

Tropical Cyclone Report
Hurricane Danny
16-21 July 2003

Stacy R. Stewart
National Hurricane Center
27 November 2003

Hurricane Danny made a large looping path over the north central Atlantic Ocean, but did not directly affect land and was mainly a threat to shipping.

a. Synoptic History

Danny formed from a large, well-organized tropical wave that moved off the coast of Africa on 9 July. The highly amplified wave, accompanied by deep convection over land and a small low pressure system, quickly weakened and became devoid of any thunderstorm activity as it moved westward over the cooler waters north of 10° N latitude. The southern portion of wave continued to move westward, while the highly amplified northern portion remained convectively inactive as it moved steadily northwestward for the next 3 days. Finally, on 13 July, a large cluster of thunderstorms developed near a mid-level vorticity center located along the wave axis. The thunderstorm activity slowly increased and became better organized over the next couple of days, and Dvorak satellite classifications began late on 15 July. The next day, visible satellite imagery and ship observations indicated that a closed surface circulation developed, and it is estimated that Tropical Depression Five had formed at 1200 UTC 16 July about 550 n mi east of Bermuda. The “best track” chart of the tropical cyclone’s path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1.

The depression quickly developed outer convective banding features and satellite intensity estimates indicate the cyclone became Tropical Storm Danny at 0000 UTC 17 July when it was located about 470 n mi east of Bermuda. For the next 24 hours, Danny moved steadily northwestward around the western periphery of a deep layer anticyclone before gradually turning northward and then northeastward early on 18 July as the cyclone began to be influenced by southwesterly upper-level winds ahead of an approaching shortwave trough. Although Danny was located at a relatively high latitude, the storm continued to strengthen as it passed over a narrow region of unusually high seas-surface temperatures (27° -27.5° C) late on 18 July. By 1109 UTC 19 July, a cloud-filled eye became apparent in visible satellite imagery (Fig. 4). Danny was upgraded to hurricane status based on the eye feature noted in visible and microwave (Fig. 5) satellite imagery, and a Dvorak satellite intensity estimate of 65 kt from all three satellite agencies – TPC/Tropical Analysis and Forecast Branch (TAFB), Satellite Analysis Branch (SAB), and Air Force Weather Agency (AFWA).

Since Danny had developed at an unusually high latitude, the cyclone was embedded within a higher than average surrounding environmental pressure field. When Danny first became a tropical storm, its outermost closed isobar was 1024 mb – about 12 mb higher than average – and its center

was located within about 350 n mi of the center of a 1031 mb high pressure system. This is not unprecedented and a good analog to Danny would be Hurricane Frances of 1986. Like Danny, Hurricane Frances developed at a fairly high latitude and within a higher than average background surface pressure field, and remained surrounded by above average pressures throughout its lifetime. Frances developed an eye feature in visible satellite imagery and later that same day a reconnaissance aircraft investigating the cyclone found flight-level winds of 75 kt and a surface pressure of 1000 mb (see ANNUAL SUMMARY – Atlantic Hurricane Season of 1986, *Monthly Weather Review*, Volume 115, September 1987, pp. 2155-2160).

As Danny moved eastward around the northern periphery of the nearly stationary Bermuda-Azores high pressure ridge, it encountered moderate upper-level westerly shear, causing the cyclone to begin a slow weakening trend late on 19 July. By early the next day, Danny moved over cooler sea-surface temperatures, which when combined with the increasing westerly vertical shear, initiated rapid weakening. By 1800 UTC, Danny had turned southeastward and had weakened back to a tropical depression. Rapid weakening continued and Danny degenerated into a non-convective remnant low pressure system by 0600 UTC 21 July. For the next two days, the remnant low moved slowly southward and then westward around the south side of the subtropical ridge before making a small loop clockwise loop on 24-25 July about 1250 n mi east-northeast of Bermuda. After making the loop, the remnant circulation turned southwestward and began moving over warmer water. Some deep convection briefly re-developed over the low-level center for a few hours early on 26 July, but the presence of large quantities of dry mid- to upper-level air over the system likely prevented the thunderstorms from persisting. The remnant low pressure system continued to moving southwestward and eventually dissipated at 1200 UTC 27 July about 1080 n mi east of Bermuda, which is also about 550 n mi east of where Danny originated.

b. Meteorological Statistics

Observations in Danny (Figs. 2 and 3) include satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB) and the U. S. Air Force Weather Agency (AFWA).

