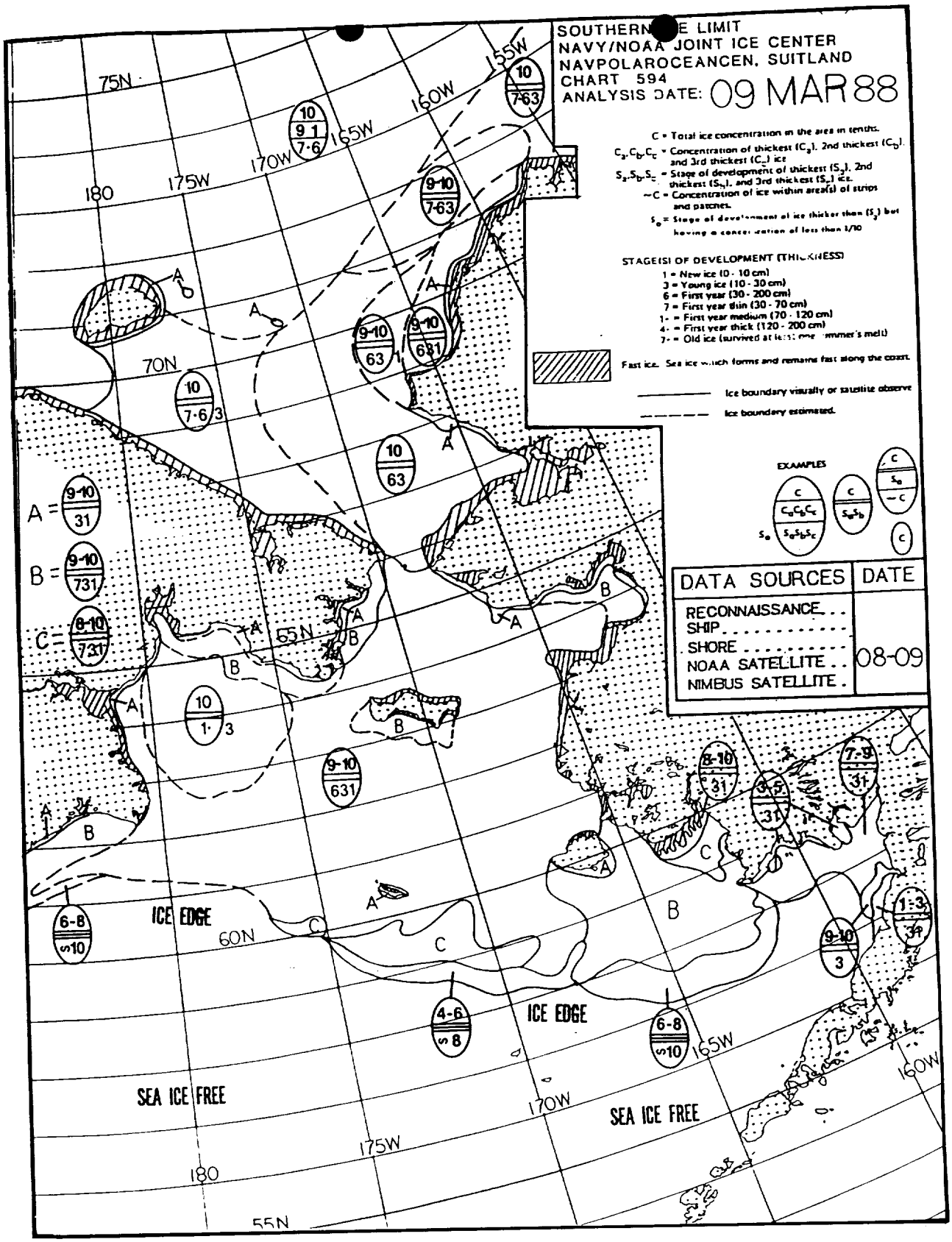
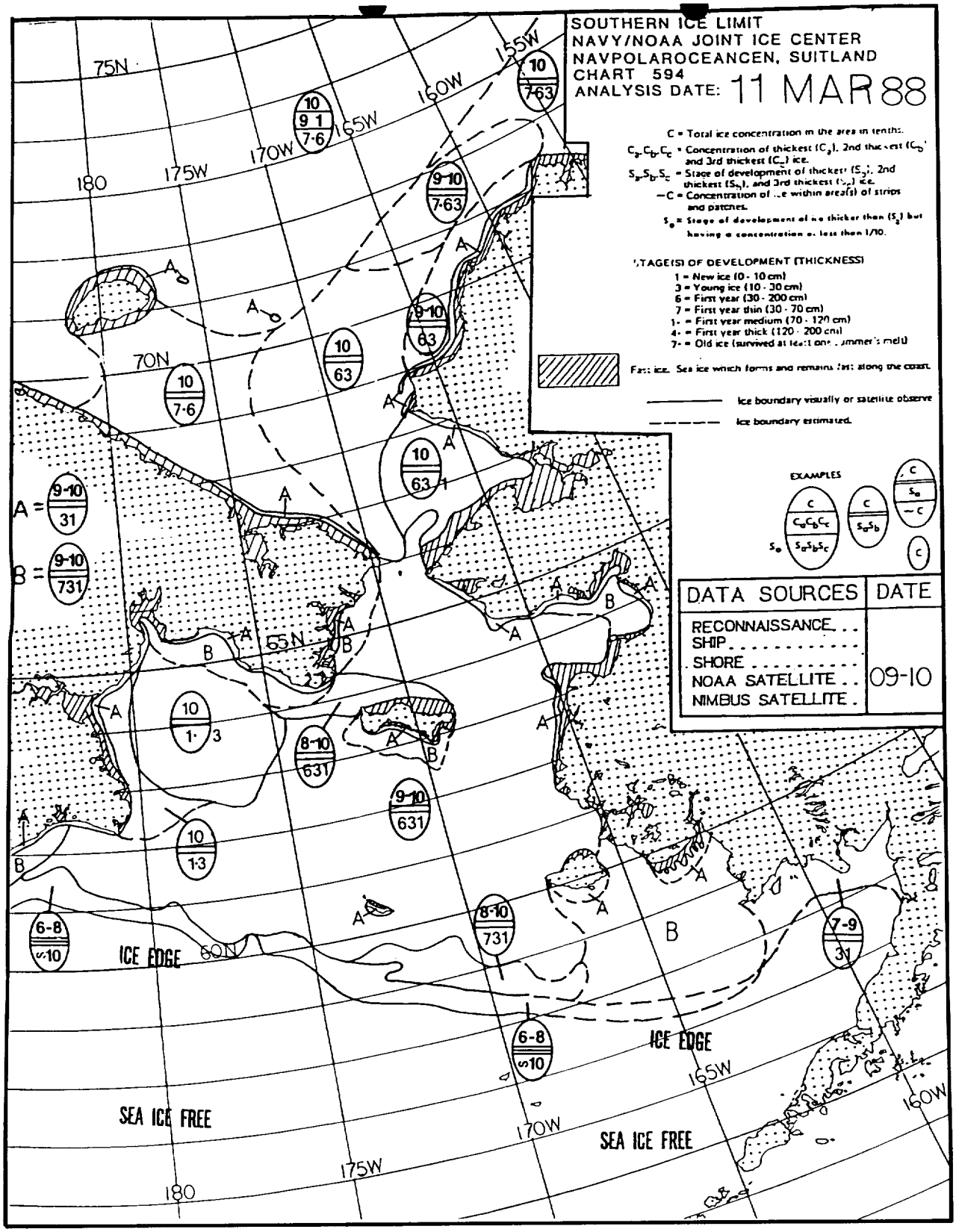





SOUTHERN ICE LIMIT
NAVY/NOAA JOINT ICE CENTER
NAVPOLAROCEANCEN, SUITLAND
CHART 594
ANALYSIS DATE: 09 MAR 88
C = Total ice concentration in the area in tenths.
C_a.C_b.C_c = Concentration of thickest (C_a), 2nd thickest (C_b), and 3rd thickest (C_c) ice
S_a.S_b.S_c = Stage of development of thickest (S_a), 2nd thickest (S_b), and 3rd thickest (S_c) ice.
~C = Concentration of ice within area(s) of strips and patches.
S_o = Stage of development of ice thicker than (S_a) but having a concentration of less than 1/10
STAGE(S) OF DEVELOPMENT (THICKNESS)
1 = New ice (0 - 10 cm)
2 = Young ice (10 - 30 cm)
3 = First year (30 - 200 cm)
4 = First year thin (30 - 70 cm)
5 = First year medium (70 - 120 cm)
6 = First year thick (120 - 200 cm)
7 = Old ice (survived at least one summer's melt)
Fast ice. Sea ice which forms and remains fast along the coast.
Ice boundary visually or satellite observed
Ice boundary estimated.
