Mission Summary
Bonnie
980826H Aircraft 42RF

Scientific Crew (42RF)

Lead Project Scientist _____ Gary Barnes (U Hawaii)
Radar Scientist _____ Fran k Marks
AXBT Scientist _____ Todd Kimberlin (CSU)
Dropwindsonde Scientist_____ Sim Aberson
Boundary-Layer Scientist___ Derek Wroe (U Hawaii)
Workstation Scientist_____ Paul Leighton

Mission Briefing:

At 1200 UTC on 26 August Hurricane Bonnie was projected to be a 32.5 N and 77.8 W, only 200 nm off the North Carolina coast and moving NNW at 11 kts. We briefed the N42RF crew for the Rainband Thermodynamic Structure Experiment (p. 55 in HFP) with a take off at 1000 UTC from MacDill AFB. The initial point (IP) in the pattern was 100 nm SW of the center (31.3 N, 79.2 W). We planned SW-NE traverse of the center to a point 100 nm NE of the center. From there we planned a spiral inflow pattern starting NE of the storm, passing between rainbands to the eyewall NW of the center. After passing through the center the pattern called for a spiral out to the south and east to a point 100 nm S of the center. After a leg downwind to a point 100 nm E of the center we would repeat this inflow-outflow spiral pattern in the other two quadrants. Each spiral would include 10 GPS sondes and 3 AXBTs roughly evenly spaced. If there was time we would then run tracks towards either Wilmington (KLTX) or Moorehead City (KMHX) WSR-88D radars for dual-Doppler coverage. If N43RF was tasked to fly in the developing disturbance near Cuba we would also fly legs parallel to the coast to map the onshore and offshore winds.

Mission Synopsis:

Take off occurred at 1020 UTC and we did proceed to the initial point. Radar revealed that Bonnie was a concentric system with an inner eyewall with a radius of 15-20 nm. and an outer ring at a radius of 50-55 nm. The inner ring was a weak stratiform semicircle while the outer ring contained vigorous convective scale features, especially on the north and west sides of the hurricane. The first spiral inflow pattern was started to the north of the eye and lengthened in an attempt to capture the complex situation. About 12 GPS sondes were deployed on this first spiral along with three AXBTs. Sondes were dropped in the amorphous eye and the spiral pattern was repeated, this time toward the east and south of the circulation center. Completion of this second spiral (another 14 GPS sondes and 3 AXBTs) placed the aircraft south of the center. A leg was flown north to the eye, then extended to the northwest to near the South Carolina coast. Here the aircraft reversed course and flew a spiral toward the center covering the flow from offshore. Another 12 GPS sondes and 3 AXBTs were deployed. A fourth spiral was then flown toward the east and south of the center, but this part of the pattern was truncated because of numerous GPS sonde failures. The other three spirals met with a much higher success rate with respect to the GPS sondes.

The co-lead project scientists then decided to fly a figure "4" to document the evolution of the slow moving hurricane and leave the coastal monitoring to 43 RF which was now approaching Bonnie. The figure "4" was to place the aircraft roughly north of the center and along a radial from the Morehead City radar to the center of the storm. At the start of this pattern, which was adjacent to a vigorous convective rainband with supercells type signatures, we suffered a problem forcing the shutdown of number four engine. While repairs were effected we dropped a GPS sonde very near one of the strong cells. After the engine was restarted we picked up the figure "4" pattern 80 nm. northeast of the center and tracked into the eye along the Morehead City radar radial. The eye had now undergone significant evolution , taking the form of a "6", with the lower circle of the "6" having a radius of about 30 -40 nm. 80 nm. southwest of the center we turned and tracked towards a point 80 nm. south-southeast of the center along a radial to the eye and Wilmington's radar. As we tracked in from the southeast we noticed another band had formed inside the radius of the old eyewall. We flew over the radar at 12,000 feet, turning in the northwest corner of the eyewall and retraced our pattern to the eye. we exited to the southwest and at 80 nm. climbed to fuel efficent altitude for the ferry back to Macdill AFB. During the figure "4" both GPS sondes and AXBTs were deployed on either side of significant convection.

