Tropical Cyclone Report
Tropical Storm Rosa
(EP172012)
30 October - 3 November 2012

Todd B. Kimberlain
National Hurricane Center
3 December 2012

Rosa was a slow-moving late-season tropical cyclone that formed well southwest of the Baja California peninsula.

a. Synoptic History

The passage of the Madden-Julian Oscillation (MJO) over the eastern Pacific during the last week in October likely resulted in a breakdown of the Intertropical Convergence Zone (ITCZ). The ITCZ breakdown led to the formation of three vortices by 25 October, with the middle disturbance around 105°W showing the most organization during the following few days; the other two systems ultimately dissipated. Under a middle- to upper-level anticyclone, the disturbance moved west-northwestward but was slow to become better organized due to an abundance of dry low- to mid-level air across the region. A well-defined surface low formed by late on 29 October, but deep convection was disorganized and removed from the circulation center due to westerly shear associated with a trough well to the northwest. The convection increased in coverage and formed closer to the low-level center early on 30 October, and a tropical depression formed around 0600 UTC that day about 610 n mi south-southwest of the southern tip of the Baja California peninsula, the depression strengthened into a tropical storm 6 h later. The "best track" chart of Rosa'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[1].

Rosa moved slowly west-northwestward and then westward to the south of the western end of a weak low- to mid-level ridge through early on 31 October. Despite moderate westerly shear, the cyclone strengthened during that time and reached a peak intensity of 45 kt early on 31 October. The storm drifted southwestward later that day and then south-southwestward by 1 November in response to a blocking mid-level ridge to the northwest. Rosa maintained its strength as it moved away from the region of strongest shear, but westerly shear increased again by 2 November due to a shortwave trough moving quickly through southern California and the eastern Pacific. Although persistent bursts of deep convection continued to form east of the circulation center, weakening commenced by late that day. The tropical storm began moving southwestward and then westward more quickly as the shear increased even further, with the shear causing the low-level center to separate entirely from the small area of deep convection

[1] A digital record of the complete best track, including wind radii, can be found on line at ftp://ftp.nhc.noaa.gov/atcf. Data for the current year's storms are located in the *btk* directory, while previous years' data are located in the *archive* directory.

remaining early on 3 November. Rosa weakened to a tropical depression around 1200 UTC that day, while centered about 840 n mi southwest of the southern tip of the Baja California peninsula. With all of the deep convection dissipating, Rosa degenerated into a remnant low 6 h later. The increasingly shallow cyclone temporarily slowed down and nearly stalled early on 4 November, with the remnant circulation resuming a slightly faster forward speed toward the northwest prior to dissipation early on 5 November about 900 n mi southwest of the southern tip of the Baja California peninsula.

b. Meteorological Statistics

Observations in Rosa (Figs. 2 and 3) include subjective satellite-based Dvorak technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB) and the Satellite Analysis Branch (SAB), and objective Advanced Dvorak Technique (ADT) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Tropical Rainfall Measuring Mission (TRMM), the European Space Agency's Advanced Scatterometer (ASCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Rosa.

The peak intensity estimate of 45 kt for Rosa is based on consensus satellite classifications of T3.0 from SAB and TAFB.

There were no ship reports of winds of tropical storm force in association with Rosa.

c. Casualty and Damage Statistics

There were no reports of damage or casualties associated with Rosa.

d. Forecast and Warning Critique

The system from which Rosa formed was first introduced in the Tropical Weather Outlook (TWO) with a low chance (less than 30%) of development about 78 h prior to genesis. Probabilities then increased to a medium chance (30 to 50 %) 60 h before tropical cyclone formation. The precursor disturbance was expected to move farther north into an environment dominated by strong westerly shear, and as a result the genesis probabilities never reached a high chance (60% or greater). The disturbance instead moved farther south into a relatively lower shear environment.

A verification of NHC official track forecasts for Rosa is given in Table 2a. Official forecast track errors were greater than the mean official errors for the previous 5-yr period at all forecast periods except at 12 h. These errors were significantly above the long-term means beyond 72 h, though the number of verifying forecasts by 96 h is too small to draw meaningful conclusions. The official forecast exhibited a distinct northward bias, similar to most of the

normally better-performing track guidance (Fig. 4). A homogeneous comparison of the official track errors with selected guidance models is given in Table 2b. Only the UKMI and FSSE consistently outperformed OFCL, with TVCE also besting OFCL most of the time. The GFSI and GFS-based GFDI and HWFI were relatively poor in comparison since these models generally forecast a more northerly track.

