

Tropical Cyclone Report  
Tropical Storm Norman  
(EP152006)  
9 – 15 October 2006

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Norman was a short-lived tropical storm over the open waters of eastern North Pacific. It had an even shorter second life as a tropical depression near the coast of Mexico.

a. Synoptic History

Norman formed from a tropical wave that moved westward from the coast of Africa on 21 September. The wave crossed the tropical Atlantic Ocean and Caribbean Sea with little convection, reaching the eastern North Pacific on 1 October. It moved slowly westward and showed increasing convection beginning on 5 October. By 8 October, the wave was in the eastern portion of a large and complex area of disturbed weather, which included a system to the west that became Tropical Storm Olivia. The eastern system showed signs of convective organization that day, and additional organization resulted in the formation of a tropical depression near 0000 UTC 9 October about 665 n mi southwest of Cabo San Lucas, Mexico. 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 moved slowly north-northwestward and became a tropical storm 12 h after genesis. Norman reached a peak intensity of 45 kt early on 10 October. Southwesterly vertical wind shear then displaced the convection to the northeast of the center, and Norman weakened to a depression later that day as it turned east-northeastward. Continued shear caused the cyclone to degenerate to a low pressure area on 11 October about 460 n mi southwest of Cabo San Lucas.

The low pressure area moved east-southeastward on 12-13 October, followed by an eastward motion on 14 October. This motion was due to the low interacting with a broad area of disturbed weather near the coast of southwestern Mexico. During the interaction, convection re-organized near the center of the low, and it is estimated that Norman again became a tropical depression near 0000 UTC 15 October about 175 n mi south-southeast of Manzanillo, Mexico. The cyclone moved northward and then northwestward inside the cyclonic envelope of the larger disturbance until it abruptly dissipated late on 15 October about 20 n mi south of Manzanillo.

It should be noted that the exact fate of the center of Norman on 15 October is uncertain. Conventional satellite imagery suggests the center may have moved inland east of Manzanillo. However, surface observations do not support a landfall, and the center was too disorganized to

be easily tracked in microwave satellite imagery. Therefore, the best estimate is that the center dissipated over water as it approached Manzanillo.

b. Meteorological Statistics

Observations in Norman (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). Microwave satellite imagery from NOAA polar-orbiting satellites, the NASA Tropical Rainfall Measuring Mission (TRMM), the NASA Aqua, the NASA QuikSCAT, the Department of Defense WindSat, and Defense Meteorological Satellite Program (DMSP) satellites were also useful in tracking Norman.

There were no reports of tropical-storm-force winds from Norman.

c. Casualty and Damage Statistics

While Norman produced some locally heavy rains over portions of southwestern Mexico, there were no reports of damage or casualties.

d. Forecast and Warning Critique

The genesis of Norman was well anticipated. The pre-Norman disturbance was mentioned in the Pacific Tropical Weather Outlook starting about 31 h before genesis, with the potential for tropical cyclone formation first being mentioned about 25 h before genesis. The re-development of Norman was also anticipated well in advance, with the potential for tropical cyclone formation being mentioned about 40 h before it occurred,

A verification of official and guidance model track forecasts is given in Table 4. Average official track errors for Norman were 41, 94, 143, and 174 n mi for the 12, 24, 36, and 48 h forecasts, respectively. The number of forecasts ranged from 10 at 12 h to 3 at 72 h. These errors are greater than the average long-term official track errors (Table 2), and are greater than the average errors of much of the numerical guidance. The relatively large errors were due to forecasts that Norman would move quickly northeastward toward Baja California as a tropical storm. This did not verify when the storm became strongly sheared and instead moved slowly east-northeastward.

Average official intensity errors were 6, 11, 13, and 12 kt for the 12, 24, 36, and 48 h forecasts, respectively. For comparison, the average long-term official intensity errors are 6, 11, 14, and 17 kt respectively. The intensity forecasts from the first part of Norman's life followed the scenario that intensification would be limited due to shear. This proved correct; however, the shear was stronger than originally expected and caused a faster weakening than forecast. The

GFDL model had very low average forecast errors, as it correctly forecast that Norman would not strengthen significantly.

The government of Mexico issued a tropical storm warning for the coast from Lazaro Cardenas to Cabo Corrientes at 0900 UTC 15 October when Norman reformed. The warning was discontinued 12 h later when the cyclone dissipated.