Evaluation:

Overall the experiment went very well since we completed three spirals into the storm and collected supporting flight level data around Bonnie. The GPS operator did a marvelous job meeting the frequent launch times set by the experiment (every 2-3 minutes). We did lose a fourth spiral due to sonde failures. AOC should receive kudos for solving both a radar and the aforemetioned engine shutdown problem with a minimum of lost time. It is difficult to monitor all the sondes when the operator is busy with baselining and launching at such a frentic pace. We need to devise a way to monitor sonde quality during very demanding situations.

Problems:

Problems include:

(1) numerous GPS failures, especially on the fourth spiral,

(2) a radar reboot needed that lost about 18 minutes of data, and

(3) a faulty engine temperature sensor which forced shutdown of number 4 engine for 10 minutes.

Approximately 13 of 16 AXBTs were successful and 45 of 55 GPS drops were mostly successful. Sondes that started with an ID starting with 97 had the majority of problems.

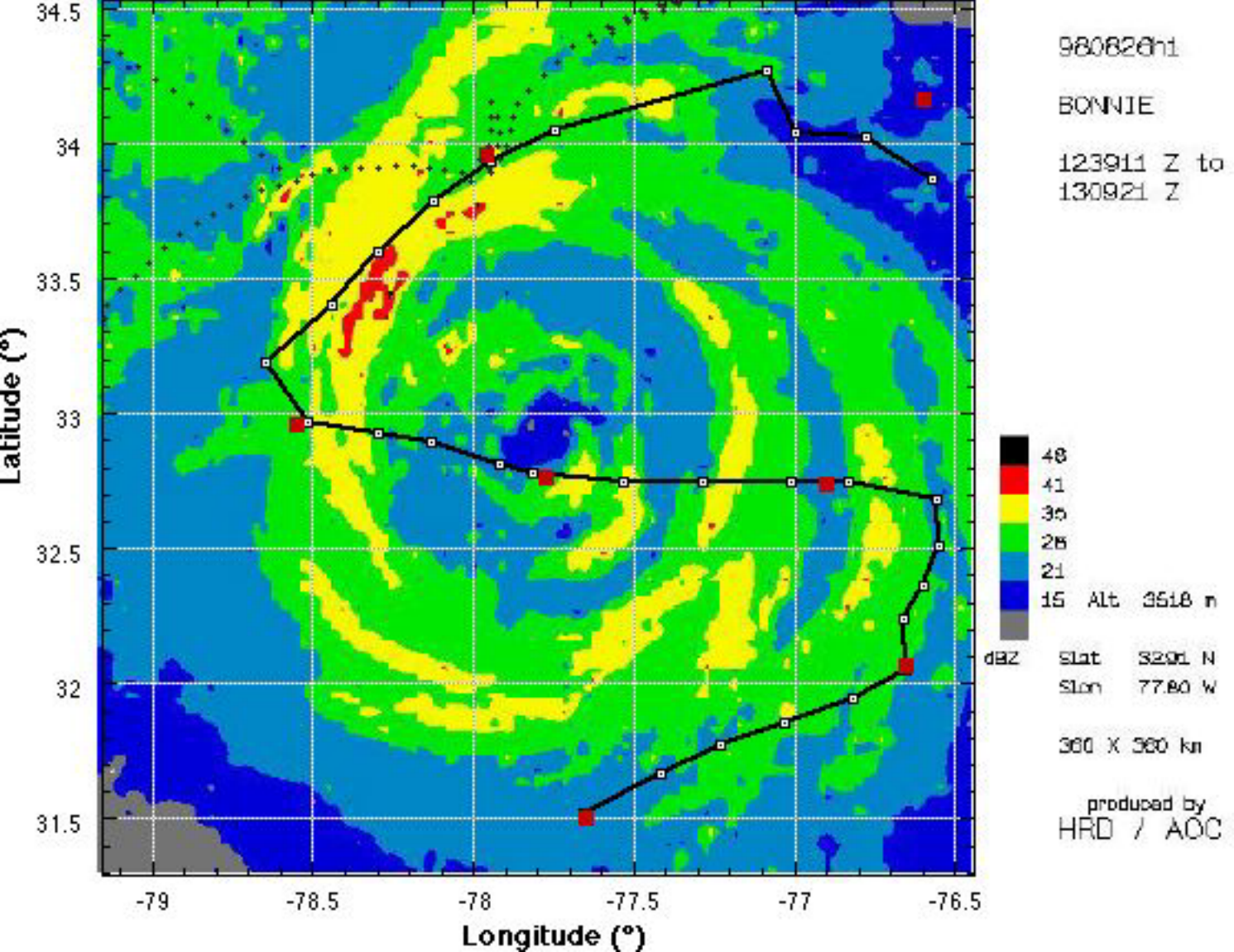
Gary Barnes and Frank Marks
26 August 1998

