Tropical Cyclone Report
Tropical Storm Rosa
3 - 8 November 2000

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Rosa made landfall near Huatulco, Mexico as a minimal tropical storm.

a. Synoptic History

During the last few days of October, an area of disturbed weather was located over the southwestern Caribbean Sea. This feature was associated with a tropical wave that emerged from Africa on 18 October. The system showed some organization and potential for tropical cyclone development over the Caribbean. However the opportunity for development in that basin ended when the disturbed weather moved westward over Central America on 1 November. As the system moved out over the eastern Pacific on the 2nd, it again showed signs of development, with curved cloud bands and a concentration of deep convection a couple hundred miles south-southeast of El Salvador. There was no development during the next day or so as the disturbed weather moved slowly westward. On 3 November there was a well-defined circulation in the low clouds, and by 1800 UTC deep convection was close enough to the center to indicate the formation of Tropical Depression Nineteen-E about 200 n mi south of the El Salvador/Guatemala border.

With a low- to mid-level ridge to its north, the depression moved westward over the ensuing couple of days. By 1200 UTC 5 November, the organization of the system improved slightly and the depression became Tropical Storm Rosa. The cyclone had turned toward the west-northwest by that time. A mid-tropospheric trough was located to the northwest of Rosa, along 105°-110°W southward to near 15°N. This feature eroded the ridge, which induced a slowing of Rosa's forward speed and a turn toward the north on 6 November. The storm also reached its peak intensity of 55 kt around 1800 UTC on the 6th. From that point until landfall, Rosa underwent a very slow weakening. Under the influence of the trough to its northwest, the storm turned toward the northeast with some increase in forward speed on the 7th. Rosa made landfall early on 8 November, not far from Huatulco, Mexico with estimated maximum winds of 35 kt, and then quickly dissipated over mountainous terrain.

b. Meteorological Statistics

Table 1 lists the best track positions and intensities of Rosa at six-hourly intervals.

Figure 1 is a display of this track. Figures 2 and 3 depict the curves of maximum one-minute average "surface" (10 meters above ground level) wind speed and minimum central sea-level pressure, respectively, as functions of time. Also plotted are the observations on which the curves are based. These consist of measurements by reconnaissance aircraft, and Dvorak-technique estimates using satellite imagery by the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB), and the U.S. Air Force Weather Agency (AFWA). There was one Air Force Hurricane Hunter aircraft mission into Rosa, while the storm approached the coast on 7 November from about 1500 to 1700 UTC. Interestingly, the Hurricane Hunters reported a closed eyewall, even though the maximum winds were well below hurricane strength. A GPS dropsonde deployed in that mission measured a surface wind of 47 kt at 1658 UTC. The minimum pressure reported from the aircraft was 1000 mb.

A rainfall total of 103.0 mm associated with Rosa was reported from Puerto Angel, Mexico.

c. Casualty and Damage Statistics

Rosa was a weakening, minimal tropical storm at landfall, so its impact was probably not serious. No reports of casualties or damages associated with Rosa have been received.

d. Forecast and Warning Critique

Rosa was a tropical storm for about 66 h, so there are not many forecasts to verify. Even for the small number of cases it is interesting to look at the performance of the numerical guidance as summarized in Table 2. Track models such as the GFDL, UKMI, and the consensus numerical forecast, GUNS, had quite low errors, and these models did very well in capturing the recurvature of Rosa. The mean official forecast errors were slightly larger than the most recent ten-year averages.

In general, the intensity of Rosa was over-predicted, by both the official forecasts and by the SHIPS model. Even though the tropical cyclone was mostly in a low vertical shear environment, it did not strengthen much (obviously due to factors other than shear).

Table 3 summarizes the watches and warnings issued for Rosa. The storm made landfall at the eastern end of the original tropical storm warning area, 22 h after the issuance of this warning.

Table 1. Best track, Tropical Storm Rosa, 3 - 8 November 2000.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
03 / 1800	10.3	89.8	1005	25	tropical depression
04 / 0000	10.6	90.7	1002	30	"
04 / 0600	10.7	91.8	1002	30	"
04 / 1200	10.6	92.8	1003	30	"
04 / 1800	10.4	94.2	1003	30	"
05 / 0000	10.4	95.2	1003	30	"
05 / 0600	10.5	96.1	1003	30	"
05 / 1200	10.8	97.0	1002	35	tropical storm
05 / 1800	11.0	97.9	1001	40	"
06 / 0000	11.4	98.5	997	50	"
06 / 0600	11.8	98.8	994	55	"
06 / 1200	12.3	98.8	994	55	"
06 / 1800	12.7	98.7	993	55	"
07 / 0000	13.2	98.7	995	55	"
07 / 0600	13.6	98.2	997	50	"
07 / 1200	14.0	97.7	998	50	"
07 / 1800	14.5	97.3	1000	50	"
08 / 0000	15.0	97.0	1001	45	"
08 / 0600	15.5	96.5	1002	40	"
08 / 1200	16.3	95.9	1003	25	tropical depression
08 / 1800					dissipated
06 / 1800	12.7	98.7	993	55	minimum pressure
08 / 0700	15.7	96.3	1002	35	landfall near Huatulco, Mexico

Table 2.