Ship **MANE** at 1200 UTC 20 July 2003 reported a west wind of 39 kt when it was located about 90 n mi south of Danny.

c. Casualty and Damage Statistics

There were no reports of damages or casualties associated with Danny.

d. Forecast and Warning Critique

Danny was a tropical cyclone for only 108 h, resulting in a relatively small number of 96 h forecasts to verify and no 120 h forecasts. However, average official track errors (with the number of cases in parentheses) for Danny were 37 (17), 42 (15), 45 (13), 53 (6), 166 (7), and 290 (3) n mi

for the 12, 24, 36, 48, 72, and 96 h forecasts, respectively¹. These errors are lower than the average official track errors for the 10-yr period 1993-2002² of 45, 81, 116, 150, 225, and 282 n mi, respectively, (Table 4).

Average official intensity errors 5, 8, 11, 15, 14, and 7 kt for the 12, 24, 36, 48, 72, and 96 h forecasts, respectively, were slightly better than average. For comparison, the average official intensity errors over the 10-yr period 1993-2002³ are 6, 10, 13, 15, 19, 21, and 22 kt, respectively.

No watches or warnings were associated with Danny.

¹ All forecast verifications in this report include the depression stage of the cyclone. National Hurricane Center verifications presented in these reports prior to 2003 did not include the depression stage.

² Errors given for the 96 and 120 h periods are averages over the two-year period 2001-2.

³ Errors given for the 96 and 120 h periods are averages over the two-year period 2001-2.

Table 1. Best track data for Hurricane Danny, 16-21 July 2003.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
16 / 1200	30.8	54.1	1017	25	tropical depression
16 / 1800	31.7	54.7	1015	30	"
17 / 0000	32.5	55.2	1013	35	tropical storm
17 / 0600	33.4	55.6	1011	45	"
17 / 1200	34.4	56.4	1009	50	"
17 / 1800	35.3	56.6	1008	55	"
18 / 0000	36.2	56.4	1007	55	"
18 / 0600	37.1	56.0	1006	55	"
18 / 1200	38.1	54.9	1003	60	"
18 / 1800	39.2	53.4	1002	65	hurricane
19 / 0000	40.1	51.7	1001	65	"
19 / 0600	41.1	50.0	1000	65	"
19 / 1200	42.1	47.8	1001	65	"
19 / 1800	42.7	45.8	1003	60	tropical storm
20 / 0000	42.7	44.0	1005	55	"
20 / 0600	42.5	42.4	1007	45	"
20 / 1200	41.9	40.7	1008	40	"
20 / 1800	40.9	39.2	1009	30	tropical depression
21 / 0000	39.8	37.9	1009	30	"
21 / 0600	38.8	36.8	1010	30	remnant low
21 / 1200	37.9	36.3	1011	25	"

21 / 1800	37.1	35.9	1013	25	"
22 / 0000	36.3	35.8	1015	25	"
22 / 0600	35.7	36.2	1017	25	"
22 / 1200	35.3	36.7	1018	25	"
22 / 1800	35.1	37.2	1019	25	"
23 / 0000	35.0	37.8	1020	20	"
23 / 0600	34.9	38.6	1020	20	"
23 / 1200	35.5	39.0	1020	20	"
23 / 1800	36.0	40.0	1020	20	"
24 / 0000	36.0	40.5	1021	20	"
24 / 0600	36.6	40.5	1021	20	"
24 / 1200	36.5	40.0	1021	20	"
24 / 1800	36.4	39.5	1021	20	"
25 / 0000	36.5	38.9	1022	20	"
25 / 0600	36.3	39.2	1022	20	"
25 / 1200	36.0	39.0	1022	20	"
25 / 1800	35.5	39.0	1022	20	"
26 / 0000	34.5	39.5	1023	20	"
26 / 0600	33.8	40.0	1023	20	"
26 / 1200	33.0	40.5	1023	20	"
26 / 1800	32.0	41.0	1023	20	"
27 / 0000	31.0	42.0	1024	20	"
27 / 0600	31.0	43.5	1024	20	"
27 / 1200					dissipated
19 / 0600	41.1	50.0	1000	65	minimum pressure