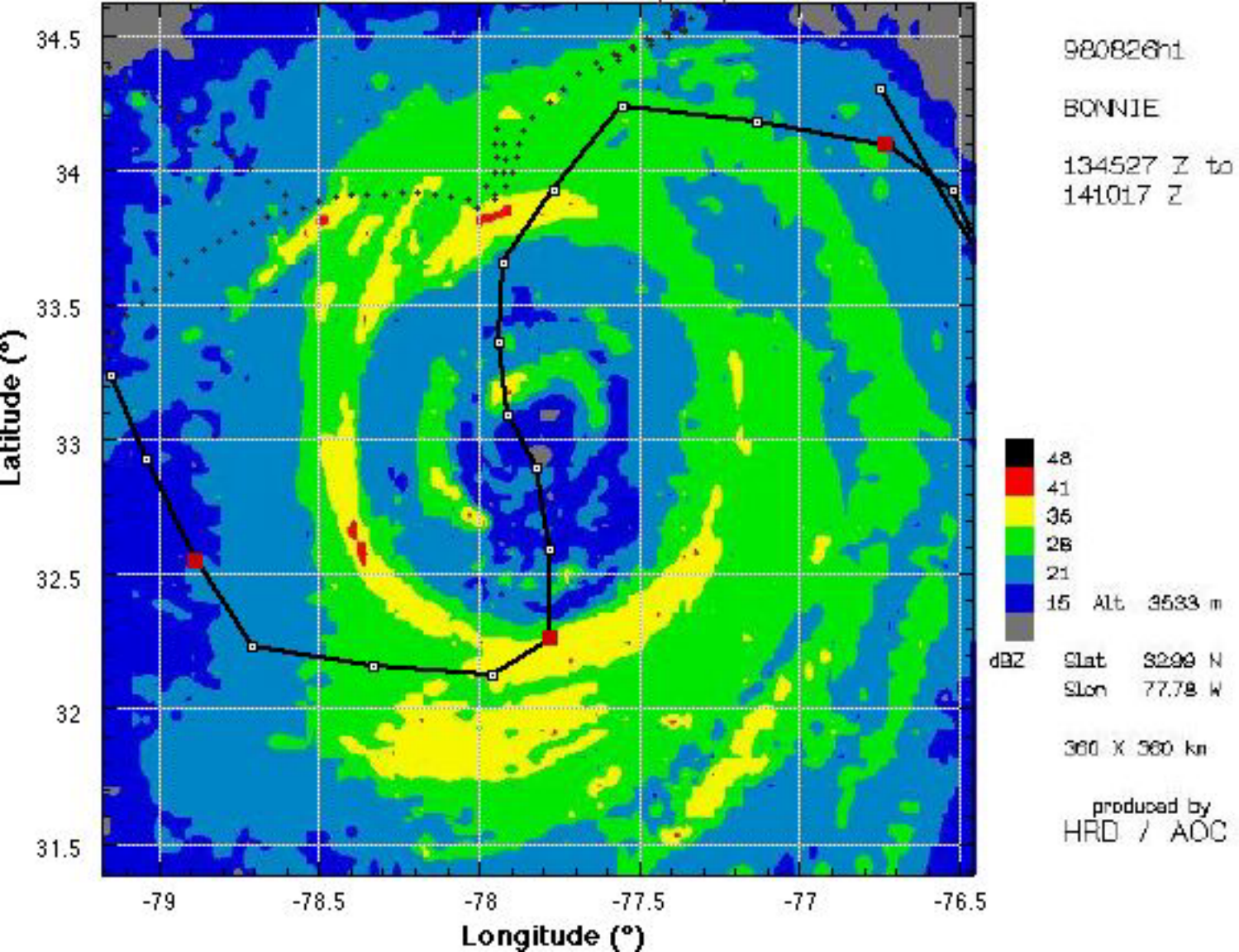
Dropwindsonde Log

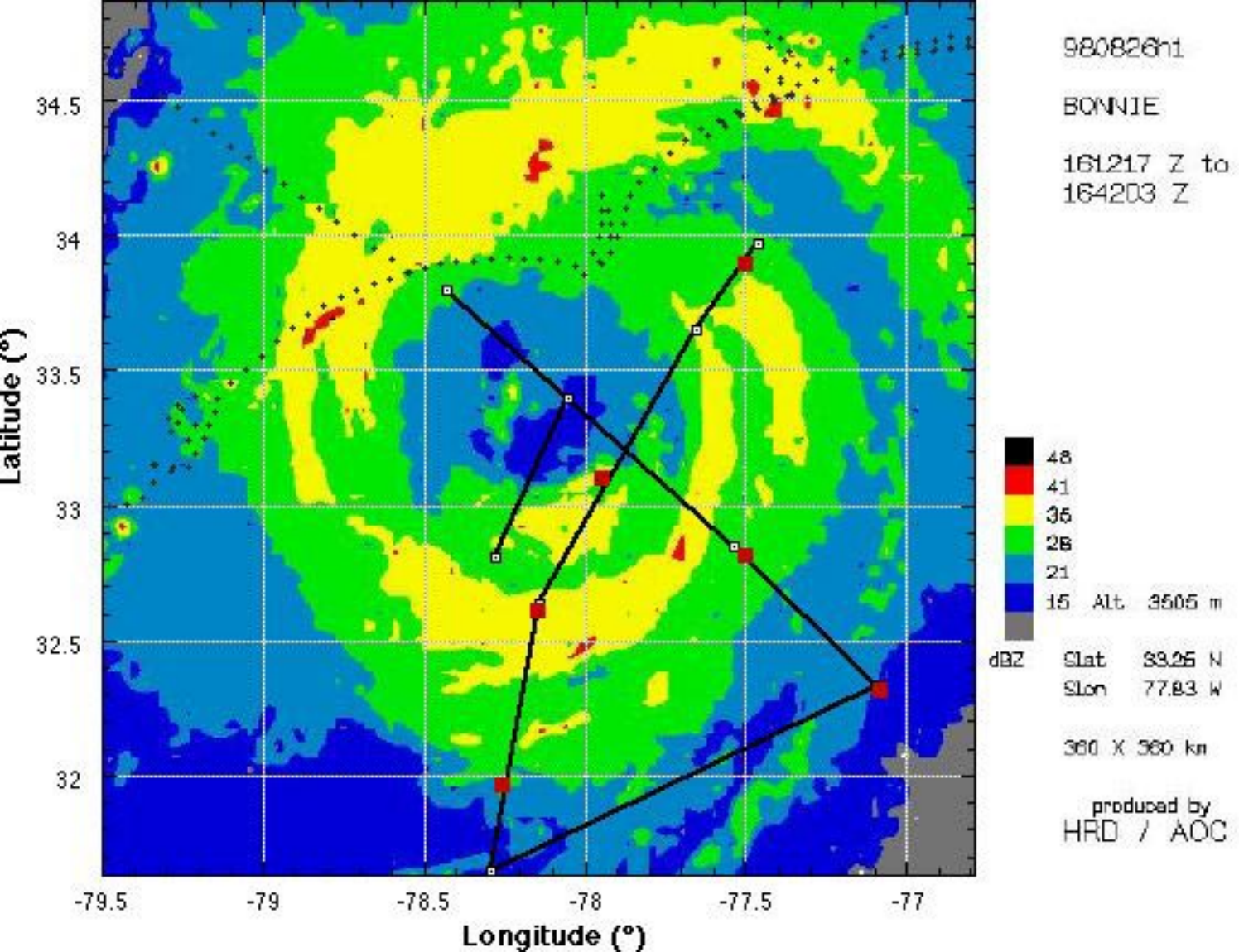
#	Sonde ID	Time (UTC)	Latitude (°)	Longitude (°)	Location	SST (°C)	MBL winds (kts)	SFC Winds (kts)	Comments
1	982010048	12:20:34	33.868	-76.568	rainband	28.5	56	44	
2	982430016	12:23:05	34.023	-76.775	rainband		58	45	
3	971720128	12:25:18	31.042	-77.000	rainband		51		p bias, late launch
4	981820032	12:28:04	34.267	-77.083	rainband		57	48	p bias
5	981750080	12:32:12	34.050	-77.747	rainband	27.9	68	57	
6	981810048	12:34:37	33.930	-77.943	rainband		64	36	
7	982010112	12:37:07	33.788	-78.127	rainband		74	54	p bias
8	981820096	12:39:55	33.595	-78.298	rainband		85		p bias
9	981810048	12:42:29	33.403	-78.442	rainband				fast fall
10	981740032	12:45:30	33.185	-78.648	eyewall NW				no launch detection
11	982010048	12:50:06	32.965	-78.520	"""	28	83		
12	982010112	12:54:44	32.927	-78.297	"""		65	54	p bias
13	974910016	12:54:48	32.895	-78.128	"""		39	31	
14	981750080	12:57:33	32.815	-77.920	"""		26	13	p bias
15	982430208	12:58:51	32.777	-77.817	eye	29			p bias
16	982010112	13:02:00	32.747	-77.537	eye E		58	42	p bias
17	981740032	13:04:56	32.745	-77.283	eyewall E		68	48	p bias