Preliminary forecast evaluation of Tropical Storm Rosa
Heterogeneous sample

(Errors in nautical miles for tropical storm
and hurricane stages with number
of forecasts in parentheses)

Technique	**Period (hours)**				
	12	**24**	**36**	**48**	**72**
AVNI	37 (10)	88 (8)	100 (6)	184 (4)	
CLIP	61 (9)	136 (7)	228 (6)	377 (4)	
GFDI	27 (10)	38 (8)	70 (6)	108 (3)	
GUNS	27 (8)	31 (7)	44 (6)		
NGPI	65 (9)	79 (8)	118 (6)	73 (3)	
UKMI	44 (8)	55 (7)	103 (6)	13 (1)	
NHC OFFICIAL	47 (10)	88 (8)	110 (6)	140 (4)	
NHC OFFICIAL 1990-1999 10-year average	37 (2494)	69 (2245)	101 (1993)	132 (1760)	189 (1353)

Table 3. Watch and warning summary, Tropical Storm Rosa, November 2000.

Date/time (UTC)	Action	Location
6/1500	Hurricane watch issued	Acapulco to Puerto Angel
7/0900	Tropical storm warning issued	East of Acapulco to Puerto Angel
7/1500	Hurricane watch and tropical storm warning extended eastward	East of Puerto Angel to Salina Cruz
7/1630	Tropical storm warning shifted eastward	Punta Maldonaldo eastward to Tonala
7/1630	Hurricane watch discontinued	Acapulco to Salina Cruz
7/1630	Tropical storm warning discontinued	West of Punta Maldonaldo
8/0900	Tropical storm warning discontinued	Punta Maldonaldo eastward to Tonala

