Mission Summary
Danielle
980829I Aircraft 43RF

Scientific Crew (43RF)

Lead Project Scientist _____ Frank Marks
Radar Scientist _____ Neal Dorst
Cloud Physics Scientist _____ Chris Landsea
Dropwindsonde Scientist_____ Sim Aberson
WARDS Scientist_____ Peter Hildebrand
Workstation Scientist_____ Paul Leighton

Mission Briefing:

At 2000 UTC on 29 August Hurricane Danielle was projected to be a 25.5 N and 71 W, moving WNW at 11 kts. We briefed the N43RF crew for the Vortex Motion and Evolution Experiment (p. 19 in HFP) with a take off at 1800 UTC from Opa Locka in Miami. The initial point (IP) in the pattern was 160 nm SSW of the center. Flight-level was planned to start at 18,000 ft outside 50 nm radius from the center, climbing as high as possible throughout the mission. Inside 50 nm radius flight level would be 16,000 ft to avoid p-static effecting the GPS-sonde antenna.

Mission Synopsis::

Take off occurred at 1820 UTC and we proceeded to the IP (2005 UTC). Radar revealed that Danielle was trying to form an eyewall with a radius of 25 nm. The developing eyewall was on the SE corner of a large hook shaped principal rainband curving around the center from 200 nm SE of the center through 150 nm N of the center to 50 nm NW of the center. The principal band contained active convective cells all along its length. Initially, the eyewall was characterized by an opening to the NW, with a large anvil over the inner 50 nm radius. Scatterers were confined to the convection SW, S, SE, and E of the center at all levels and at low and high levels to the NW. During the mission the NE corner of the developing eyewall slowly wrapped around the center, and by the last pass through the center convection was growing all around the center.

The first coordinated dual-Doppler pattern was from 2029-2130 UTC. N43RF ran the Doppler radar with single PRF (1600) scanning perpendicular to the track on all of the radial legs to produce an EVTD analysis, while N42RF ran the Doppler radar in dual-PRF (2100/1400) and F/AST on all legs. The EVTD was completed showing over 80 kt winds at 1 km in the NW side of the storm and transmitted for the first time back to NHC (it was received and given to the hurricane specialist). The center at 1 km altitude was found WNW of the flight level center at 16,000 ft. Peak winds of 70 kts were found at flight level in the SE quadrant. The EVTD-derived hodograph showed the storm was embedded in a flow with a low-level (600-850 mb) E jet with mean winds of 10 kts. The hodograph showed the winds dropped off both above and below these levels.

The second coordinated dual-Doppler pattern was from 2252-2344 UTC. On this Fig-4 N42RF ran their Doppler radar with single PRF (1600) scanning perpendicular to the track on all of the radial legs to produce an EVTD analysis, while N43RF ran the Doppler radar in dual-PRF (1600/1050) and F/AST on all legs. N42RF ran an EVTD and successfully transmitted their first analysis to NHC. Again the center at the surface was found WNW of the flight-level center at 16,000 ft. Peak winds of 70 kts were found at flight level in the SE quadrant. At the end of the outbound leg 160 nm N of the storm the radar system crashed taking 9 min to be restarted. Fortunately, very little scatterers were present in this part of the pattern and no data was lost.

The third coordinated dual-Doppler pattern was from 0105-0201 UTC. As on the last coordinated Fig-4 N42RF ran their Doppler radar with single PRF (1600) scanning perpendicular to the track on all of the radial legs to produce an EVTD analysis, while N43RF ran the Doppler radar in dual-PRF (1600/1050) and F/AST on all legs. The first leg was very well coordinated with both planes passing through the eye at the same time (visual confirmation), and 3-min after the AFRES WC-130 and 1-min after the NASA DC-8. The second leg was not as well coordinated as N42RF cut their downwind leg short to avoid intense convection, thereby getting to the center 5 min ahead of us.

AXBTs on the first leg showed peak SST 160 nm WSW of the center of 28.2°, remaining above 27° through the center to 50 nm NE of the center. The coldest SST was 25.7° 160 nm SSE of the center in the wake of both Bonnie and Danielle. SSTs in the precipitation within 100 nm E of the center were typically hovering near 26-26.5°, while SSTs 160 nm N of the center were over 28°.

We had one GPS-sonde failure out of 38 total drops on the 75 nm ring E of the center inbound to the second coordinated Fig-4. We also had one bad AXBT at the 100 nm ring on the same leg and another at the 100 nm ring W of the center.