Table 1. Best track for Tropical Storm Norman, 9 – 15 October 2006.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
09 / 0000	14.2	117.2	1006	30	tropical depression
09 / 0600	14.8	117.5	1006	30	"
09 / 1200	15.4	117.7	1004	35	tropical storm
09 / 1800	15.9	117.8	1002	40	"
10 / 0000	16.2	117.9	1000	45	"
10 / 0600	16.4	118.0	1002	40	"
10 / 1200	16.5	118.1	1003	35	"
10 / 1800	16.6	117.9	1004	30	tropical depression
11 / 0000	16.7	117.3	1005	30	"
11 / 0600	16.7	116.4	1006	25	"
11 / 1200	16.8	115.7	1006	25	"
11 / 1800	17.0	115.2	1006	25	low
12 / 0000	16.9	114.6	1006	25	"
12 / 0600	16.5	114.0	1006	25	"
12 / 1200	16.2	113.3	1006	25	"
12 / 1800	15.9	112.6	1006	25	"
13 / 0000	15.7	112.2	1006	25	"
13 / 0600	15.4	111.9	1006	25	"
13 / 1200	15.1	111.4	1005	30	"
13 / 1800	14.8	110.6	1005	30	"
14 / 0000	14.7	109.7	1005	30	"
14 / 0600	14.5	108.0	1005	30	"
14 / 1200	14.5	105.9	1005	30	"
14 / 1800	15.3	104.3	1004	30	"
15 / 0000	16.4	103.6	1002	30	tropical depression
15 / 0600	17.6	103.6	1001	30	"
15 / 1200	18.2	104.1	1001	30	"
15 / 1800	18.8	104.6	1000	30	"
16 / 0000					dissipated
10 / 0000	16.2	117.9	1000	45	minimum pressure

Table 2. Preliminary track forecast evaluation (heterogeneous sample) for Tropical Storm Norman, 9 – 15 October 2006. 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.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
CLP5	47 (11)	108 (7)	170 (5)	239 (3)		792 (3)	1161 (4)
GFDI	50 (11)	<b>74</b> (7)	<b>93</b> (5)	<b>78</b> (3)		460 (1)	
GFDL*	53 (10)	<b>92</b> (7)	<b>96</b> (5)	<b>124</b> (3)		477 (2)	
GFNI	53 (7)	<b>79</b> (3)	<b>87</b> (2)				
GFDN*	57 (8)	<b>82</b> (6)	<b>105</b> (3)				
GFSI	61 (11)	<b>78</b> (7)	<b>87</b> (5)	<b>138</b> (3)			
GFSO*	69 (11)	<b>83</b> (7)	<b>72</b> (5)	<b>92</b> (3)			
AEMI	61 (11)	<b>88</b> (7)	<b>118</b> (5)	186 (3)			
AEMN*	73 (11)	<b>83</b> (7)	<b>90</b> (5)	<b>106</b> (3)			
NGPI	46 (9)	<b>79</b> (7)	<b>89</b> (5)	<b>82</b> (3)		520 (1)	717 (1)
NGPS*	53 (8)	97 (6)	<b>130</b> (4)	<b>123</b> (2)			507 (1)
UKMI	51 (10)	<b>76</b> (6)	<b>79</b> (4)	<b>153</b> (2)		204 (3)	2078 (3)
UKM*	133 (6)	<b>82</b> (4)	<b>102</b> (3)	<b>52</b> (2)		217 (2)	1441 (2)
P91E	43 (11)	<b>84</b> (7)	<b>134</b> (5)	<b>169</b> (3)		592 (3)	1225 (4)
P9UK	41 (6)	<b>93</b> (4)	<b>137</b> (3)	<b>165</b> (2)			
BAMD	95 (11)	218 (7)	336 (5)	469 (3)		1346 (3)	2267 (4)
BAMM	79 (11)	157 (7)	213 (5)	256 (3)		935 (3)	1435 (4)
BAMS	80 (11)	160 (7)	216 (5)	272 (3)		877 (3)	1123 (4)
CONU	44 (11)	<b>67</b> (7)	<b>76</b> (5)	<b>99</b> (3)		244 (2)	
GUNA	48 (8)	<b>75</b> (6)	<b>84</b> (4)	<b>109</b> (2)			
FSSE	49 (6)	<b>90</b> (5)	<b>105</b> (3)	<b>142</b> (1)			
OFCL	41 (10)	94 (7)	143 (5)	174 (3)			
NHC Official (2001-2005 mean)	35 (1300)	60 (1152)	83 (1009)	103 (877)	145 (652)	192 (465)	231 (313)

\* Output from these models was unavailable at forecast time.