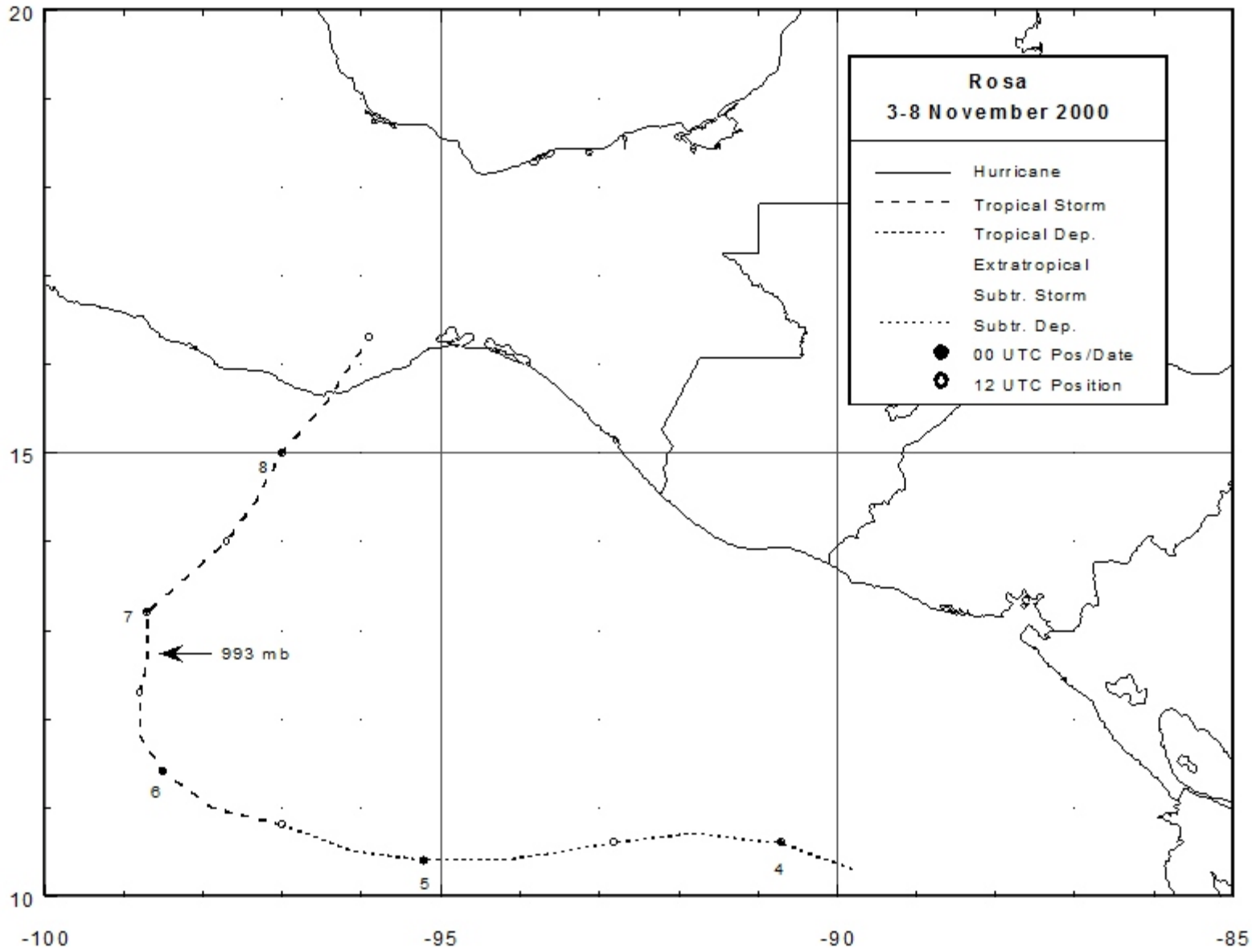

Fig. 1. Best track positions for Tropical Storm Rosa, 3-8 November 2000.