We had 6 penetrations.

Evaluation:

Overall the experiment went very well as we completed the whole pattern as planned. With the addition of the DC-8 dropsondes from 35,000 ft in the core and the presence of the G-IV dropsondes surrounding the storm, this data set should provide an unprecedented data set to match the inner vortex onto it environment for use in studies of vortex interaction. The presence of the DC-8 dropsonde thermodynamic data will provide an excellent opportunity to derive the potential vorticity structure of the vortex. The evolution of the eyewall as it formed during the mission, combined with the missions the next day should provide an excellent opportunity to study the vortex evolution.

The coordination with N42RF was pretty good during the coordinated dual-Doppler legs in the core. We typically passed through the center within 1 min of N42RF. On the next to last leg we passed though the eye at the same time as N42RF, 2 min after the AFRES WC-130 and 1 min after the NASA DC-8. The worst coordination occurred on the last leg when N42RF crossed the eye 5 min ahead of us. The GPS sondes performed very well, with only one complete sonde failure out of 38 total drops. 3-4 other dropsondes had partial failures. The radar data system also performed well, with only one outage along the downwind leg 160 nm N of the center, where we had no scatterers. The AXBTs also worked real well with 13 good sondes out of 15 total.

Problems:

Most of the data systems worked very well. We did have a few problems:

1) 2D-P was not working for almost the whole flight. 2D-C was very noisy for most of the flight, but did seem to be getting some good images.

2) Radar system crashed at 0011 UTC and was down for 22 min while we were traversing downwind 160 nm N of the storm. However, no significant data was lost as there were few scatterers.

3) Two AXBTs failed: one had no launch signal and the second had no data.

4) One total failure of the GPS sondes (D16). 3-4 had partial winds in the boundary layer.