Table 3. Preliminary intensity forecast evaluation (heterogeneous sample) for Tropical Storm Norman, 9 – 15 October 2006. Forecast errors (kt) 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.

Forecast Technique	Forecast Period (h)						
	12	24	36	48	72	96	120
SHF5	5.8 (11)	11.9 (7)	<b>12.2</b> (5)	<b>11.0</b> (3)		5.0 (3)	9.0 (4)
GFDI	7.8 (11)	<b>10.6</b> (7)	<b>6.6</b> (5)	<b>4.0</b> (3)		4.0 (1)	
GFDL*	8.1 (10)	13.4 (7)	<b>3.0</b> (5)	<b>2.0</b> (3)		3.5 (2)	
SHIP	7.0 (11)	11.9 (7)	15.2 (5)	14.0 (3)		6.0 (2)	
DSHP	6.5 (11)	11.9 (7)	15.2 (5)	14.0 (3)		6.0 (2)	
FSSE	8.0 (6)	12.0 (5)	<b>11.0</b> (3)	<b>7.0</b> (1)			
ICON	6.6 (10)	<b>8.9</b> (7)	<b>7.2</b> (5)	<b>7.3</b> (3)			
OFCL	5.5 (10)	11.4 (7)	13.0 (5)	11.7 (3)			
NHC Official (2001-2005 mean)	6.2 (1300)	10.8 (1152)	14.3(1009)	16.5 (876)	18.7 (652)	18.3 (465)	19.3 (313)

\* Output from these models was unavailable at forecast time.

