

9980830H1 - LPS

**Mission Summary**  
**Danielle**  
980830H Aircraft 42RF

Scientific Crew (42RF)

Lead Project Scientist Hugh Willoughby  
Radar Scientist AXBT Scientist ~~Chris Landsea~~  
Dropwindsonde Scientist Sim Aberson  
Dropwindsonde Scientist Sharan Majumdar (PSU)  
Workstation Scientist Peter Dodge  
Stable Isotope Jim Lawrence (UHouston)

Steve Feuer

*Mission Briefing:*

Flight 980830H was an eXtended Cyclone Dynamics eXperiment (XCDX) flown in Hurricane Danielle. It originated and terminated at Opa Locka. HRD participants were: Hugh Willoughby, Peter Dodge, Sim Aberson, Steve Feuer, Jim Lawrence (Univ. of Houston) and Sharan Majumdar (Penn. State). The objective was to fly a six-sided pattern just below the melting level, deploying 3 dropsondes, along with AXBTs, on each 300 nmi radial leg. These data combined with flight-level data from TEAL 984, which was scheduled to leave the storm at 1730 UT, TEAL 977, which was scheduled to arrive at 2300 UT, and NASA 917 (the DC8), which was flying a similar pattern at 35-37 Kft simultaneously and also deploying dropsondes, was intended to document the storm's structure and dynamics as a less comprehensive follow-on to the Vortex Motion and Evolution Experiment conducted on the previous day. The mission was also designed to provide lower tropospheric validation for remote sensors aboard the DC8.

*Mission Synopsis:*

N42RF took off from Opa Locka at 1837 UT on 30AUG98, arrived at the initial point of the pattern at 1955 UT, and flew toward the center at 5890 m from the SSW on a nominal 030 track. We attempted 3 drops at point 1, all of which failed because of a blown fuse on the preamplifier for the dropsonde receiver's antenna. The second sounding, 100 nmi farther along the track after we found and repaired the fuse, was good. It was very dry above a strong dewpoint inversion in the lower troposphere. As we approached the center, the eye appeared on radar to be irregular with an eyewall composed of bands wrapping around it. We reached the center (32-08N, 71-08W) at 2102, where we deployed two sondes, one at the flight level center and the other at our best estimate of the surface center. The observed profiles differed significantly. The splash pressures were 986 and 989 mb. We continued on the 030 track to point 3, 300 nmi NNE of the eye, where we turned westward. SST measured at the turn point was 28.3, compared with 26.3 100 nmi outward from the eye. The circulation was so small that we had only about 10 kt of tail wind on the westward leg. At this point we became concerned about fuel and decided to shorten the southeast legs.

We reached point 4, 300 nmi NNW of the eye, and turned toward the center on a nominal 150 track. Earlier, during the initial approach to the eye, we had discovered that the time on HAPS was incorrect. After numerous attempts to reset it, we received CARCAH's concurrence to send TEMP DROP messages with erroneous date-time groups. On the second approach to the eye we again observed 26C SST 100 nmi NW of the center. N42RF reached the center (27-56N, 74-15W) at 0031 UT on the 31AUG98, passed through without dropping sondes, and continued on the 150 track to relocated point 5, 250 nmi SSE of the center. Then we turned to a nominal 030 track to relocated point 6, 250 nmi E of the center. We had only 10 kt of tail wind on this leg as well. SSTs were 27.6 and 28.5C 250 nmi SSE and E of the center respectively.

The final pass across the center was from East to West. On radar, the eye appeared to be much more circular and regular. We deployed two GPS sondes in rapid succession at the flight level center (28-15N, 72-30W) at 0319 UT. Stan Czyzyk, the flight director, was in superb form. Both sondes fell at the axis of

rotation. The soundings and splash pressures were essentially identical. If one accepts 986 mb as the correct surface pressure on the initial pass, the pressure had fallen 6 mb to 980 in 6.25 h. A hundred nmi west of the center, an AXBT reported 29.2C SST (perhaps unreliable). The final point and last dropsonde was moved 275 nm west of the center to avoid dropping over land at 0422 on 31AUG98. N42RF recovered at Opa Locka at 0503 UT on 31AUG98, 10h 06m duration.

*Evaluation:*

This mission provides an invaluable follow on to the full Vortex Motion and Evolution mission on the previous day. It captures the end of Danielle's weakening trend and the beginning of the intensification that continued on the next day. A possible cause of this change is motion over warmer SSTs.

*Problems:*

There were three principal equipment problems: 1) The blown fuse in the dropsonde receiver preamp, which probably should have been diagnosed before we expended three dropsondes. 2) Inability to reset the HAPS time without the root password, now corrected. 3) Mistimed launch detects combined with large pressure offsets on more than half of the drops. Of the 24 sondes deployed only the first 3 failed outright and the last had no winds.

Hugh Willoughby  
4 September 1998

## Hurricane Research Division

---

AOML/NOAA  
4301 Rickenbacker Causeway  
Miami, FL 33149-1026

Ph: (305) 361-4400, Fx: (305) 361-44402  
Internet: willoughby@aoml.noaa.gov

7 September 1998

To: F. D. Marks

From: H. E. Willoughby

Subject: Flight 980830H

**Planning:** Flight 980830H was an eXtended Cyclone Dynamics eXperiment (XCDX) flown in Hurricane Danielle. It originated and terminated at Opalocka. HRD participants were: Hugh Willoughby, Peter Dodge, Sim Aberson, Steve Feuer, Jim Lawrence (Univ. of Houston) and Sharanya Majumdar (Penn. State). The objective was to fly a six-sided pattern just below the melting level, deploying 3 dropsondes, along with AXBTs, on each 300 nmi radial leg. These data combined with flight-level data from TEAL 984, which was scheduled to leave the storm at 1730 UT, TEAL 977, which was scheduled to arrive at 2300 UT, and NASA 917 (the DC8), which was flying a similar pattern at 35-37 Kft simultaneously and also deploying dropsondes, was intended to document the storm's structure and dynamics as a less comprehensive follow-on to the Vortex Motion and Evolution Experiment conducted on the previous day. The mission was also designed to provide lower tropospheric validation for remote sensors aboard the DC8.