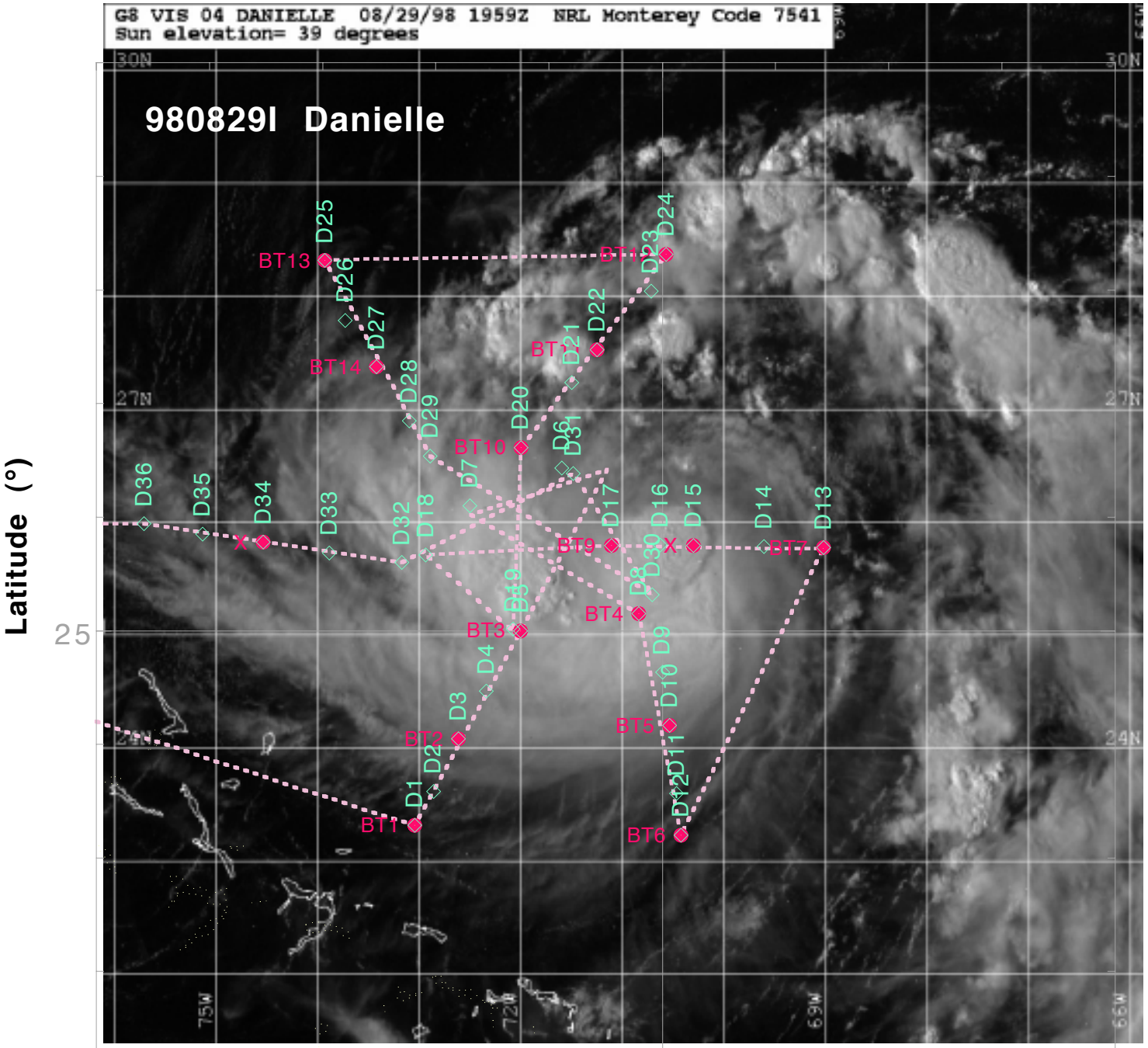
Frank Marks
3 September 1998

Dropwindsonde Log

Location	Time (UTC)	Latitude (°)	Longitude (°)	Comment
D1	29:20:08:45.0	23.286	-72.186	
D2	29:20:12:44.0	23.586	-72.022	
D3	29:20:18:35.0	24.050	-71.800	
D4	29:20:25:00.0	24.467	-71.552	
D5	29:20:29:20.0	25.000	-71.252	
D6	29:20:54:26.0	26.433	-70.886	
D7	29:21:07:20.0	26.100	-71.700	
EYE	29:21:18:20.0	25.710	-70.930	
D8	29:21:30:20.0	25.151	-70.206	
D9	29:21:38:55.0	24.633	-70.000	
D10	29:21:46:30.0	24.167	-69.933	
D11	29:21:53:07.0	23.567	-69.875	
D12	29:21:59:50.0	23.200	-69.833	
D13	29:22:29:55.0	25.733	-68.576	
D14	29:22:36:45.0	25.741	-69.100	
D15	29:22:43:20.0	25.750	-69.725	
D16	29:22:47:38.0	25.756	-70.016	failure
D17	29:22:51:49.0	25.751	-70.450	
D18	29:23:12:32.0	25.666	-72.090	
D19	29:23:24:45.0	25.016	-71.316	
D20	29:23:44:15.0	26.615	-71.250	
D21	29:23:53:17.0	27.185	-70.800	
D22	29:23:57:30.0	27.475	-70.575	
D23	30:00:05:58.0	27.990	-70.100	
D24	30:00:11:37.0	28.316	-69.966	
D25	30:00:43:15.0	28.260	-72.980	
D26	30:00:48:30.0	27.733	-72.800	
D27	30:00:54:15.0	27.325	-72.525	
D28	30:01:00:40.0	26.850	-72.233	
D29	30:01:05:00.0	26.540	-72.051	
D30	30:01:26:39.0	25.316	-70.090	
D31	30:01:40:22.0	26.386	-70.786	
EYE	30:01:50:15.0	26.050	-71.515	
D32	30:02:02:18.0	25.600	-72.300	
D33	30:02:08:38.0	25.686	-72.940	
D34	30:02:15:45.0	25.780	-73.525	
D35	30:02:21:45.0	25.850	-74.060	
D36	30:02:27:35.0	25.941	-74.580	

AXBT Log

location	Time (UTC)	Latitude (°)	Longitude(°)	SST	Comment
BT1	29:20:08:45.0	23.286	-72.186	28.200	
BT2	29:20:18:35.0	24.050	-71.800	27.000	
BT3	29:20:29:20.0	25.000	-71.252	27.200	
BT4	29:21:30:20.0	25.151	-70.206	27.300	
BT5	29:21:46:30.0	24.167	-69.933	27.200	
BT6	29:21:59:50.0	23.200	-69.833	25.700	
BT7	29:22:29:55.0	25.733	-68.576	28.300	
BT8	29:22:43:20.0	25.750	-69.725		failure
BT9	29:22:51:49.0	25.751	-70.450	26.300	
BT10	29:23:44:15.0	26.615	-71.250	26.200	
BT11	29:23:57:30.0	27.475	-70.575	28.200	
BT12	30:00:11:37.0	28.316	-69.966	28.500	
BT13	30:00:43:15.0	28.260	-72.980	26.100	
BT14	30:00:54:15.0	27.325	-72.525	26.900	
BT15	30:02:15:45.0	25.780	-73.525		failure