18	981820032	13:08:10	32.747	-77.013	"""				no launch detection
19	974530048	13:10:20	32.745	-76.830	"""	28.1	85		p bias
20	974510016	13:14:16	32.685	-76.558	rainband		79		p bias
21	982430208	13:17:53	32.512	-76.548	rainband		81	62	
22	981750080	13:20:58	32.360	-76.597	rainband				no launch detection
23	982430016	13:23:42	32.238	-76.657	rainband				p bias, data stopped
24	982010112	13:27:16	32.055	-76.652	rainband	25.1	72	46	
25	982430208	13:30:37	31.948	-76.817	rainband				no boundary layer wind
26	981820032	13:34:31	31.853	-77.033	rainband				no data below 850mb
27	981750016	13:38:00	31.773	-77.233	rainband				p bias, no data below
28	982430208	13:41:31	31.670	-77.417	rainband		65	50	80 sec of missing data
29	982430016	13:45:58	31.523	-77.657	rainband	27.5			p bias
30	982430016	14:27:41	33.238	-79.148	W side				late launch detect,
31	982430016	14:31:23	32.923	-79.042	W side				no launch detection
32	982430208	14:35:39	32.560	-78.885	W side	-99	60	52	
33	982430208	14:39:41	32.235	-78.708	W side		67	52	
34	974740032	14:43:38	32.162	-78.333	W side		76	66	p bias, late launch
35	974940032	14:46:55	32.125	-77.962	W side		82	73	no winds below ~925
36	974530112	14:50:30	32.260	-77.780	eyewall S	28.8			lost winds