Table 4. Preliminary forecast evaluation (heterogeneous sample) for Hurricane Danny, 16-21 July 2003. Forecast errors (n mi) are followed by the number of forecasts in parentheses. Errors smaller than the NHC official forecast are shown in bold-face type. Verification includes the depression stage, but does not include the extratropical stage, if any.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	58 (17)	124 (15)	189 (13)	224 (11)	303 (7)	383 (3)	
GFNI	28 (13)	50 (11)	72 (9)	119 (8)	303 (2)		
GFDI	31 (17)	55 (15)	81 (13)	121 (11)	209 (6)	297 (2)	
GFDL	28 (16)	49 (14)	70 (12)	102 (10)	165 (4)		
LBAR	33 (17)	62 (15)	91 (13)	126 (11)	135 (7)	137 (3)	
AVNI	28 (9)	39 (7)	102 (5)				
AVNO	43 (15)	59 (11)	64 (5)	102 (1)			
AEMI	19 (10)	39 (9)	77 (8)	116 (7)	212 (4)		
BAMD	46 (17)	72 (15)	89 (13)	116 (11)	239 (7)	319 (3)	
BAMM	33 (17)	46 (15)	62 (13)	88 (11)	170 (7)	228 (3)	
BAMS	41 (17)	71 (15)	101 (13)	128 (11)	158 (7)	198 (3)	
NGPI	30 (15)	42 (13)	50 (11)	70 (9)	128 (5)	477 (1)	
NGPS	40 (16)	49 (14)	50 (12)	63 (10)	117 (6)	382 (2)	
UKMI	50 (12)	103 (10)	126 (8)	142 (7)	357 (2)		
UKM	52 (8)	82 (6)	152 (2)				
A98E	45 (17)	51 (15)	72 (13)	102 (11)	207 (7)	322 (3)	
A9UK	43 (9)	58 (8)	67 (7)	51 (6)	187 (4)		
GUNS	30 (12)	51 (10)	52 (8)	51 (7)	100 (2)		
GUNA	31 (7)	51 (5)	71 (3)				
OFCL	37 (17)	42 (15)	45 (13)	53 (11)	166 (7)	290 (3)	
NHC Official (1993-2002 mean)	39 (2864)	72 (2595)	103 (2314)	131 (2050)	186 (1603)	197 (210)	223 (143)