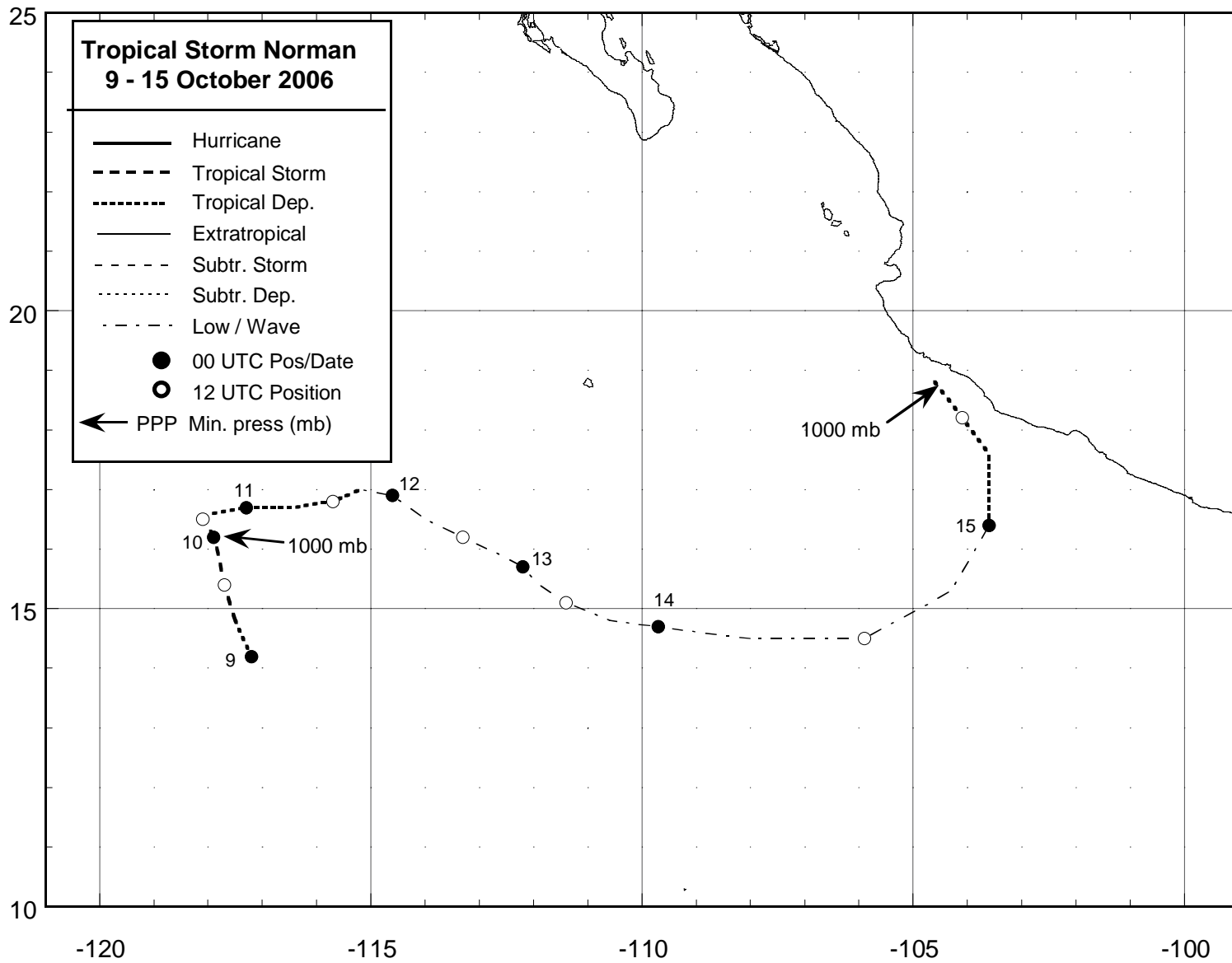


Figure 1. Best track positions for Tropical storm Norman, 9 – 15 October 2006.

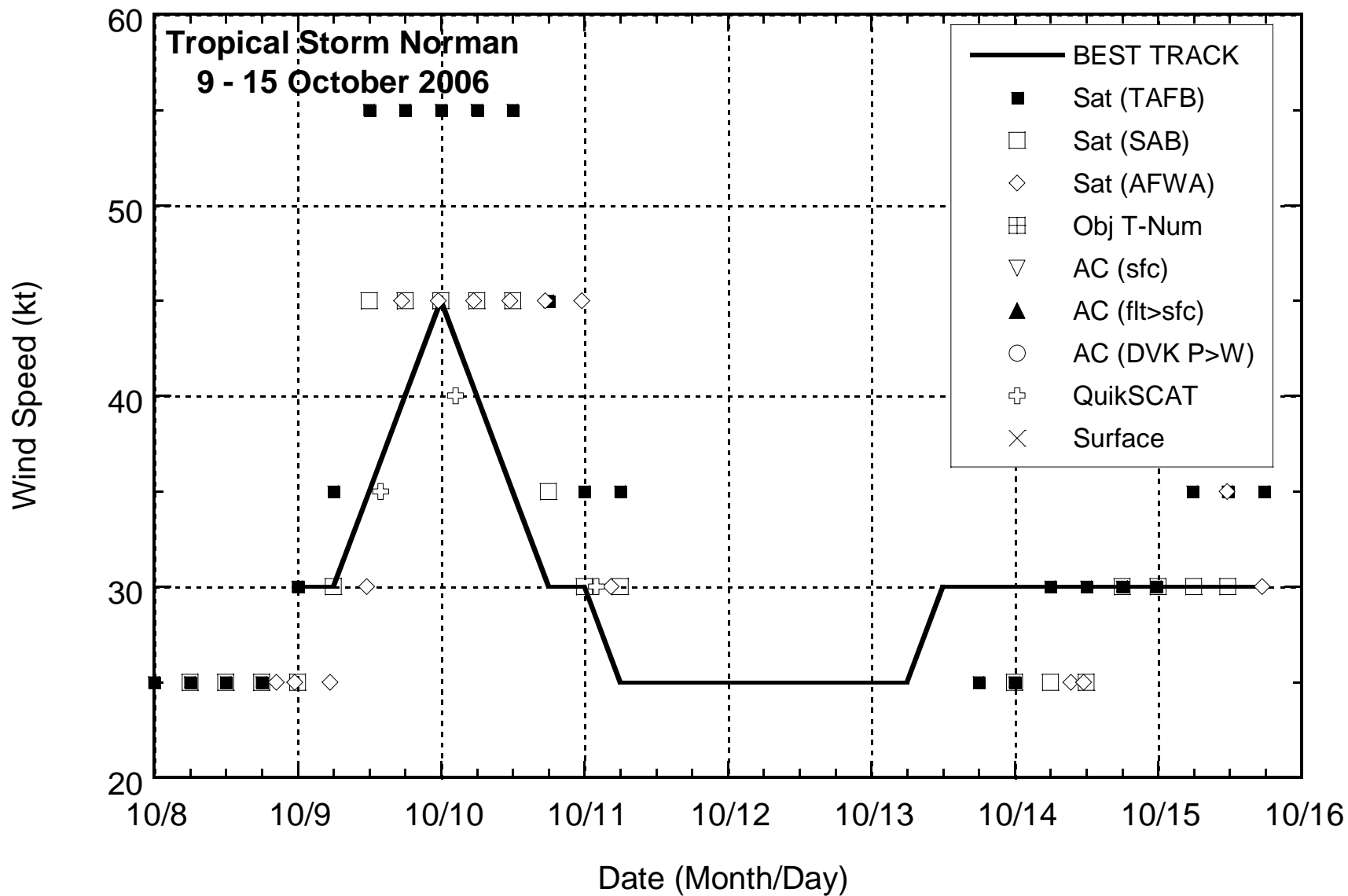


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Norman, 9 – 15 October 2006.