A verification of NHC official intensity forecasts for Rosa is given in Table 3a. Official forecast intensity errors were considerably lower than the mean official errors for the previous 5-yr period at all forecast times. The official forecasts correctly anticipated that westerly shear would inhibit significant intensification of Rosa. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 3b. The OFCL beat all of the guidance at nearly all forecast times, though the intensity consensus aids (IVCN and ICON) as well as FSSE were generally good performers.

Table 1. Best track for Tropical Storm Rosa, 30 October – 3 November 2012.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
29 / 1800	13.8	114.5	1006	30	low
30 / 0000	14.0	115.0	1006	30	"
30 / 0600	14.2	115.5	1005	30	tropical depression
30 / 1200	14.3	116.0	1004	35	tropical storm
30 / 1800	14.4	116.4	1003	40	"
31 / 0000	14.4	116.7	1003	40	"
31 / 0600	14.4	117.1	1001	45	"
31 / 1200	14.3	117.4	1001	45	"
31 / 1800	14.2	117.7	1002	45	"
01 / 0000	14.1	117.9	1002	45	"
01 / 0600	13.9	118.1	1002	45	"
01 / 1200	13.8	118.2	1002	45	"
01 / 1800	13.7	118.3	1002	45	"
02 / 0000	13.5	118.4	1003	40	"
02 / 0600	13.3	118.5	1003	40	"
02 / 1200	13.1	118.6	1003	40	"
02 / 1800	12.9	118.9	1004	40	"
03 / 0000	12.7	119.2	1005	35	"
03 / 0600	12.6	119.6	1005	35	"
03 / 1200	12.7	120.1	1007	30	tropical depression
03 / 1800	12.7	120.6	1007	30	low
04 / 0000	12.6	121.1	1008	30	"
04 / 0600	12.4	121.3	1009	25	"
04 / 1200	12.4	121.3	1009	25	"
04 / 1800	12.5	121.4	1009	25	"
05 / 0000	12.8	121.6	1009	25	"
05 / 0600	13.1	121.8	1010	20	"
05 / 1200					dissipated
31 / 0600	14.4	117.1	1001	45	Maximum wind and minimum pressure

Table 2a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Rosa, 30 October – 3 November 2012. Mean errors for the 5-yr period 2007-11 are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (Rosa)	**23.4**	49.3	74.9	99.1	146.1	196.7	
OCD5 (Rosa)	34.5	79.4	134.0	192.0	333.9	461.7	
Forecasts	16	14	12	10	6	2	
OFCL (2007-11)	28.6	46.3	62.7	78.1	108.0	145.3	
OCD5 (2007-11)	38.5	74.8	116.0	159.8	246.1	324.2	

Table 2b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Tropical Storm Rosa, 30 October – 3 November 2012. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 2a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	22.2	45.8	62.4	85.7	124.3		
OCD5	30.2	74.2	131.6	182.2	309.1		
GFSI	25.7	**44.5**	64.1	97.8	141.0		
GHMI	34.4	71.5	98.7	134.4	207.3		
HWFI	30.6	56.0	73.2	98.5	**110.9**		
UKMI	**13.6**	**20.2**	**24.0**	**24.8**	**48.5**		
EMXI	**20.8**	**45.0**	68.4	88.1	**115.5**		
CMCI	37.3	75.9	109.6	118.7	255.0		
TVCE	22.4	**42.6**	**58.7**	**82.1**	**106.7**		
FSSE	**20.6**	**42.1**	**59.3**	**76.5**	**86.0**		
AEM	27.9	58.7	84.8	95.3	**113.3**		
LBAR	42.1	87.2	122.7	191.3	323.5		
BAMS	56.8	117.4	197.2	238.5	368.3		
BAMM	36.4	60.0	69.2	**83.7**	**124.0**		
BAMD	51.1	81.1	85.3	136.9	183.0		
Forecasts	12	10	8	8	4		