**Operations:** N42RF took off from Opalocka at 1837 UT on 30AUG98, arrived at the initial point of the pattern at 1955 UT, and flew toward the center at 5890 m from the SSW on a nominal 030 track. We attempted 3 drops at point 1, all of which failed because of a blown fuse on the preamplifier for the dropsonde receiver's antenna. The second sounding, 100 nmi farther along the track after we found and repaired the fuse, was good. It was very dry above a strong dewpoint inversion in the lower troposphere. As we approached the center, the eye appeared on radar to be irregular with an eyewall composed of bands wrapping around it. We reached the center (32-08N, 71-08W) at 2102, where we deployed two sondes, one at the flight level center and the other at our best estimate of the surface center. The observed profiles differed significantly. The splash pressures were 986 and 989 mb. We continued on the 030 track to point 3, 300 nmi NNE of the eye, where we turned westward. SST measured at the turn point was 28.3, compared with 26.3 100 nmi outward from the eye. The circulation was so small that we had only about 10 kt of tail wind on the westward leg. At this point we became concerned about fuel and decided to shorten the southeast legs.

We reached point 4, 300 nmi NNW of the eye, and turned toward the center on a nominal 150 track. Earlier, during the initial approach to the eye, we had discovered that the time on HAPS was incorrect. After numerous attempts to reset it, we received CARCAH's concurrence to send TEMP DROP messages with erroneous date-time groups. On the second approach to the eye we again observed 26C SST 100 nmi NW of the center. N42RF reached the center (27-56N, 74-15W) at 0031 UT on the 31AUG98, passed through without dropping sondes, and continued on the 150 track to relocated point 5, 250 nmi SSE of the center. Then we turned to a nominal 030 track to relocated point 6, 250 nmi E of the center. We had only 10 kt of tail wind on this leg as well. SSTs were 27.6 and 28.5C 250 nmi SSE and E of the center respectively.

The final pass across the center was from East to West. On radar, the eye appeared to be much more circular and regular. We deployed two GPS sondes in rapid succession at the flight level center (28-15N, 72-30W) at 0319 UT. Stan Czyzyk, the flight director, was in superb form. Both sondes fell at the axis of rotation. The soundings and splash pressures were essentially identical. If one accepts 986 mb as the correct surface pressure on the initial pass, the pressure had fallen 6 mb to 980 in 6.25 h. A hundred nmi west of the center, an AXBT reported 29.2C SST (perhaps unreliable). The final point and last dropsonde was moved 275 mni west of the center to avoid dropping over land at 0422 on 31AUG98. N42RF recovered at Opalocka at 0503 UT on 31AUG98, 10h 06m duration.

**Equipment:** There were three principal equipment problems: 1) The blown fuse in the dropsonde receiver preamp, which probably should have been diagnosed before we expended three dropsondes. 2) Inability to reset the HAPS time without the root password, now corrected. 3) Mistimed launch detects combined with large pressure offsets on more than half of the drops. Of the 24 sondes deployed only the first 3 failed outright and the last had no winds.

**Critique:** This mission provides an invaluable follow on to the full Vortex Motion and Evolution mission on the previous day. It captures the end of Danielle's weakening trend and the beginning of the intensification that continued on the next day. A possible cause of this change is motion over warmer SSTs.