G8 VIS 04 DANIELLE 08/29/98 1959Z NRL Monterey Code 7541
Sun elevation= 39 degrees
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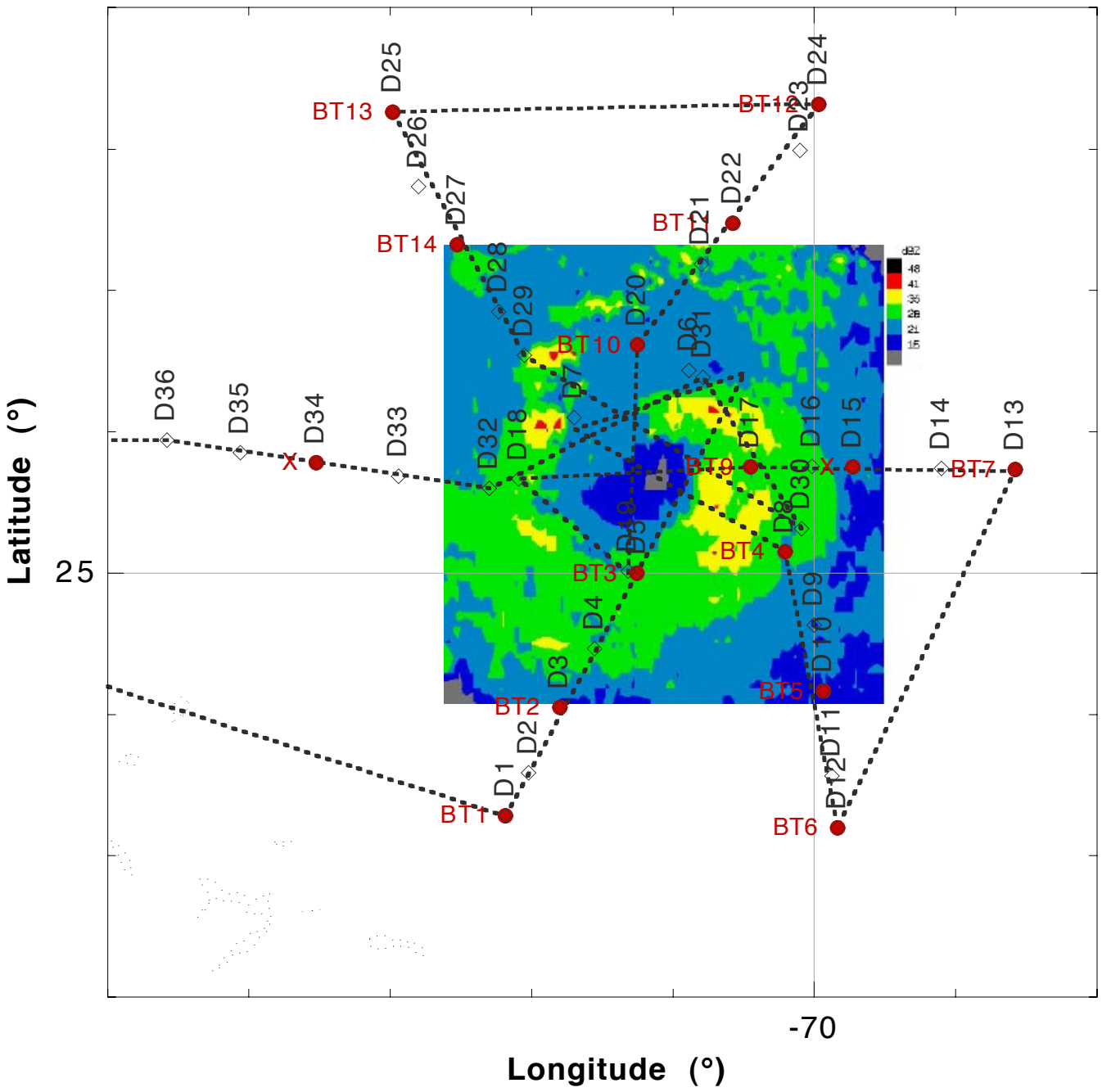
Longitude (°)


980829l Danielle
Latitude (°)
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