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Rosa, 30 October – 3 November 2012. Mean errors for the 5-yr period 2007-11 are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL (Rosa)	**1.3**	**2.5**	**5.4**	**5.5**	**5.8**	**7.5**	
OCD5 (Rosa)	3.5	5.1	7.8	8.4	9.7	8.5	
Forecasts	16	14	12	10	6	2	
OFCL (2007-11)	6.4	10.6	13.7	15.1	17.0	18.5	
OCD5 (2007-11)	7.5	12.4	16.1	18.4	20.1	20.1	

Table 3b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Tropical Storm Rosa, 30 October – 3 November 2012. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 3a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	1.0	1.9	5.0	4.4	4.0		
OCD5	3.2	4.6	7.5	8.2	11.6		
HWFI	2.7	5.6	6.7	5.0	9.0		
GHMI	5.7	6.5	6.2	8.4	9.6		
DSHP	2.3	3.4	**3.5**	5.1	11.4		
LGEM	2.6	4.0	5.3	7.7	11.8		
ICON	2.5	3.1	**4.4**	**4.0**	4.6		
IVCN	2.5	3.1	**4.4**	**4.0**	4.6		
FSSE	2.9	3.6	**4.6**	**3.9**	6.6		
Forecasts	15	13	11	9	5		

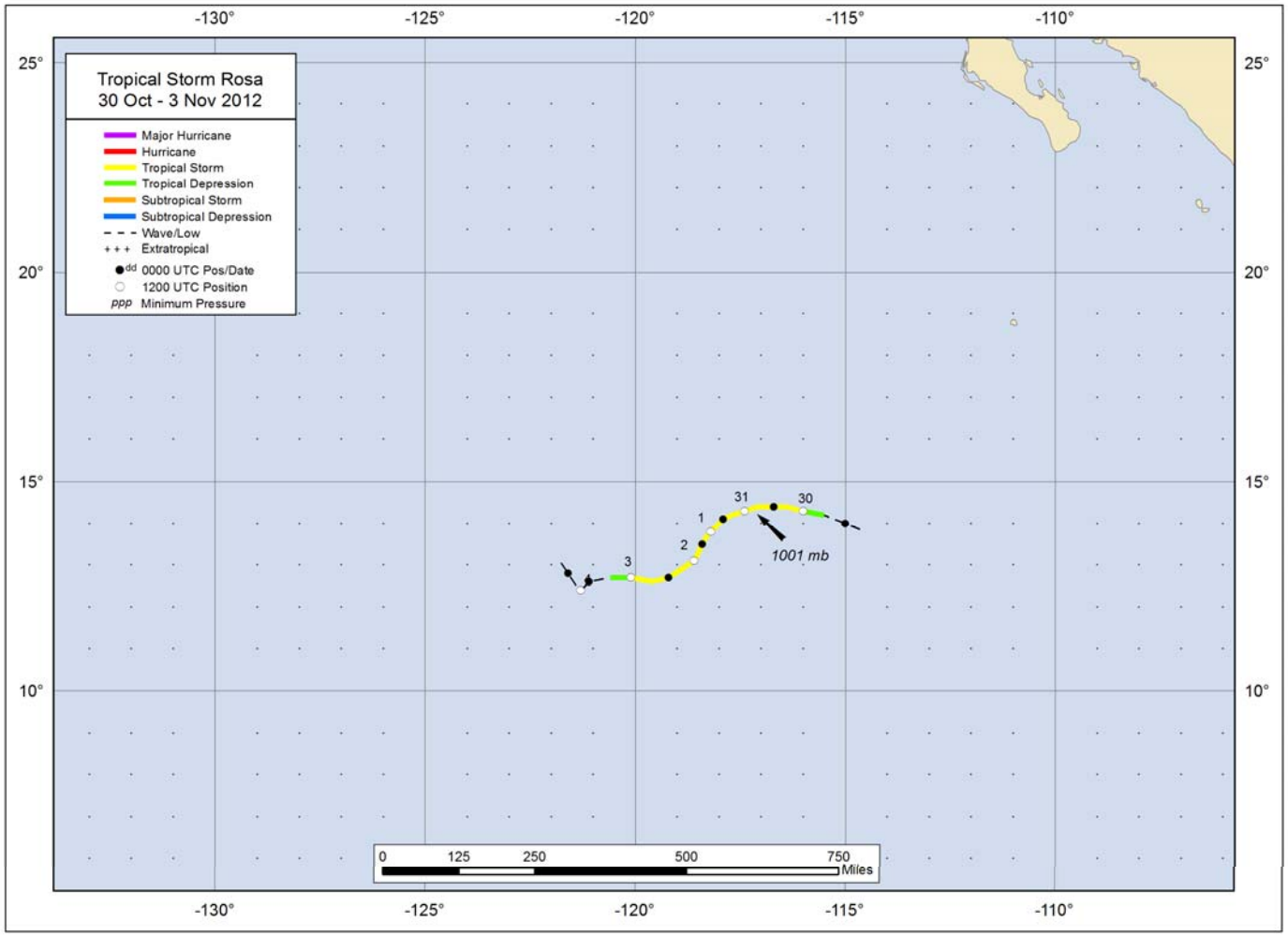

Figure 1. Best track positions for Tropical Storm Rosa, 30 October – 3 November 2012.

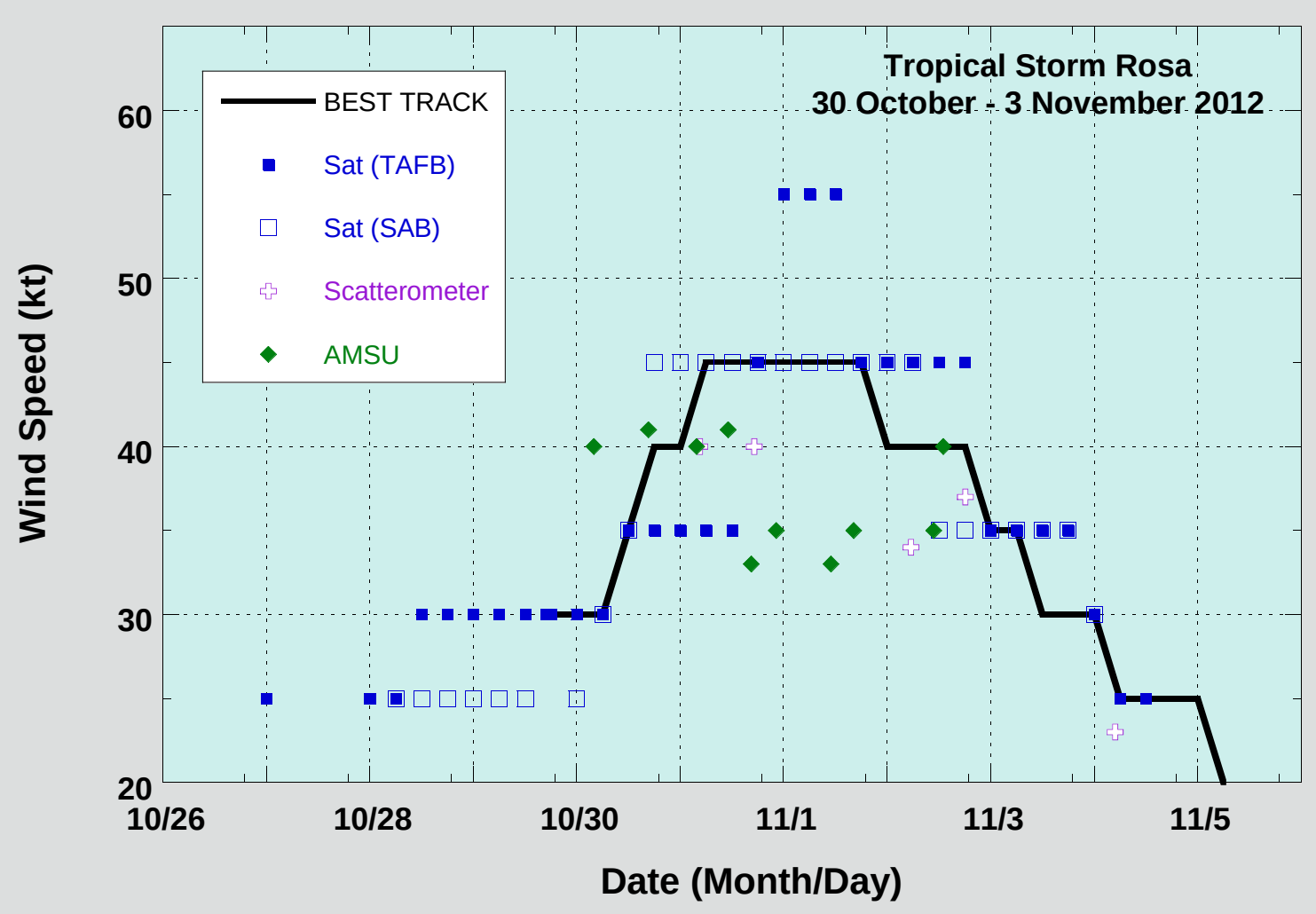

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Rosa, 30 October – 3 November 2012. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