980830H

XCDX



4

3

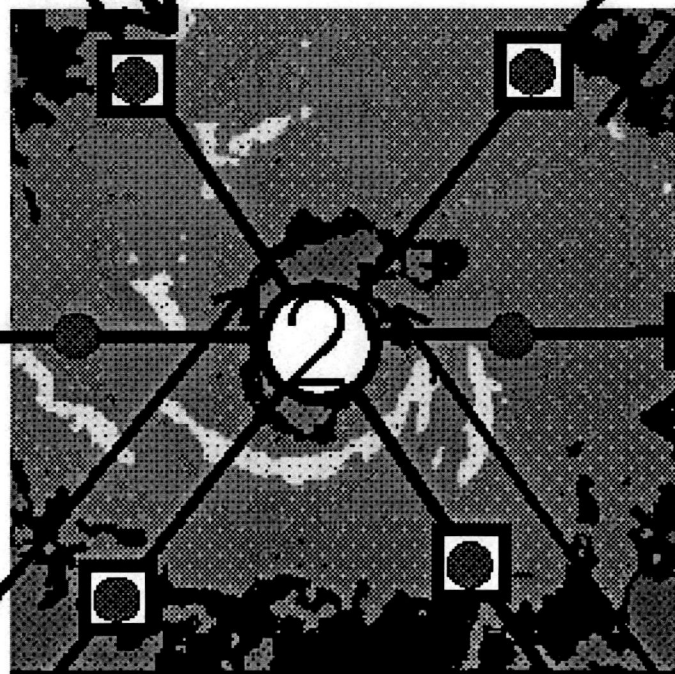
● DROP

□ AXBT

Drop & BT at turns

7

IND



2

300 nmI

250 nmI

Double drops in the eye  
first and last time through

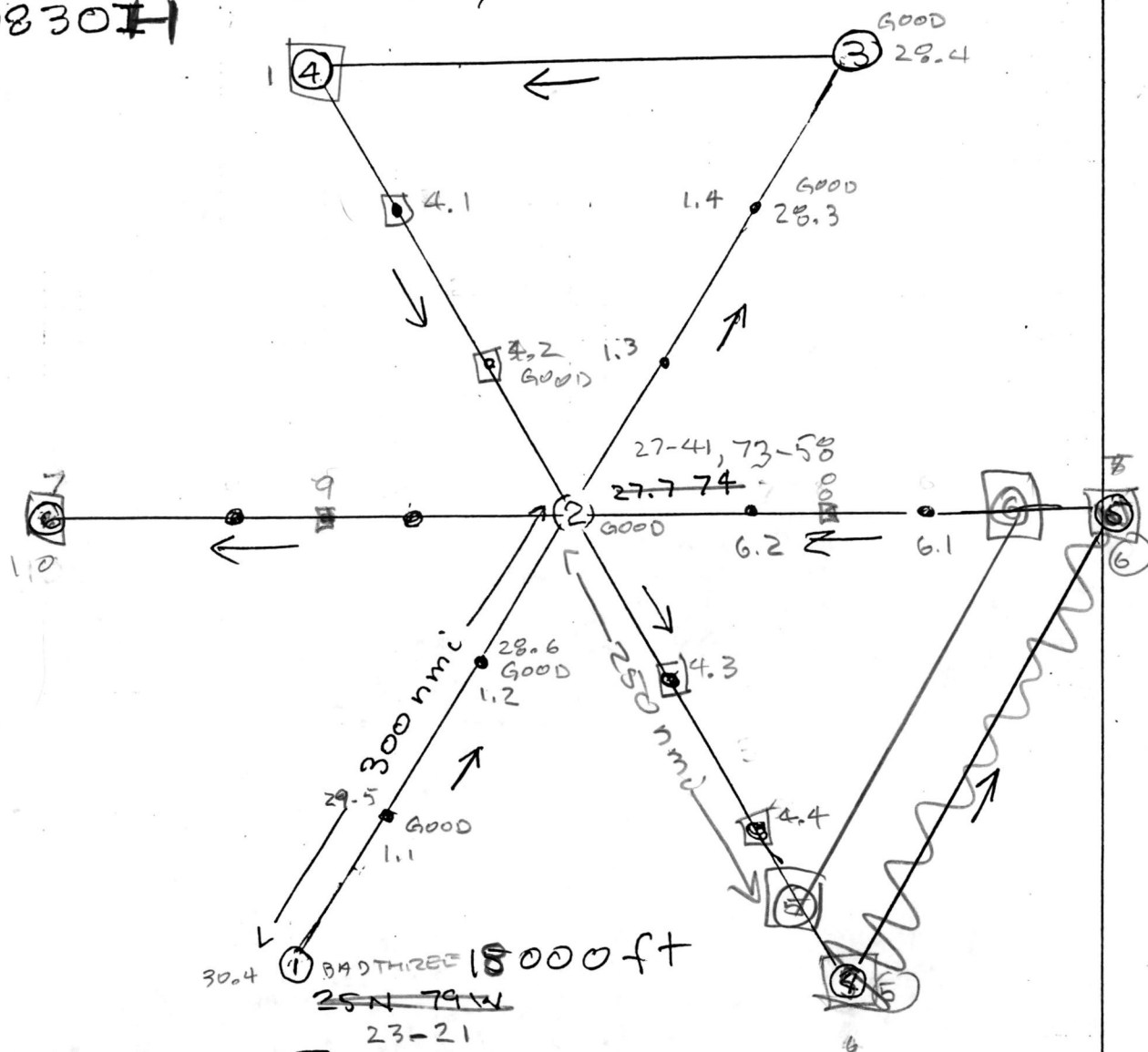
1

IP

5

TEAL 33 / 237

980830H



● DROP 3 BT 76-50

POSSIBLE 2 DROPS IN EYE FIRST  
AND LAST TIME THROUGH

200-04  
14-1a

## **E.2 Lead Project Scientist (On-Board)**

### **E.2.1 Preflight**

- ☒ 1. Participate in general mission briefing.
- ☒ 2. Determine specific mission and flight requirements for assigned aircraft.
- ☒ 3. Determine from CARCAH or field program director whether aircraft has operational fix responsibility and discuss with AOC flight director/meteorologist and CARCAH unless briefed otherwise by field program director.
- ☒ 4. Contact HRD members of crew to:
  - a. Assure availability for mission.
  - b. Arrange ground transportation schedule when deployed.
  - c. Determine equipment status.
- ☒ 5. Meet with AOC flight crew at least 90 minutes before takeoff, provide copies of flight requirements, and provide a formal briefing for the flight director, navigator, and pilots.
- ☒ 6. Report status of aircraft, systems, necessary on-board supplies and crews to appropriate HRD operations center (MGOC in Miami or FGOC at remote recovery location).

### **E.2.2 In-Flight**

- ☒ 1. Confirm from AOC flight director that satellite data link is operative (information).
- ☒ 2. Confirm camera mode of operation.
- ☒ 3. Confirm data recording rate.
- ☒ 4. Complete Form E-2.

### **E.2.3 Postflight**

- ☒ 1. Debrief scientific crew.
- ☒ 2. Report landing time, aircraft, crew, and mission status along with supplies (tapes, etc.) remaining aboard the aircraft to the appropriate HRD operations center (MGOC or FGOC).
- ☒ 3. Gather completed forms for mission and turn in at the appropriate operations center. [Note: all data removed from the aircraft by HRD personnel should be cleared with the AOC flight director.]
- ☒ 4. Obtain a copy of the 10-s flight listing from the AOC flight director. Turn in with completed forms.
- ☒ 5. Determine next mission status, if any, and brief crews as necessary.
- ☒ 6. Notify the appropriate operations center (FGOC or MGOC) as to where you can be contacted and arrange for any further coordination required.
- ☒ 7. Prepare written mission summary.