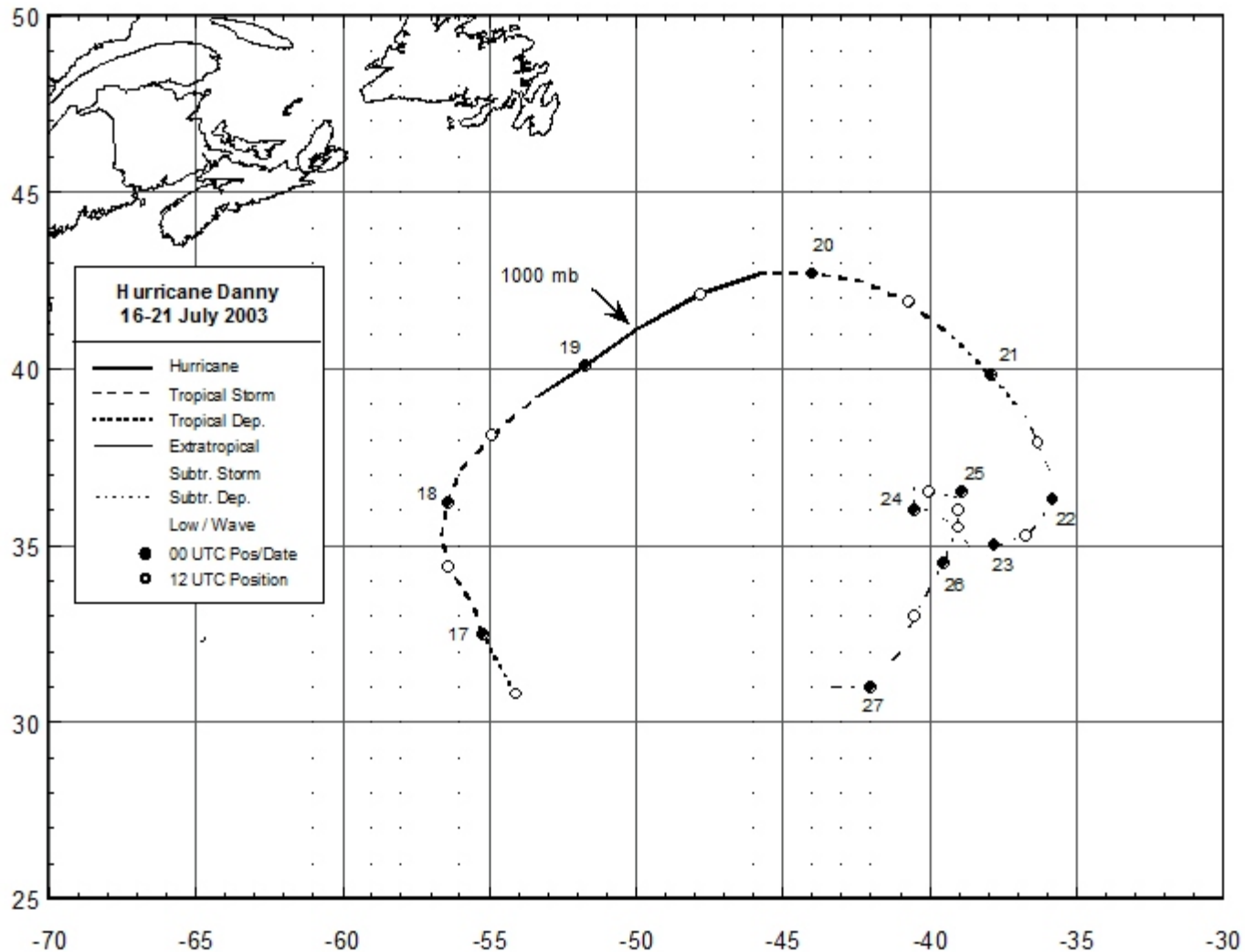


Figure 1. Best track positions for Hurricane Danny, 16-21 July 2003. Track positions during the remnant low stage (begins 0600 UTC 21 July) are based on analyses from the Tropical Prediction Center's Tropical Analysis and Forecast Branch (TAFB) and the Ocean Prediction Center (OPC).