EXAMPLES
DATA SOURCES
DATE
RECONNAISSANCE
SHIP
SHORE
NOAA SATELLITE
NIMBUS SATELLITE
08-09
75N
70N
65N
60N
55N
180
175W
170W
165W
160W
155W
ICE EDGE
ICE EDGE
SEA ICE FREE
SEA ICE FREE



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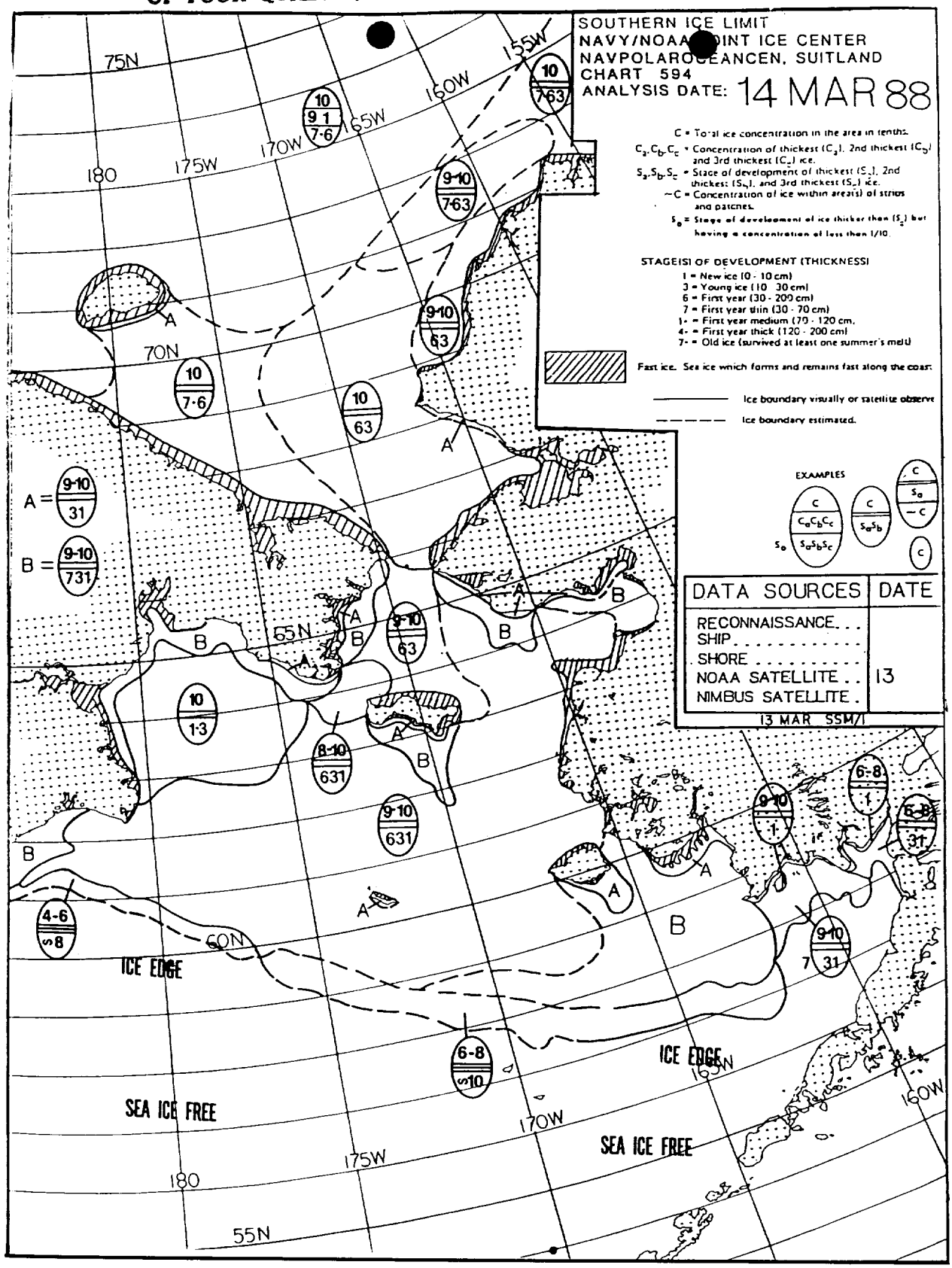

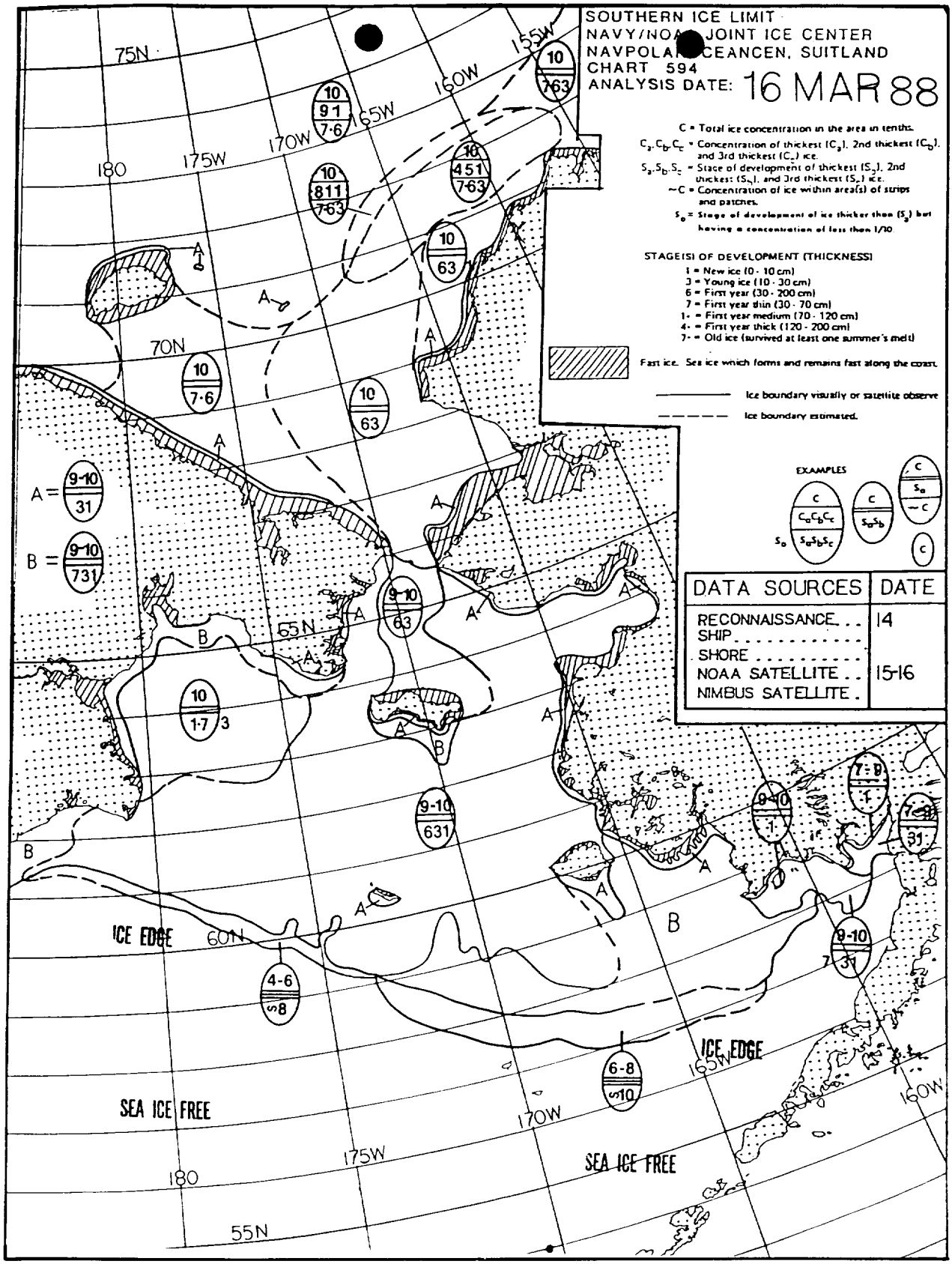

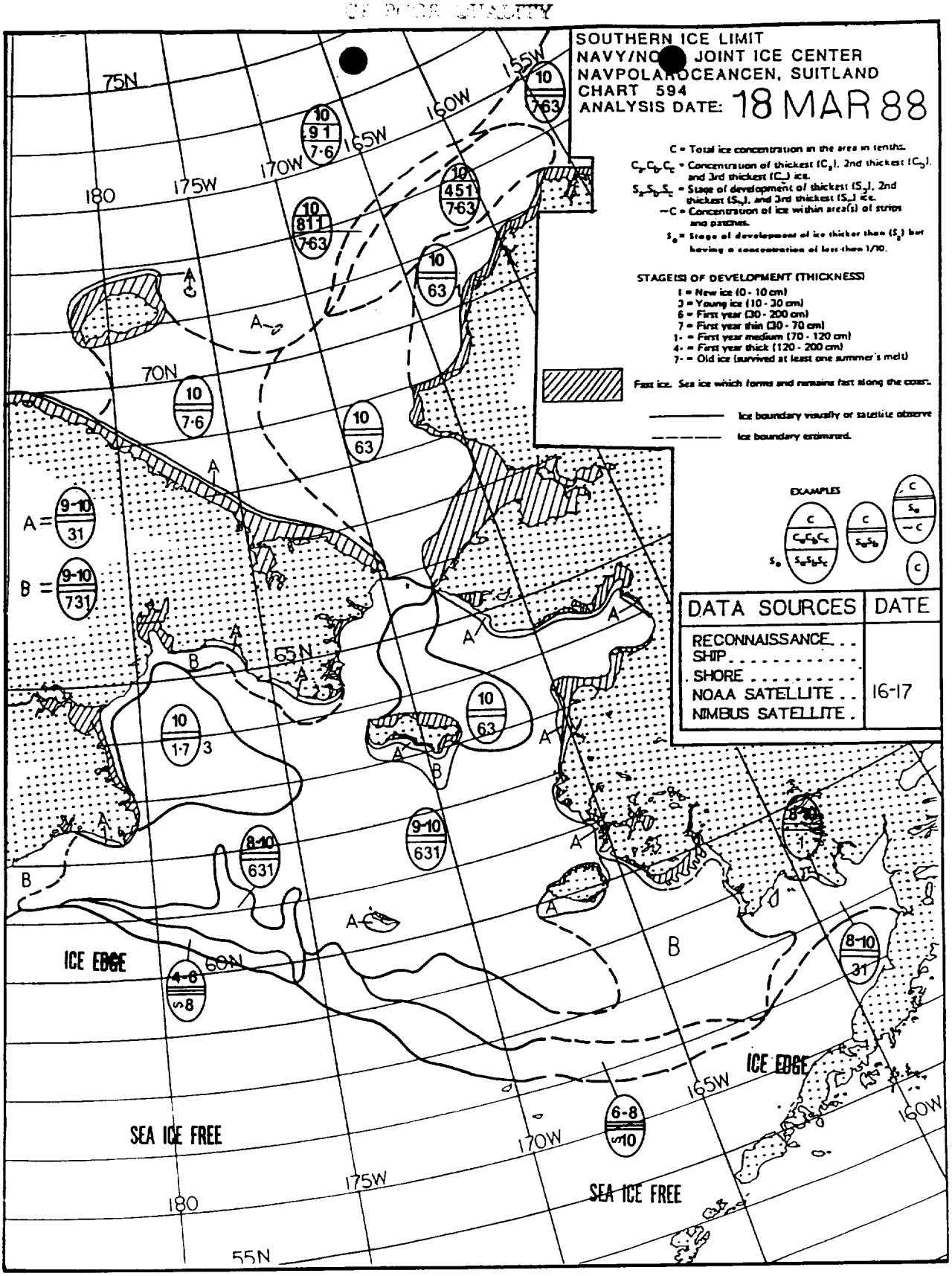