### On-Board Lead Project Scientist Check List

Date 30 AUG 98 Aircraft N422F Flight ID 980830H

DANIELLE

**A. Participants:**

HRD		AOC	
Function	Participant	Function	Participant
Lead Project Scientist	<u>WILLOUGHBY</u>	Flight Director	<u>CZYZYK</u>
Cloud Physics		Pilots	<u>PHILIPBORNIC</u> <u>KENEL/OMADA</u>
Radar	<u>DO</u>	Navigator	<u>RATHBURN</u>
Workstation	<u>DODGE</u>	Systems Engineer	<u>MCILLAN</u>
Photographer/Observer	<u>LAWTENE/MAJUMDAR</u>	Data Technician	
Omegasonde	<u>ABERON</u>	BT/GPS	
Electronics Technician		Electronics Technician	<u>BARZ</u>
AXBT/AXCP/Guest	<u>FEVER</u>	Other	<u>RADAR</u> <u>SMITH</u>

Take-Off: 30/1857Z Location: OPF

Landing: \_\_\_\_\_ Location: \_\_\_\_\_ Number of Eye Penetrations: \_\_\_\_\_

**B. Past and Forecast Storm Locations:**

Date/Time	Latitude	Longitude	MSLP	Maximum Wind

**C. Mission Briefing:**

FLY 6-SIDED PATTERN AT 15 Kft. APS  
DZOPS AND BTs EVERY 100 nmi ON 300  
nmi LEGS

**D. Equipment Status** (Up, Down, Not Available, Not Used)

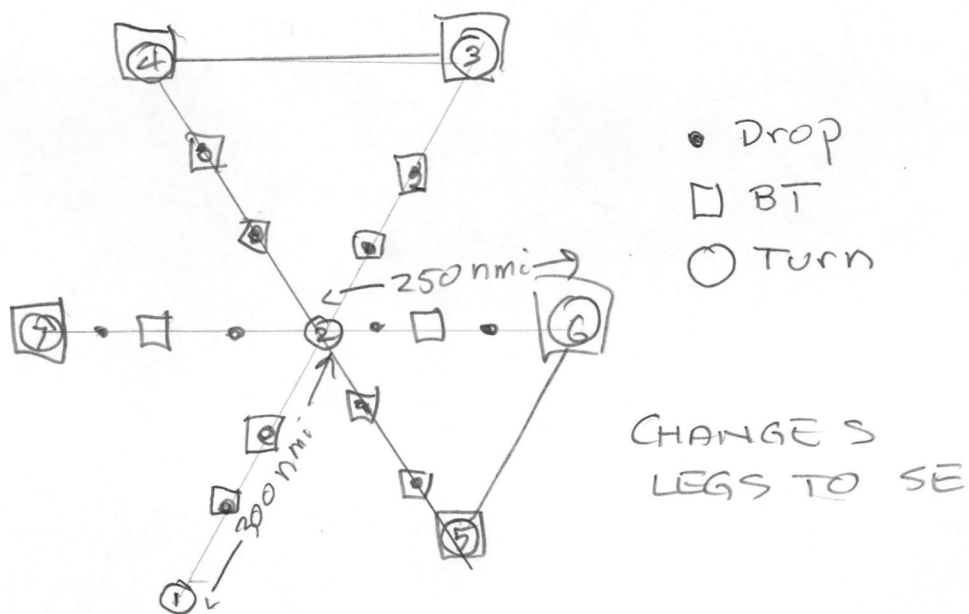
Equipment	Pre-Flight	In-Flight	Post-Flight
Aircraft	↑	same	same
Radar/LF	↑		
Radar/TA (Doppler)	↑		
Cloud Physics	↑		
Data System	↑		
GPS Omegasondes	↑		
AXBT/AXCP	↑		
Workstation	↑		
Videography	↑		

REMARKS: ① Blown fuse on dropsonde receiver, repaired in flight

② Times wrong on heps, could not reset in flight. Transmitted TEMP-DROP with incorrect DTG.

**E. (I) Proposed Flight Pattern (sketch or designate by number)**  
SEE ATTACHED SKETCH

**E. (II) Actual Flight Pattern**





# Lead Project Scientist Event Log

1 of 2

Date 30 AUG 98

Flight 980830N

LPS WILLIUGHBY

TURN OFF,

Time	Event	Position	Comments
30/1857	T/O	1KOPF	
1955	DROP ①, BT	23-21 76-50	TWO DROPS BAD TRAK 030 → ⑤ BT OK SST 30.4
2007	ANOTHER TRY AT DROP ①	24-13 76-18	NO SIGNAL, BLOWN FUSE IN PREAMP
2017	DROP 1.1, BT	24-51 75-54	LOOKS GOOD, IS GOOD SST 29.5
2039	DROP 1.2, BT	26-16, 74-59	GOOD SST 28.6
2054		35 MILES OUT	APPROACHING EYE OPEN TO SW
2102	② eye drop FL	27-41 73-58 986	43 EXTRAP 985
2104	③ eye SEC??	27-47 74-04 989 090/23	TRAK 030 ③ → ③
2131	DROP 1.4 BT	29-13 73-02	SST 26.3
2154	DROP 1.5 BT	30-40 72-02	GOOD SST 28.3
2216	③	32-08 71-08	TRAK 270 → ④ ST 28.4
2325	④ DROP BT	32-06 77-19	GOOD BT FAIL
2351			REBOOTED HAPS TIME STILL BAD
2353	4.1 DROP	30-14 75-55	GOOD SST 29.0
0010	DROP 4.2 BT	29-16 75-14	GOOD SST 28.4
0031	⑤	27-56 74-15	TRAK ⑤ → 150
0054	DROP 4.3 BT	26-26 73-16	GOOD SST 27.7
0116	DROP 4.4	25-03 72-19	NO BT
0130	DROP ⑤	24-20 71-43	GOOD SST 27.6
0224	DROP ⑥ BT	28-13 69-34	GOOD SST 28.5
0236	DROP 6.1	28-15 70-34	