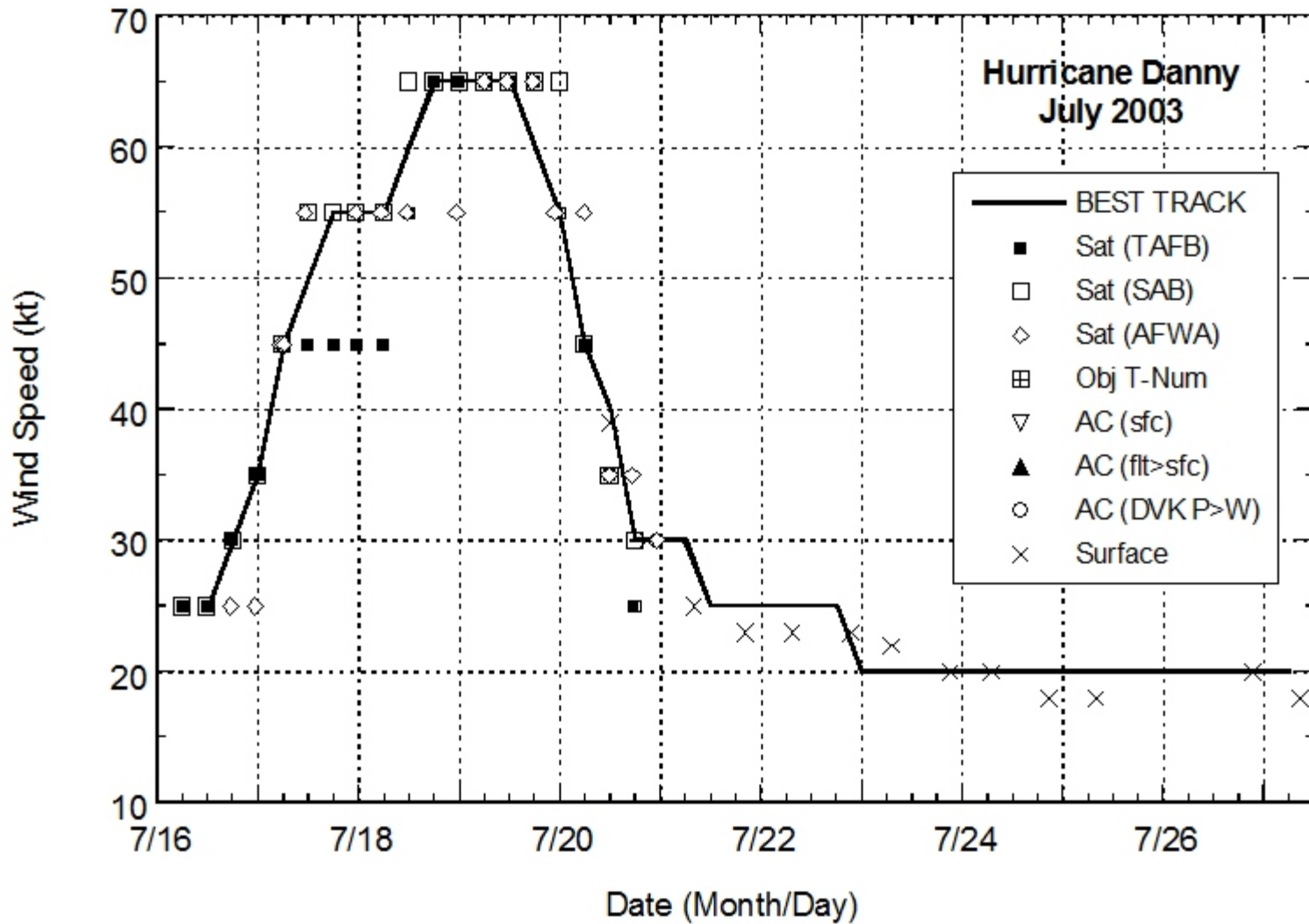


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Danny, 16-21 July 2003. Estimates during the remnant low stage (begins 0600 UTC 21 July) are based on analyses from the Tropical Prediction Center's Tropical Analysis and Forecast Branch (TAFB) and the Ocean Prediction Center (OPC). Surface estimates indicated by "X" after 0000 UTC 21 July are based on uncontaminated QuikSCAT scatterometer wind data.