37	974730048	14:54:58	32.590	-77.780	"""		50	20	p bias
38	974740032	14:59:02	32.892	-77.820	"""		44		gaps in winds, p off
39	982010112	15:02:02	33.093	-77.912	eye				no data below 720 mb
40	974530048	15:05:41	33.357	-77.937	eyewall N				p bias, no data belo
41	974940032	15:09:55	33.652	-77.925	"""				no data below 680 mb
42	974530048	15:14:43	33.922	-77.768	"""				no data
43	974940032	15:20:12	33.237	-77.552	"""				no data below 720 mb
44	974730112	15:26:44	34.182	-77.135	rainband NE				no data
45	974740160	15:33:08	34.090	-76.723	rainband NE	-99			no data
46	974150016	15:38:04	33.925	-76.522	rainband NE				
47	974940032	15:44:18	33.630	-76.422	rainband NE				
48	974510016	16:01:48	34.300	-76.750	rainband		60	42	**drop next to supercell**
49	974730048	16:19:40	33.967	-77.462	eyewall NE	27.1	79		p bias
50	974730048	16:25:15	33.652	-77.652	eye (not center)	27.4			
51	974740096	16:40:36	32.637	-78.143	eyewall S	28.3			p bias
52	974730112	16:52:17	31.645	-78.290	eyewall SSW	28.7	56	50	
53	974940032	17:07:49	32.332	-77.093	outside SE eyewall	26.7	66	53	
54	974740032	17:16:44	32.852	-77.537	eyewall SE	-99	101	77	strong convection
55	974736832	17:59:13	32.810	-78.275	eyewall S		86	67	