\* CARCAH WANTS SONDES WITH BAD TIMES

NASA 982

OUTER BAND VIS

5 m/s UPDRAFT -3 m/s

TIME BAD ON WIKSTA

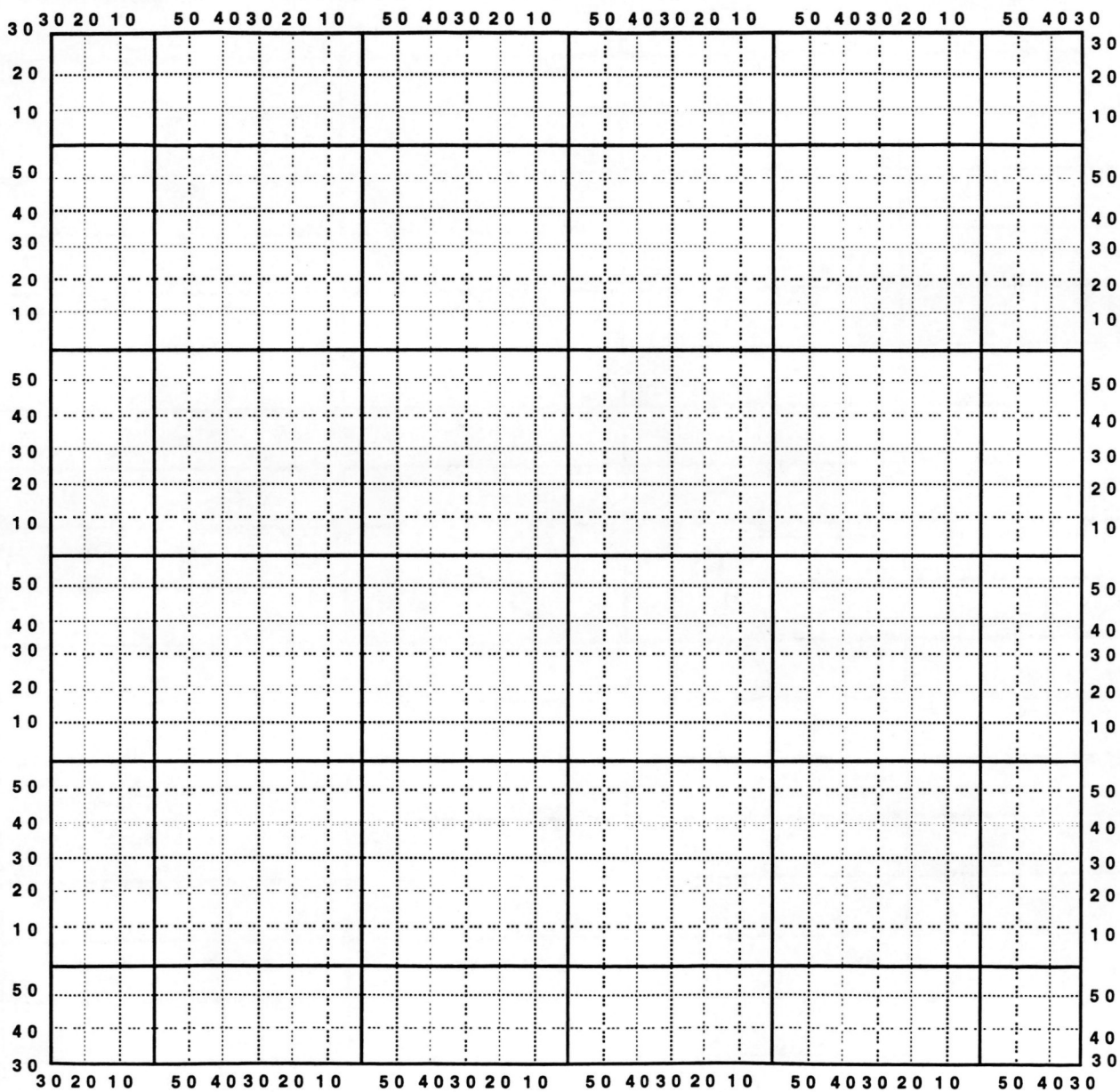
\*

7.7 m/s ↑

# Hurricane Recco Plotting Chart

True at 25° Latitude, in Degrees and Minutes

Date \_\_\_\_\_ Flight ID \_\_\_\_\_ LPS \_\_\_\_\_



**Note :** Label full degrees according<sup>a</sup> to location of the flight area.

2 of 2

LPS WILLOWSBY

[illegible]

{ identical

$$\begin{array}{r} 8 \\ 2903 \\ 1057 \\ \hline 10406^m \end{array}$$
$$\begin{array}{r} 79-39 \\ 74 \quad 21 \\ \hline 510 \end{array}$$