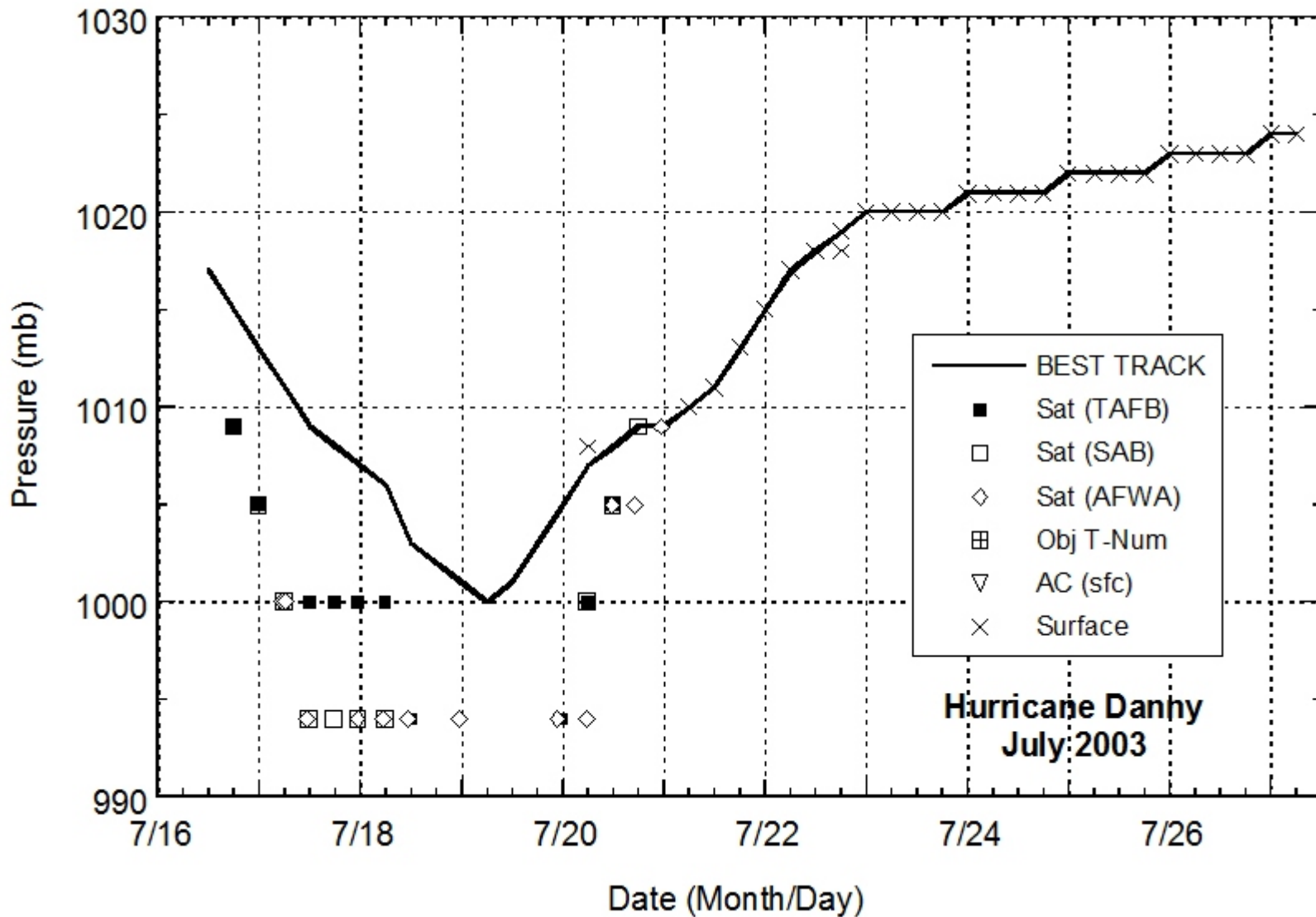


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Danny, 16-21 July 2003. Estimates during the remnant low stage (begins 0600 UTC 21 July) are based on analyses from the Tropical Prediction Center's Tropical Analysis and Forecast Branch (TAFB) and the Ocean Prediction Center (OPC).