AXBT Log

Sonde	Time	Latitude (°)	Longitude(°)	SST	Comment
1	12:20:50.00000	34.160	-76.600	28.500	
2	12:33:30.00000	33.960	-77.960	27.900	
3	12:49:46.00000	32.960	-78.550	28.000	
4	12:58:55.00000	32.766	-77.775	29.000	
5	13:09:26.00000	32.740	-76.900	28.100	
6	13:27:19.00000	32.067	-76.650	25.100	
7	13:45:59.00000	31.500	-77.650	27.500	
8	14:35:39.00000	32.551	-78.887		failure
9	14:50:00.00000	32.266	-77.780	28.800	
10	15:33:00.00000	34.100	-76.737		failure
11	16:20:30.00000	33.900	-77.500	27.100	
12	16:32:00.00000	33.100	-77.950	27.400	
13	16:41:00.00000	32.616	-78.150	28.300	
14	16:52:00.00000	31.967	-78.260	28.700	
15	17:07:45.00000	32.320	-77.088	26.700	
16	17:16:00.00000	32.816	-77.500		failure


980826h1
BONNIE
123911 Z to
130921 Z
48
41
35
28
21
15 Alt 3518 m
dBZ
Slat 3201 N
Slon 77.80 W
300 X 300 km
produced by
HRD / AOC
Latitude (°)
Longitude (°)
34.5
34
33.5
33
32.5
32
31.5
-79
-78.5
-78
-77.5
-77
-76.5


980826h1
BONNIE
134527 Z to
141017 Z
48
41
35
28
21
15 Alt 3533 m
dBZ
Slat 3299 N
Slon 77.78 W
360 X 360 km
produced by
HRD / AOC
34.5
34
33.5
33
32.5
32
31.5
Latitude (°)
-79
-78.5
-78
-77.5
-77
-76.5
Longitude (°)


980826h1
BONNIE
161217 Z to
164203 Z
48
41
36
28
21
15 Alt 3505 m
dBZ
Slat 33.25 N
Slon 77.83 W
360 X 360 km
produced by
HRD / AOC
34.5
34
33.5
33
32.5
32
Latitude (°)
-79.5
-79
-78.5
-78
-77.5
-77
Longitude (°)