● ● ●

Date \_\_\_\_\_

Flight \_\_\_\_\_

LPS \_\_\_\_\_

1

### Lead Project Scientist Event Log

Date \_\_\_\_\_ Flight \_\_\_\_\_ LPS \_\_\_\_\_

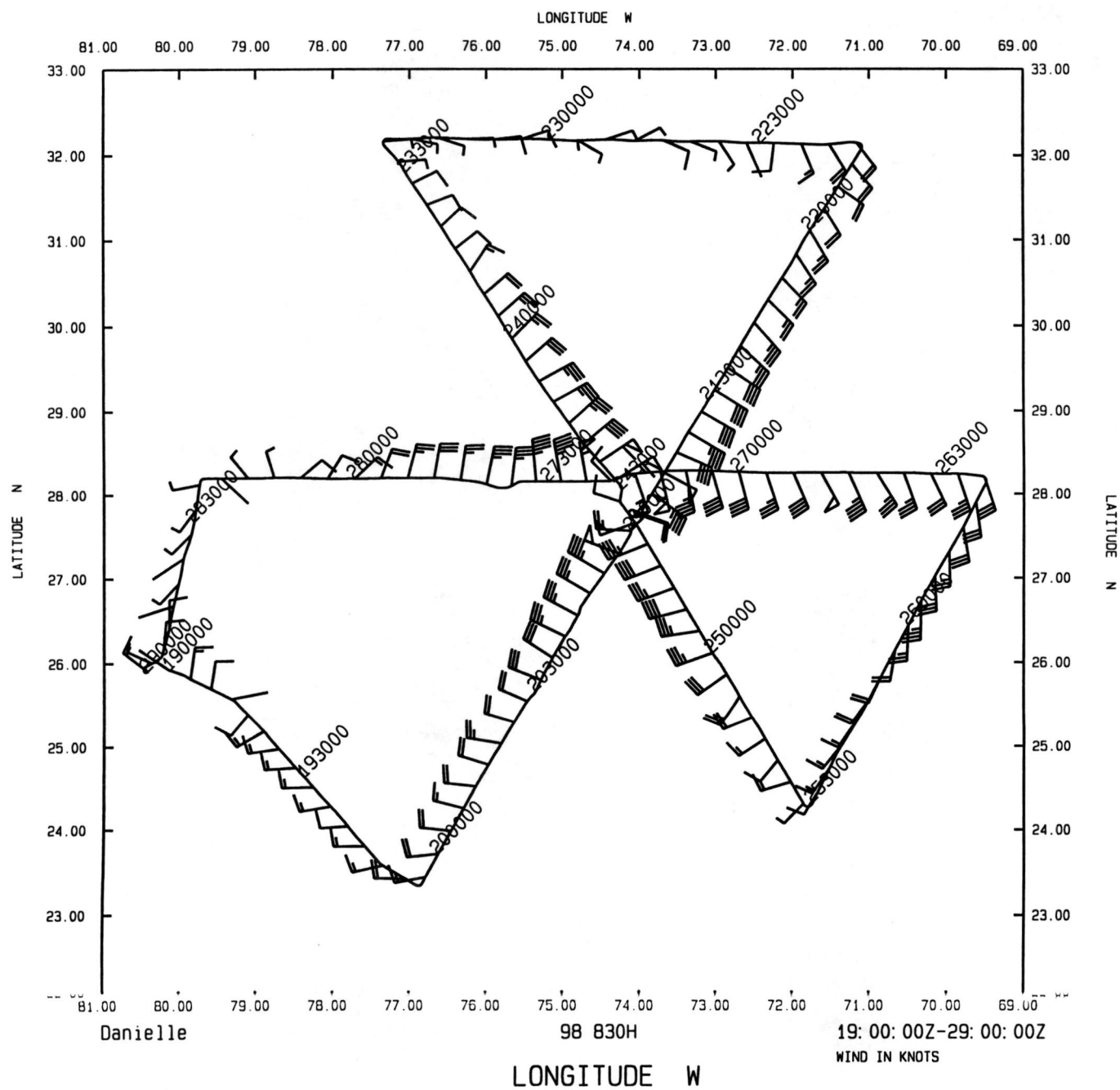
[illegible]