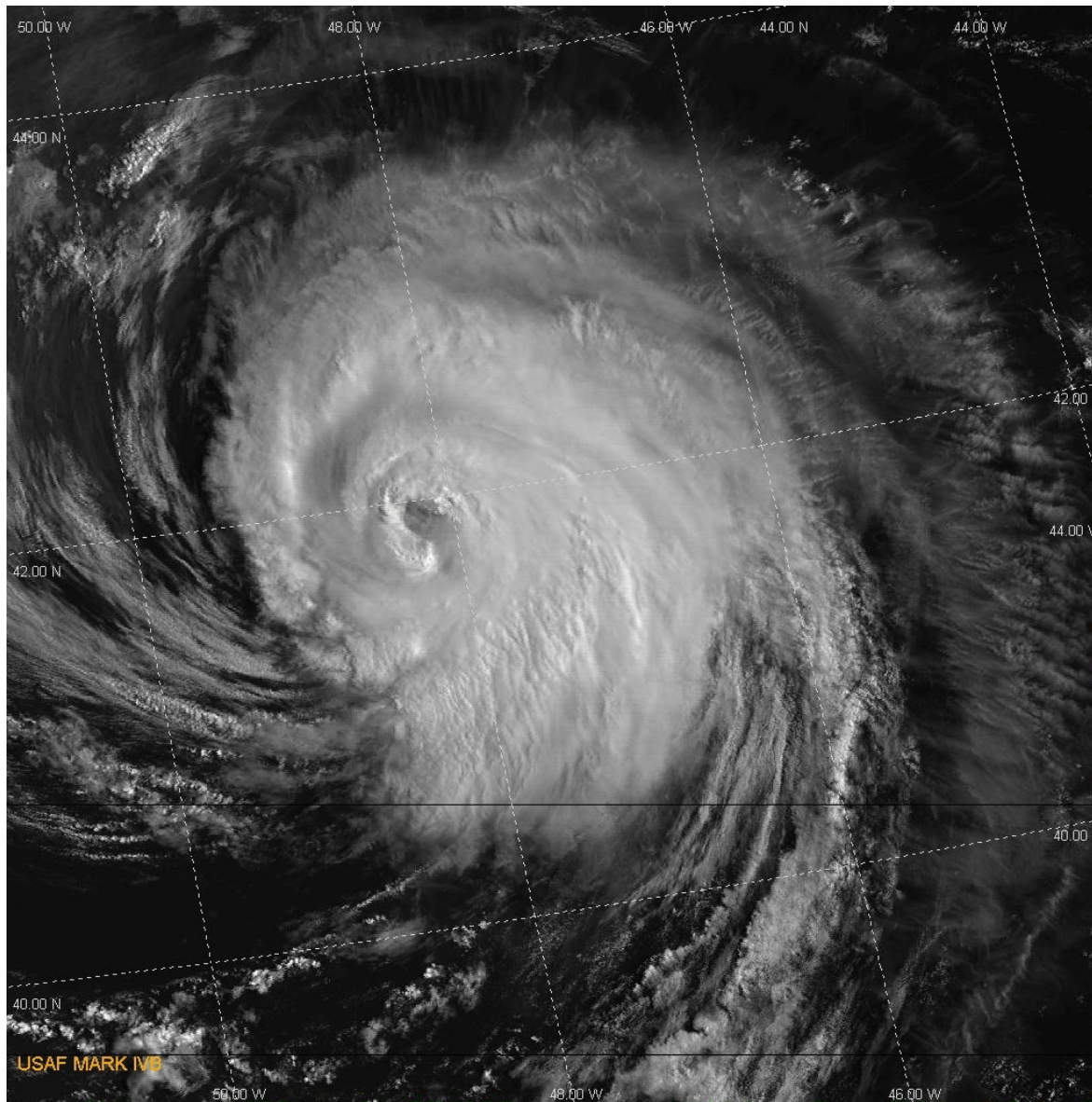


Figure 4. U.S. Air Force Defense Meteorological Satellite Program (DMSP-F14) visible image of Hurricane Danny, 1109 UTC 19 July 2003.