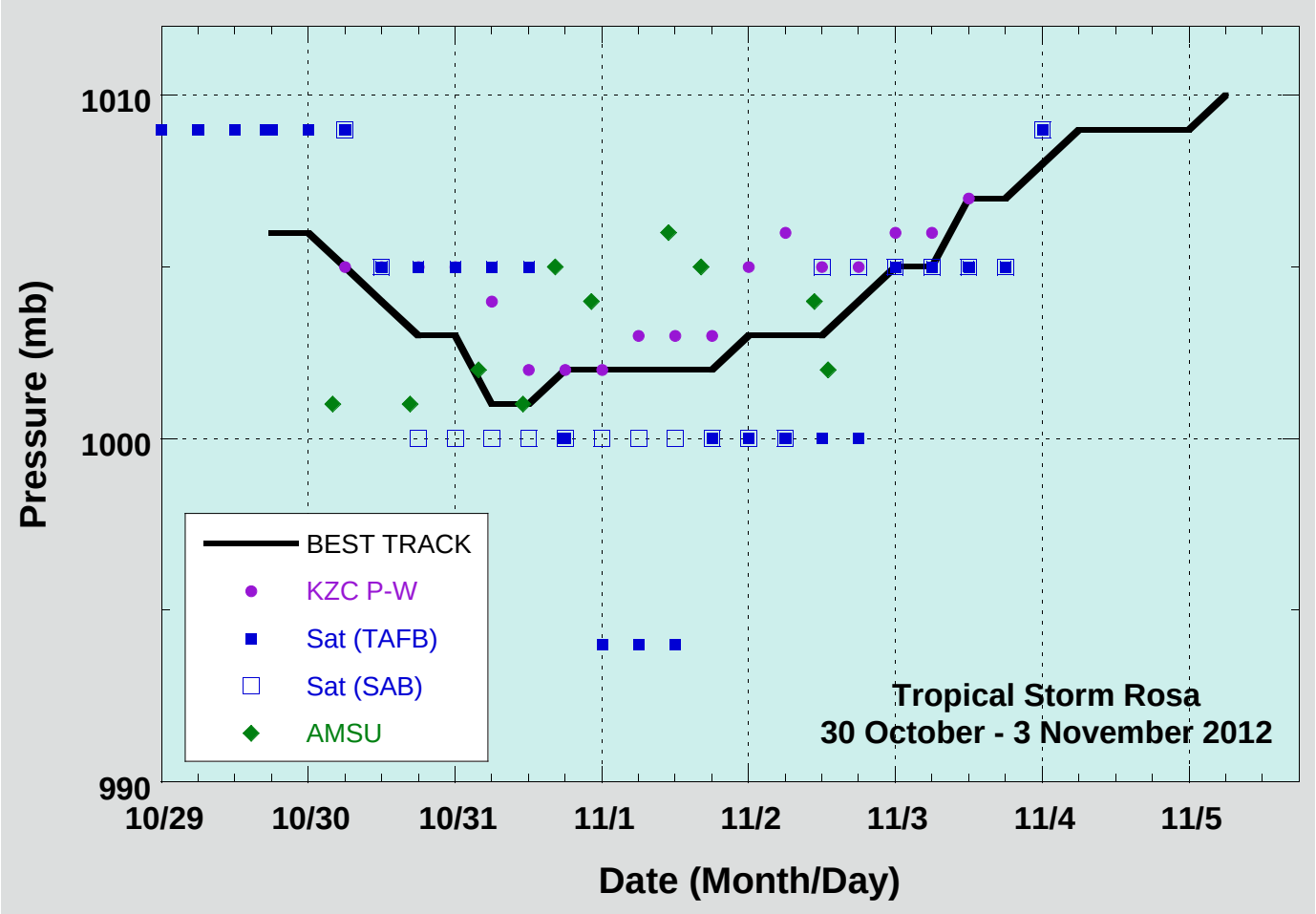

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Rosa, 30 October – 3 November 2012. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. The KZC P-W values are obtained by applying the Knaff-Zehr-Courtney pressure-wind relationship to the best track wind data. Dashed vertical lines correspond to 0000 UTC.