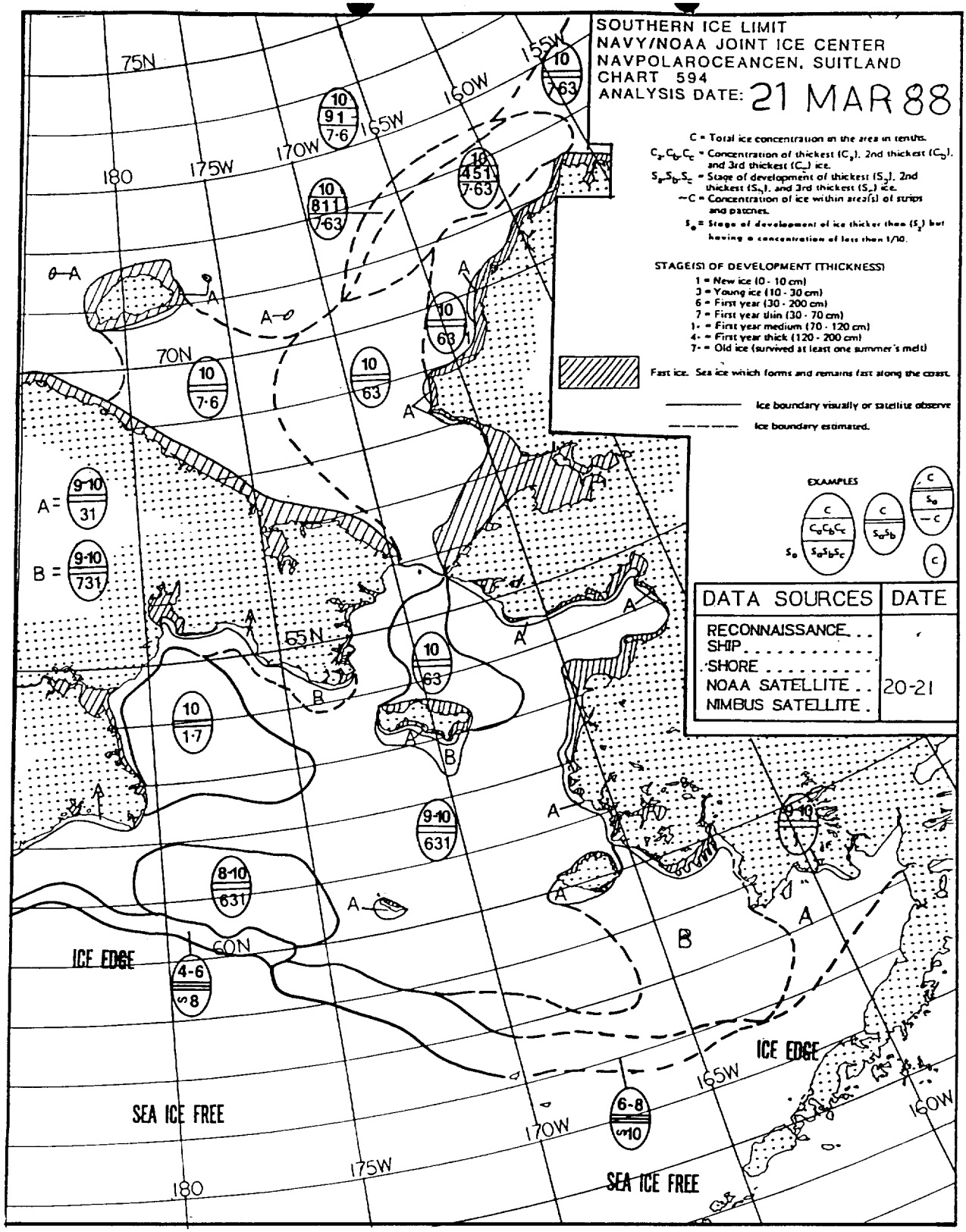

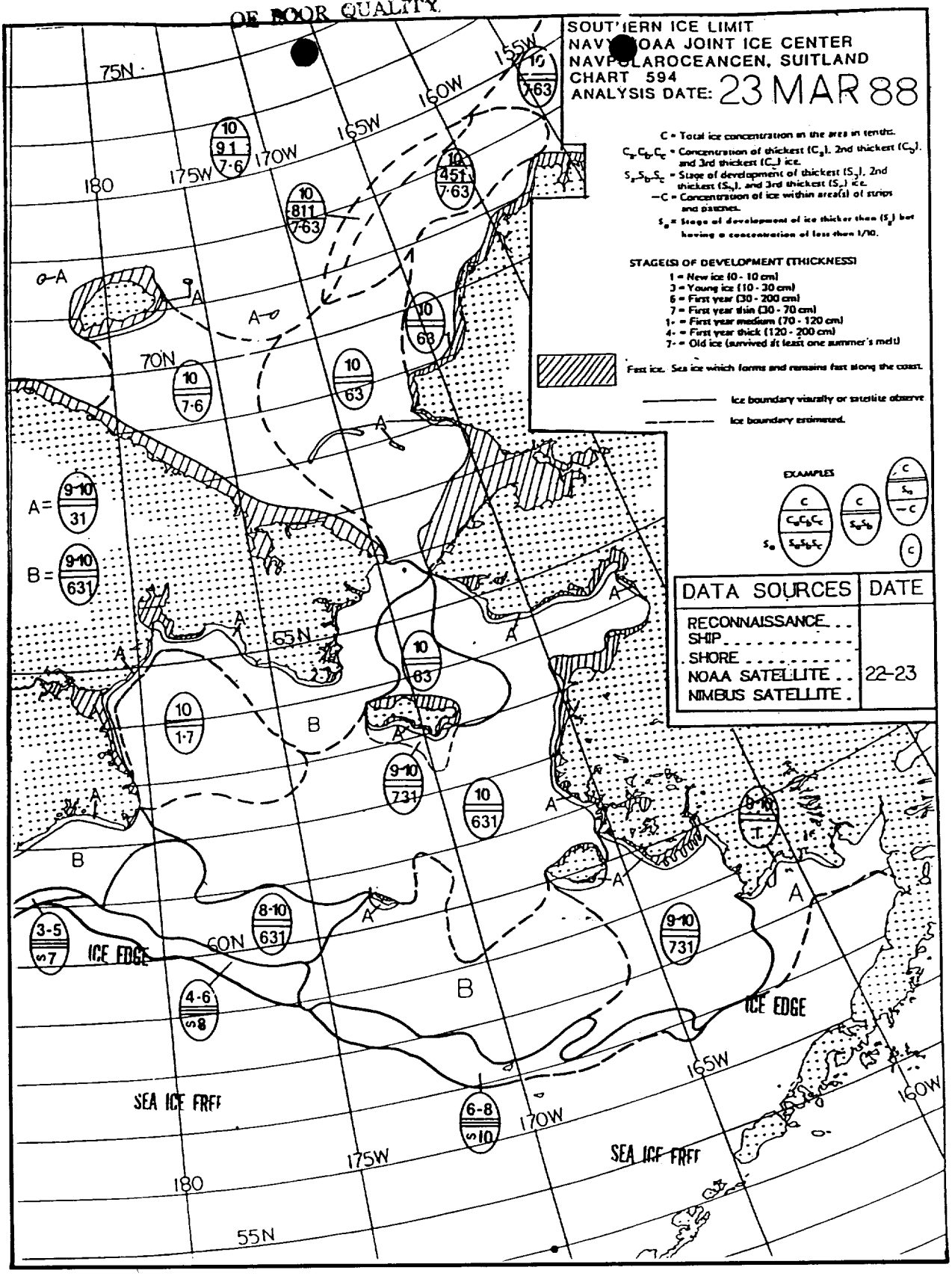

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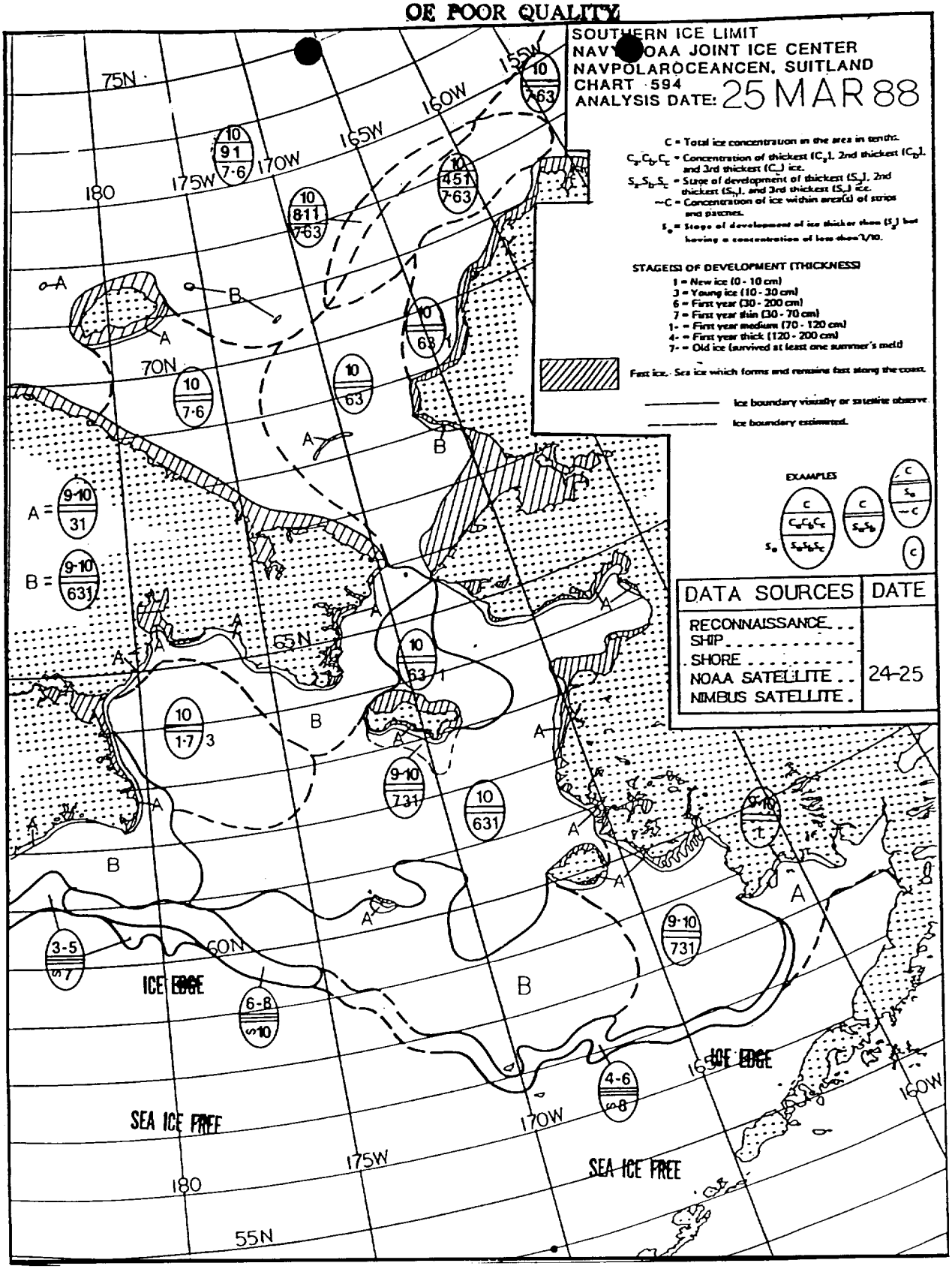

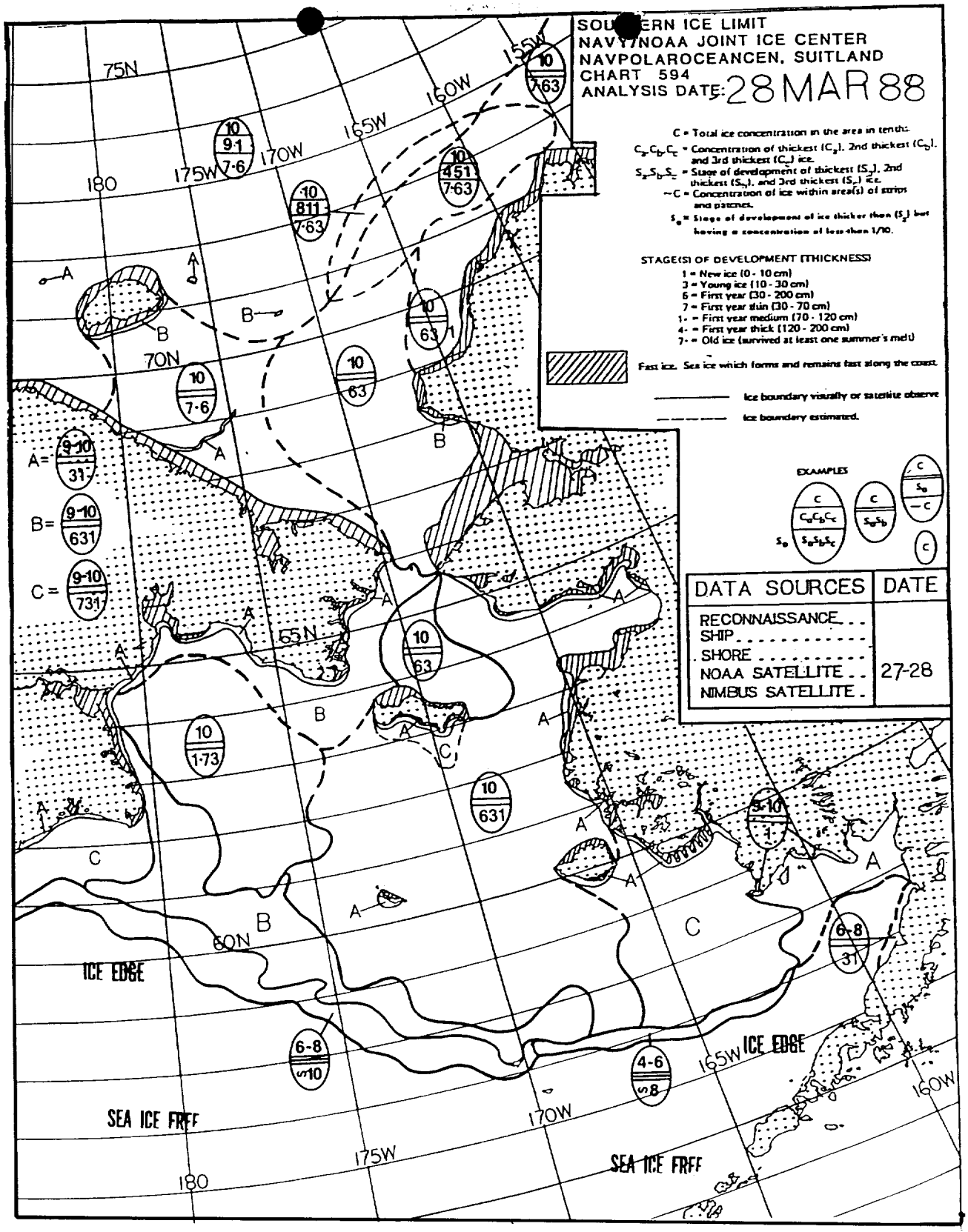

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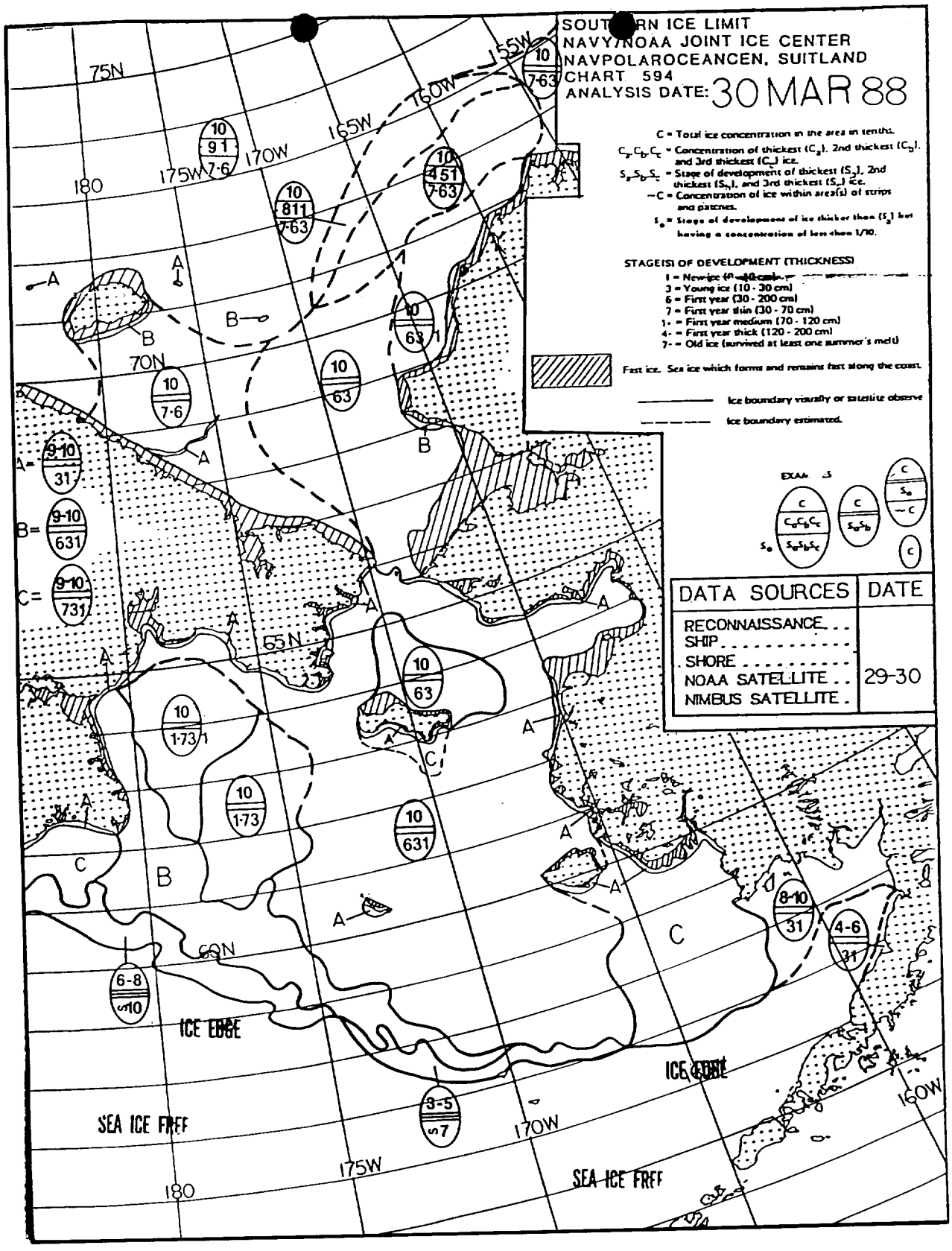

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7. Author(s): D. J. Cavalieri	8. Performing Organization Report No.: 88B0262
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15. Supplementary Notes

16. Abstract

In June 1987 a new microwave sensor called the Special Sensor Microwave Imager (SSM/I) was launched as part of the Defense Meteorological Satellite Program (DMSP). In recognition of the importance of this sensor to the polar research community, NASA developed a program to acquire the data, to convert the data into sea ice parameters, and finally to validate and archive both the SSM/I radiances and the derived sea ice parameters. Central to NASA's sea ice validation program was a series of SSM/I aircraft underflights with the NASA DC-8 Airborne Laboratory. The mission (dubbed the Arctic '88 Sea Ice Mission) was completed in March 1988. This report summarizes the mission includes a summary of aircraft instrumentation, coordination with participating Navy aircraft, flight objectives, flight plans, data collected, SSM/I orbits for each day during the mission, and lists several piggyback experiments supported during this mission.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
DMSP SSM/I, Microwave, sea ice, snow	Unclassified - Unlimited Subject category 48

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of pages	22. Price
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