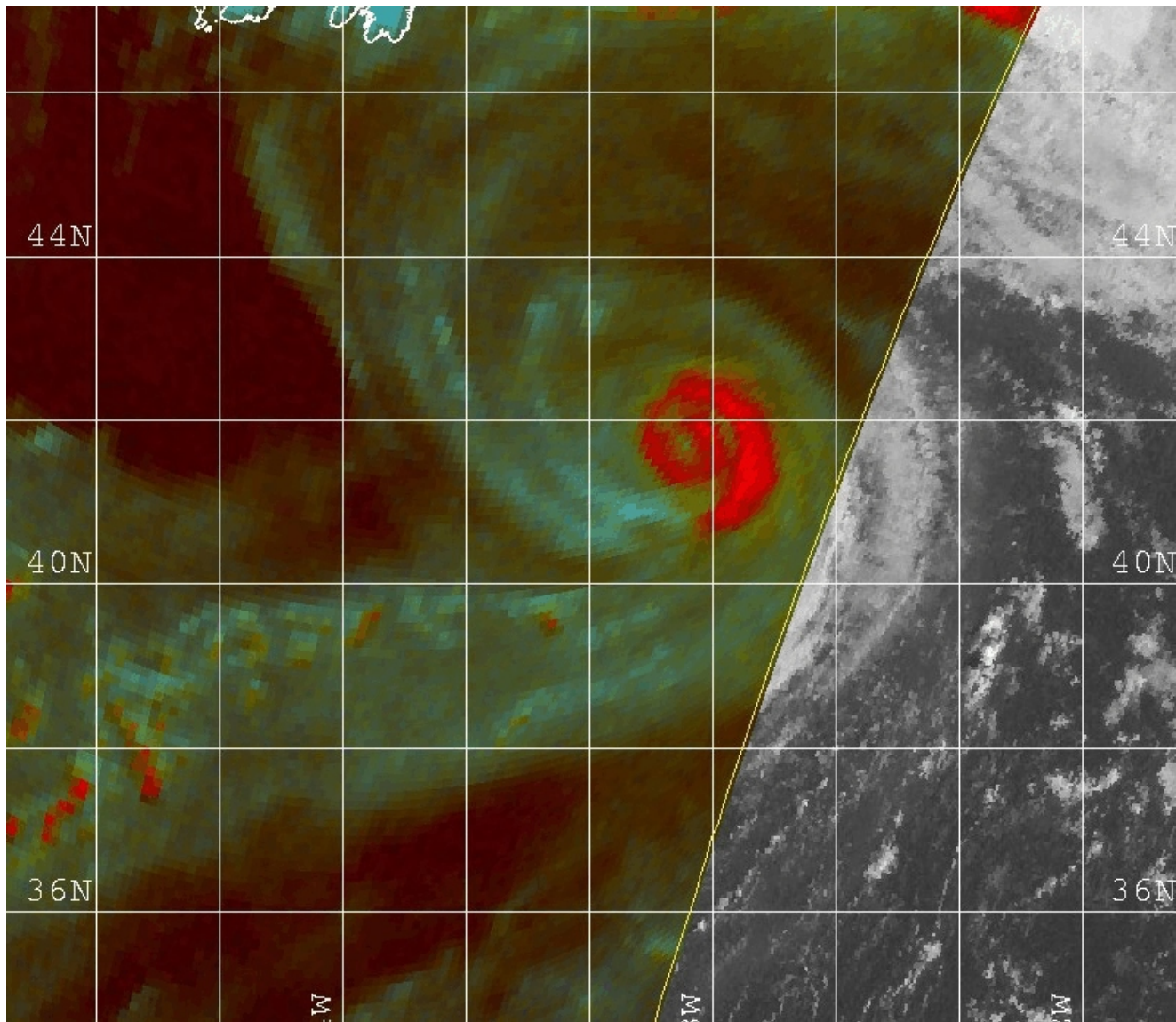


Figure 5. DMSP Special Sensor Microwave/Imager (SSM/I-F13) multispectral image of the eye and banding features associated with Hurricane Danny, 1032 UTC 19 July 2003 (image courtesy of Naval Research Laboratory).