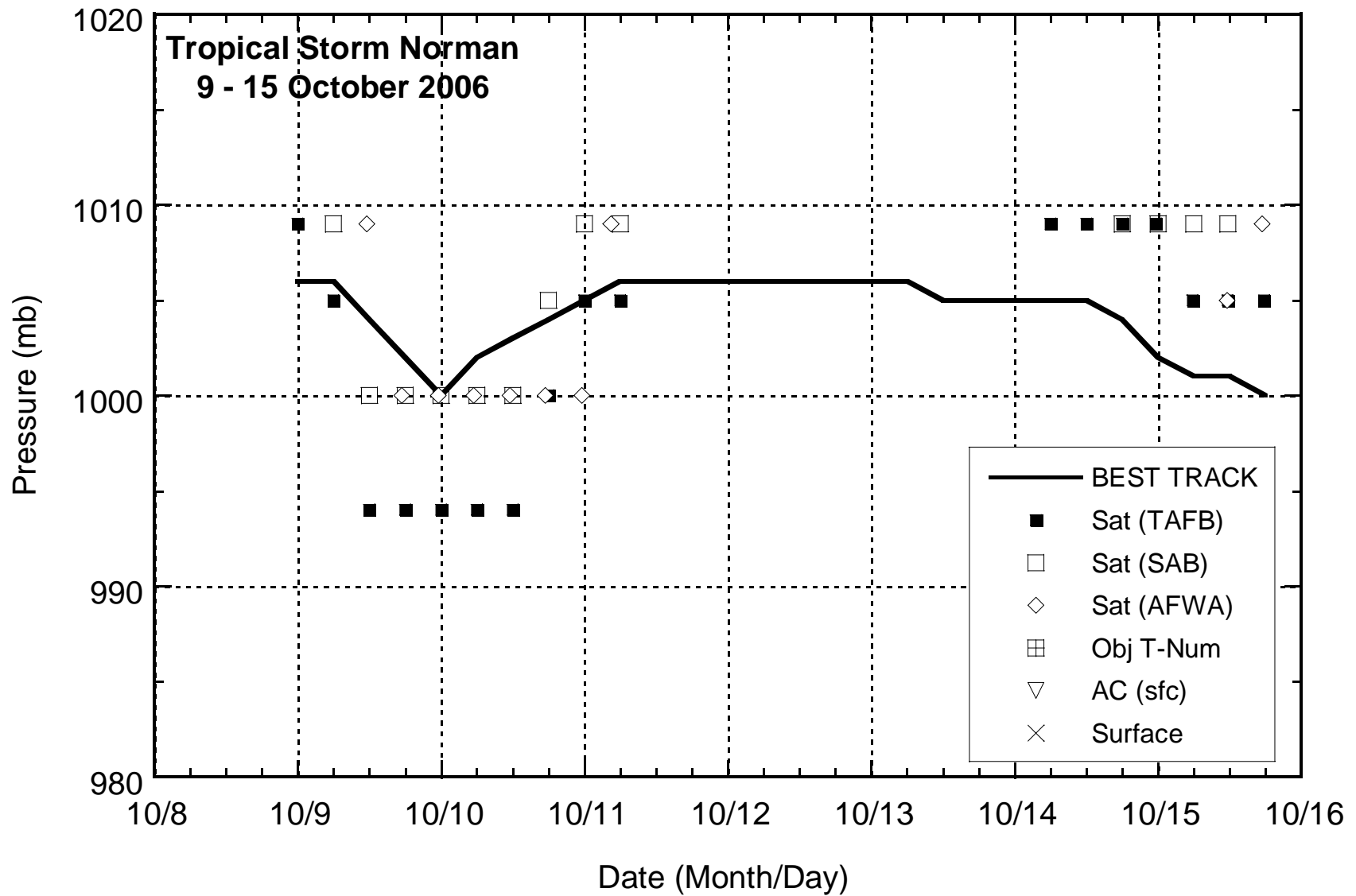


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Norman, 9 – 15 October 2006.