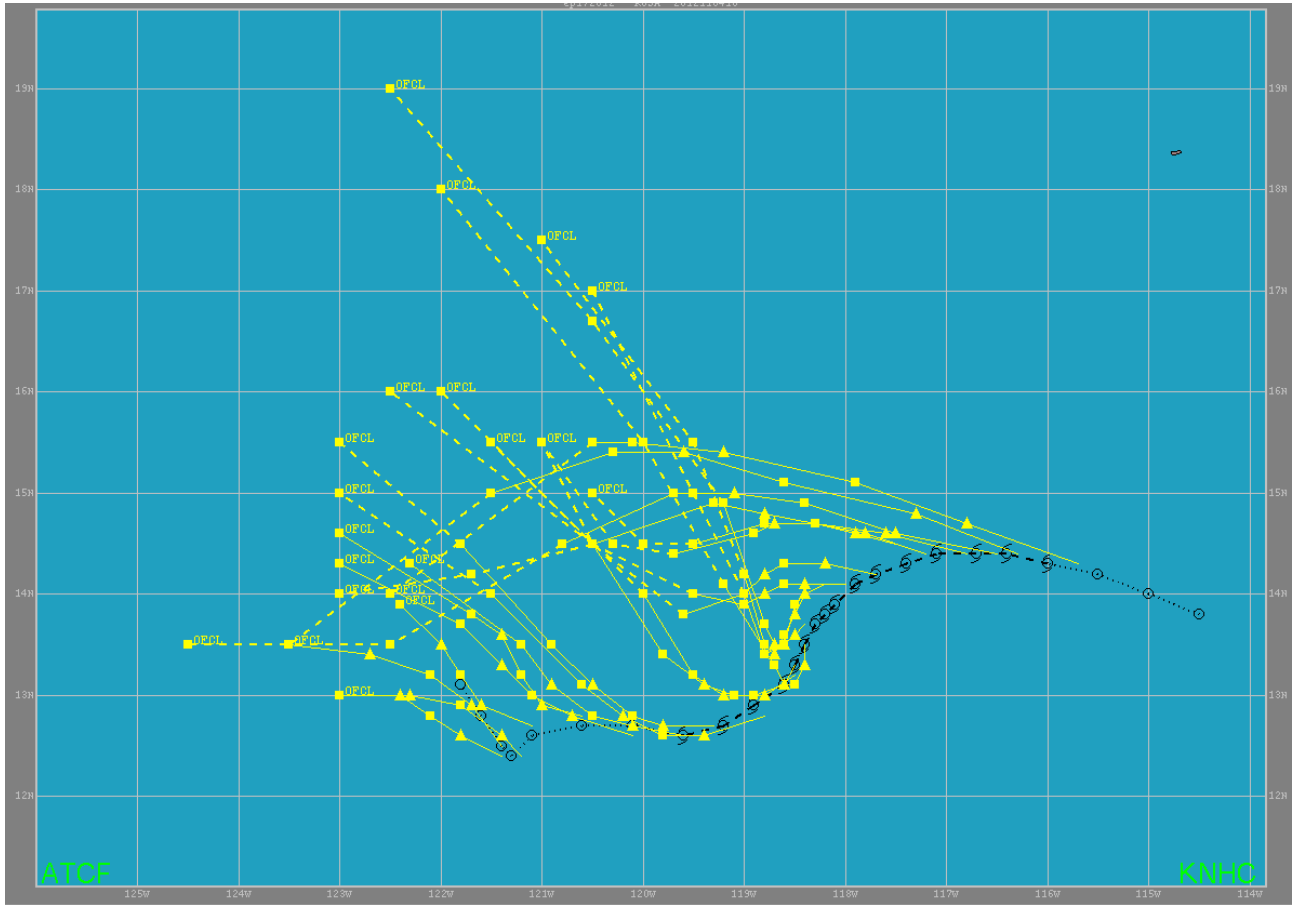

Figure 4. Selected official track forecasts (yellow lines) for Tropical Storm Rosa, 30 October - 3 November 2012. The best track is given by the black line with positions at 6 h intervals.