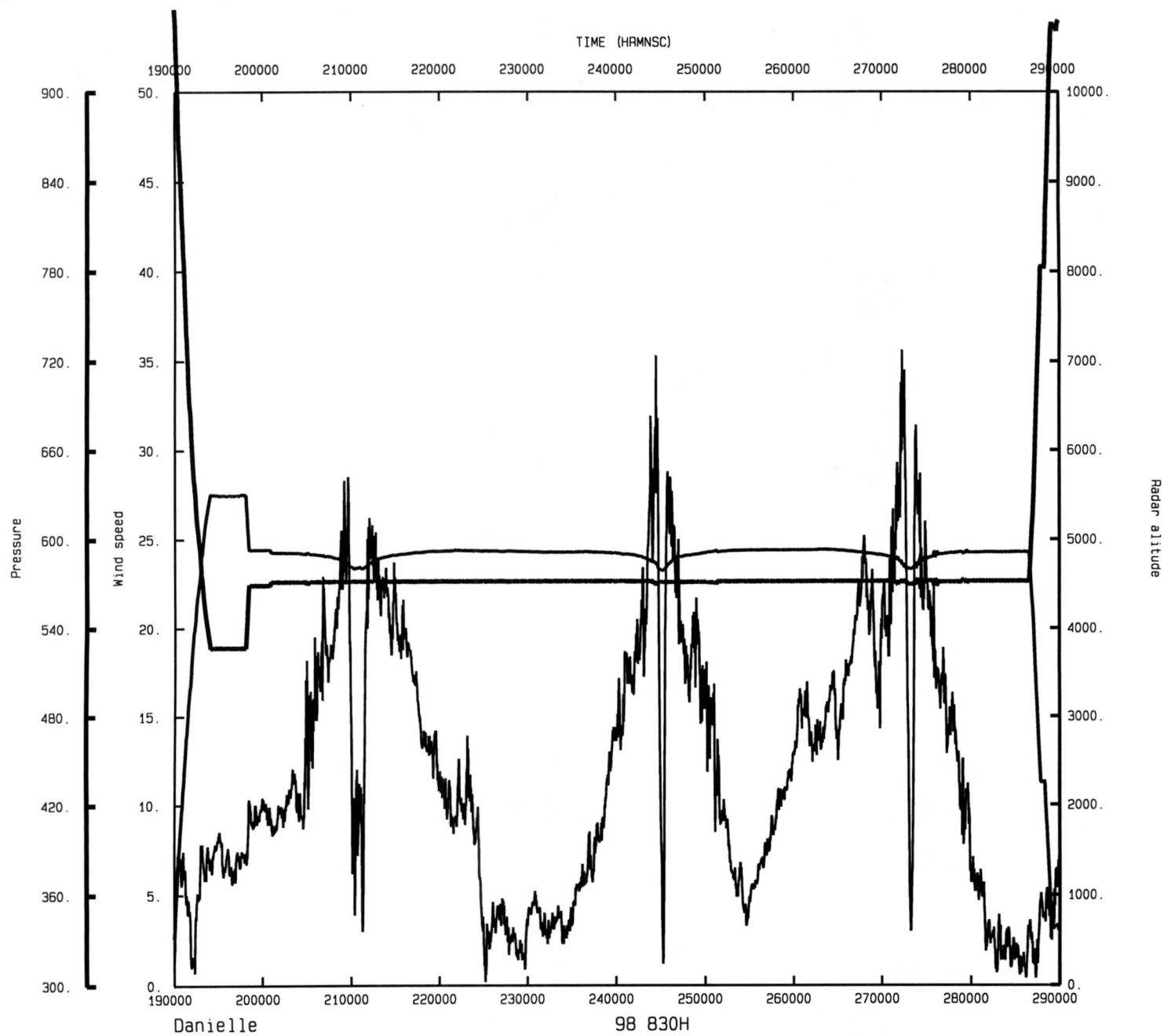


True at 25° Latitude, in Degrees and Minutes

**Note : Label full degrees according to location of the flight area.**







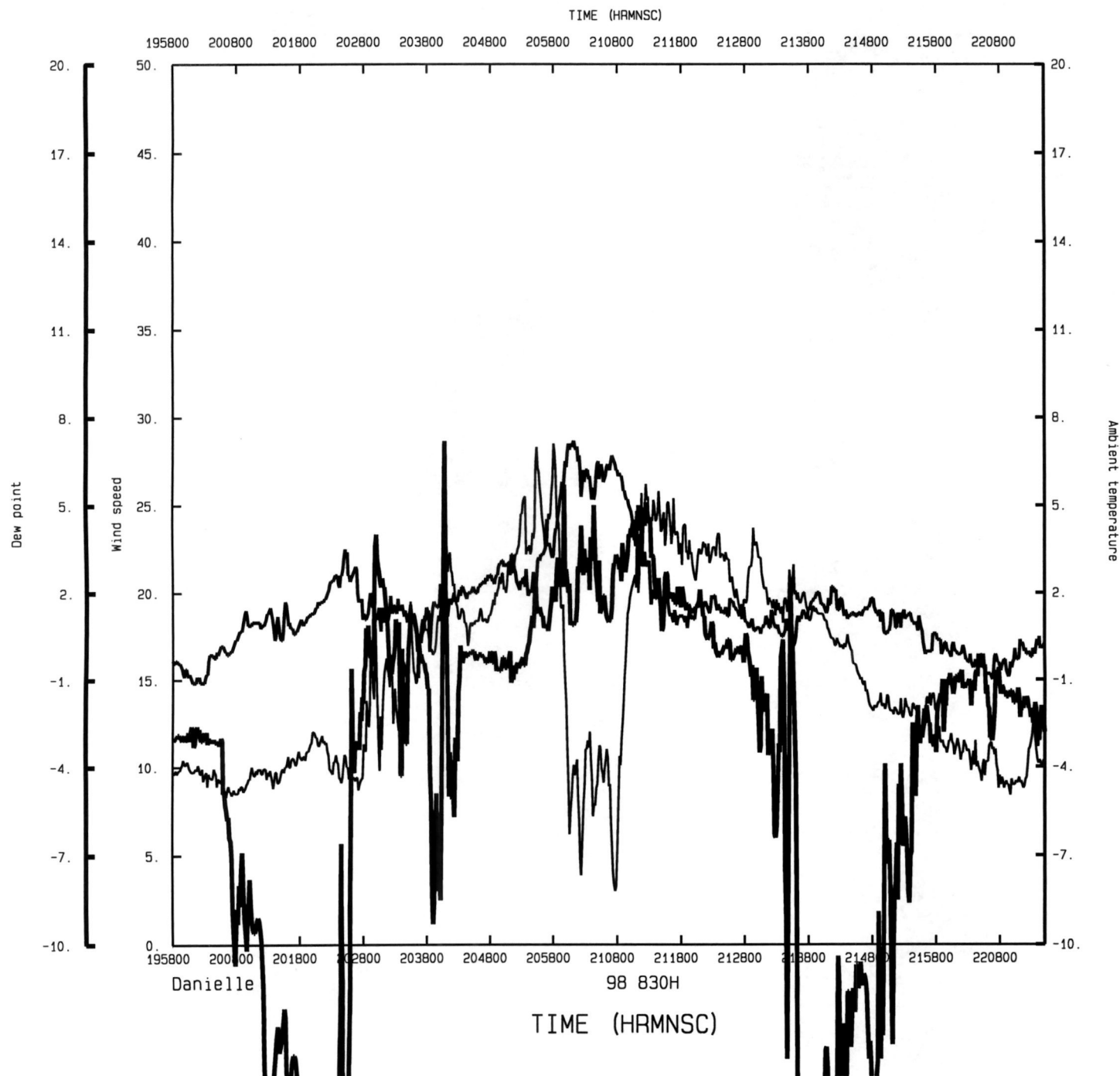