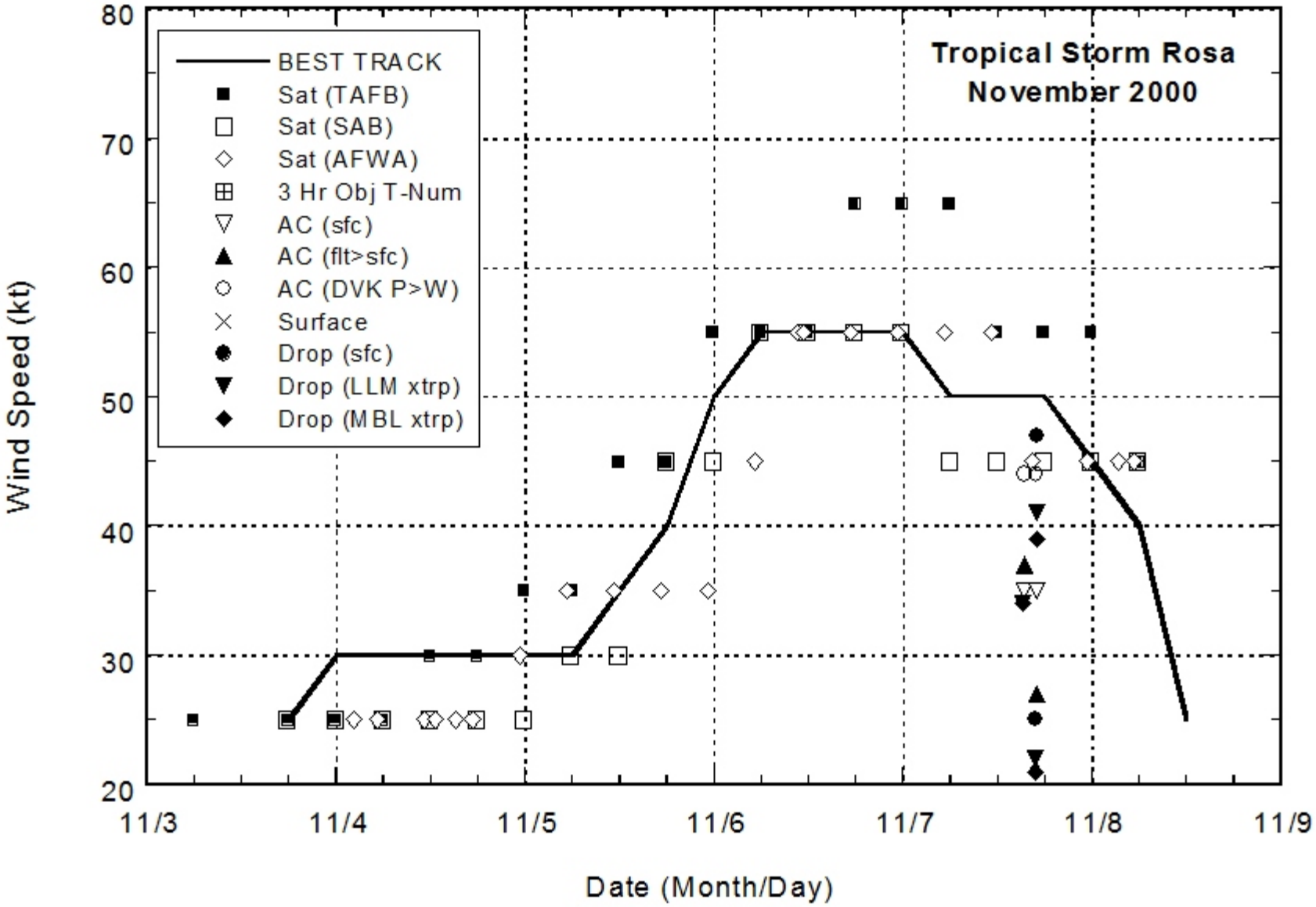

Fig. 2. Best track maximum sustained surface wind speed curve for Tropical Storm Rosa, 3-8 November 2000, along with selected intensity estimates.

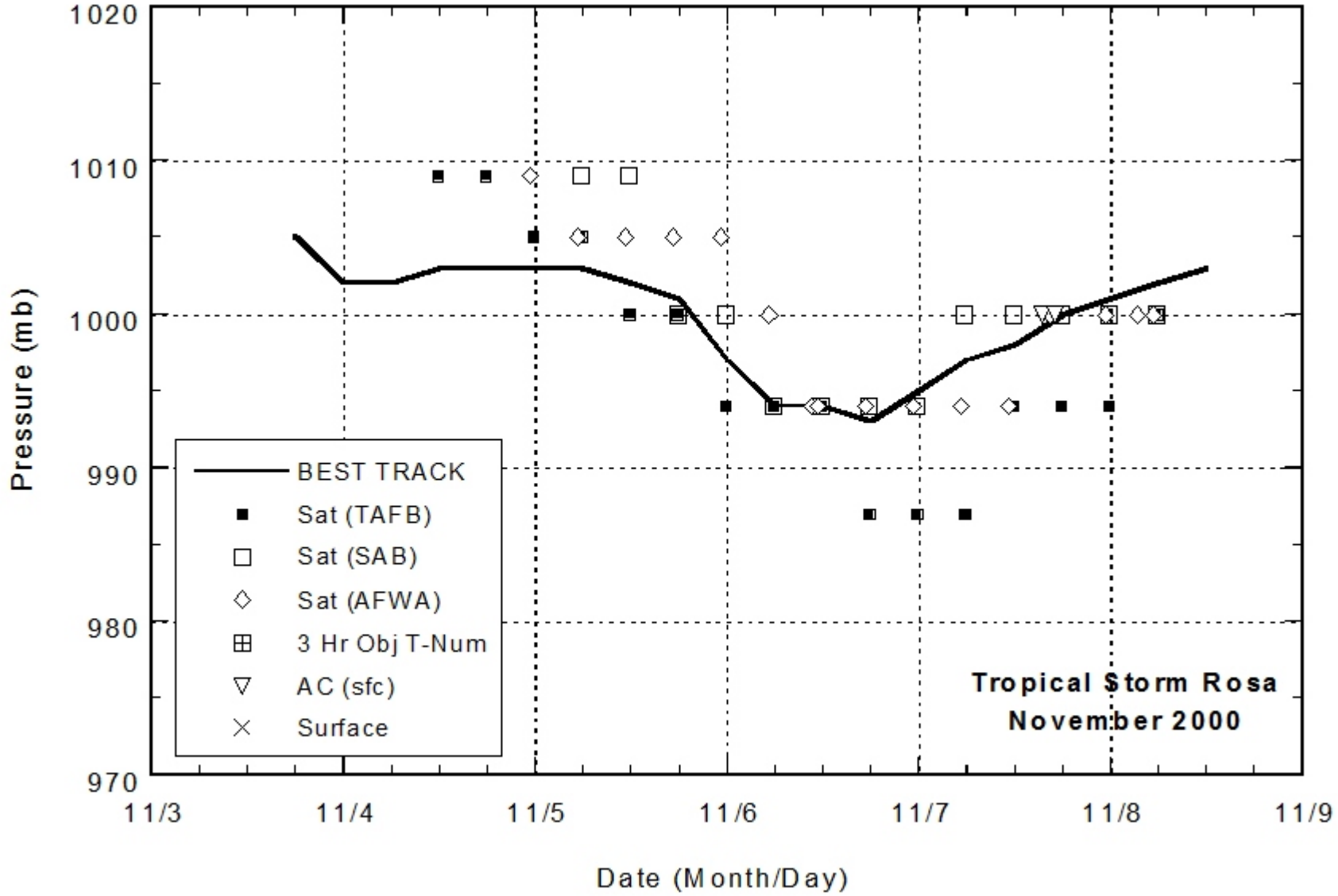

Fig. 3. Best track minimum central pressure curve and central pressure estimates for Tropical Storm Rosa, 3-8 November 2000.