Danielle

98 830H

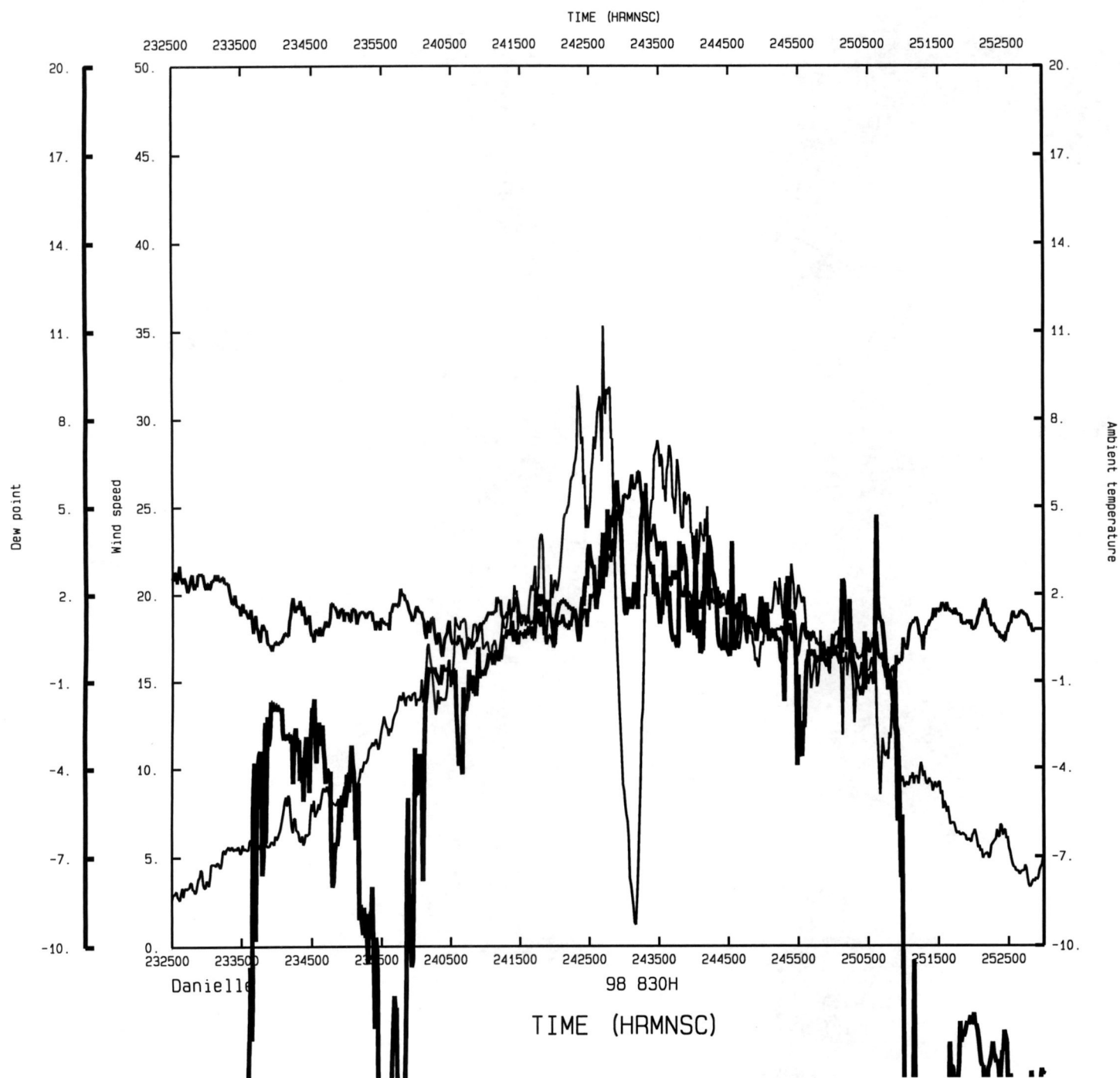
TIME (HRMNSC)



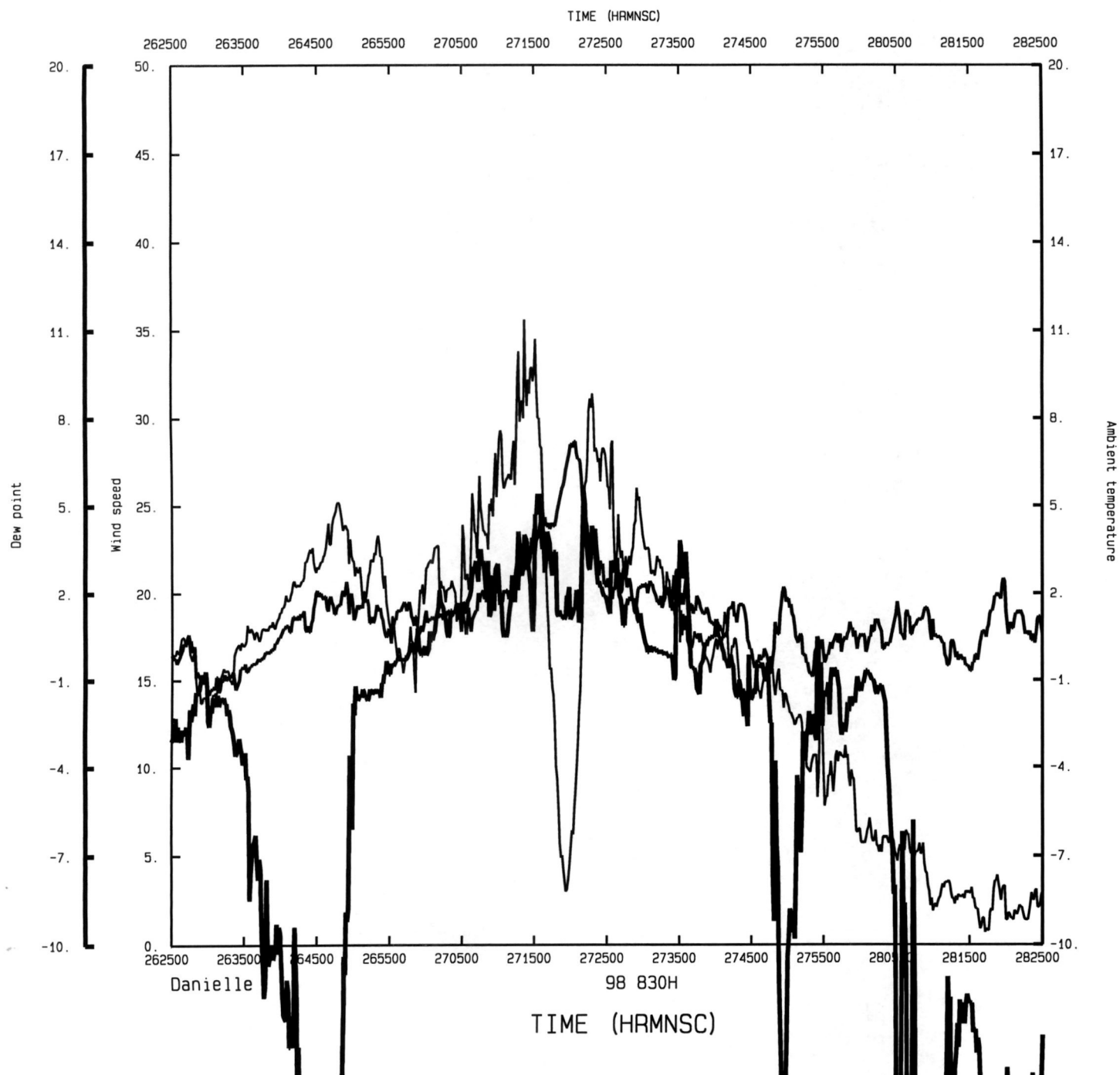
NOAA/HRD



NOAA/HRD



NOAA/HRD



NOAA/HRD