

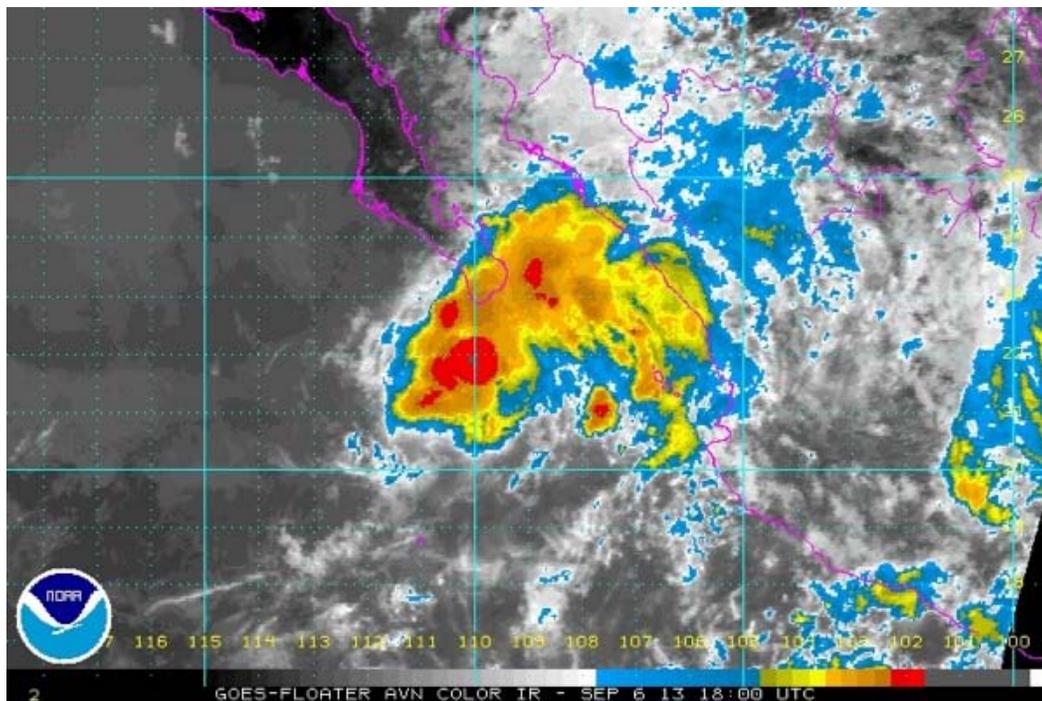


NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM LORENA (EP122013)

5 – 7 Sep 2013

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National Hurricane Center
8 January 2014



GOES-FLOATER AVN COLOR IR - SEP 6 13 18:00 UTC
LORENA NEAR BAJA CALIFORNIA SUR (6 SEP 1800 UTC) - NOAA

Lorena was a tropical storm of moderate intensity that moved close to Baja California Sur. Although Lorena brought tropical storm conditions to the coast, there were no reports of damage or casualties.

Tropical Storm Lorena

5 – 7 SEP 2013

SYNOPTIC HISTORY

The wave that spawned Lorena was first clearly apparent over Central America on 31 August. Convection increased the next day over and south of the Gulf of Tehuantepec near the wave axis, and a broad low formed from the wave on 2 September, with a well-defined mid-level circulation present by late in the day. However, the low-level circulation remained ill defined, and convection did not persist near the surface center. The system moved slowly west-northwestward to northwestward, roughly parallel to the coast of southwestern Mexico. By 1200 UTC 4 September, a well-defined surface low formed, although the associated shower and thunderstorm activity was weak. By 0600 UTC the next day, convection was organized enough to denote the formation of a tropical depression about 125 n mi southwest of Manzanillo, Mexico. The system became a tropical storm 6 h later. The “best track” chart of Lorena’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 1¹.

After genesis, Lorena moved faster to the northwest, steered by a strengthening mid-level ridge over Mexico. Intensification was very gradual due to light-to-moderate southwesterly shear, an elongated low-level structure, and some separation of the low and mid-level centers. As Lorena approached Baja California Sur, convection became a little more organized, and the storm reached an estimated peak intensity of 45 kt from 1200 to 1800 UTC 6 September (cover image). Lorena then weakened when it began to ingest drier and more stable air above the cooler waters located west of Baja California Sur. The tropical cyclone also moved more slowly to the northwest while it passed a short distance offshore of Mexico. Thunderstorms diminished significantly early on 7 September, and Lorena stopped producing any convection after the morning hours, becoming a remnant low at 1800 UTC that day about 50 n mi west-southwest of Santa Fe, Mexico. The low then gradually turned westward and southward, caught in light steering currents. Scatterometer data suggest that the low gradually weakened and opened up into a trough early on 9 September about 100 n mi west of Santa Fe.

METEOROLOGICAL STATISTICS

Observations in Lorena (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

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 *bt* directory, while previous years’ data are located in the *archive* directory.

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 Lorena.

The estimated peak intensity of 45 kt is based on a blend of Dvorak satellite intensity estimates and a 10-min sustained, 41-kt wind report from a Mexican Navy station at 27 m elevation in Cabo Pulmo, Baja California Sur at 1730 UTC 6 September.

There were no ship reports of winds of tropical storm force associated with Lorena.

CASUALTY AND DAMAGE STATISTICS

Although some heavy rains and rough seas affected the southern tip of the Baja California peninsula, there were no reports of damage or casualties associated with Lorena.

FORECAST AND WARNING CRITIQUE

Table 2 indicates how far in advance of genesis the NHC official genesis forecasts first reached the indicated likelihood categories. Overall, the genesis was well forecast, with good lead times in all categories.

A verification of NHC official track forecasts is given in Table 3a. Official forecast track errors were larger than the mean official errors for the previous 5-yr period, and the CLIPER errors were also larger than average. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. The CMCI model, TVCE consensus, and the GFDL model (GHMI) all beat the official forecast at all forecast time periods. The ECMWF model (EMXI) and the HWRF model struggled with the track of Lorena.

A verification of NHC official intensity forecasts is given in Table 4a. Official forecast intensity errors were much lower than the mean official errors for the previous 5-yr period, which matched the lower-than-average CLIPER errors. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The official forecast was superior to all of the guidance at all time periods. This appears to be due to the NHC forecasters recognizing that the initial structure was not conducive for significant intensification. Most of the guidance demonstrated a notable high bias. The intensity consensus (IVCN) model provided the best overall guidance.

Watches and warnings associated with Lorena are given in Table 5.



Table 1. Best track for Tropical Storm Lorena, 5-7 September 2013.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
04 / 1200	17.1	104.9	1006	25	low
04 / 1800	17.2	105.3	1006	25	"
05 / 0000	17.3	105.6	1006	25	"
05 / 0600	17.5	105.8	1005	30	tropical depression
05 / 1200	18.1	106.1	1004	35	tropical storm
05 / 1800	18.9	106.5	1004	35	"
06 / 0000	19.9	107.2	1004	35	"
06 / 0600	20.9	108.0	1003	40	"
06 / 1200	21.8	109.0	1002	45	"
06 / 1800	22.5	110.0	1002	45	"
07 / 0000	22.8	110.8	1003	40	"
07 / 0600	23.2	111.3	1005	35	"
07 / 1200	23.5	111.6	1006	30	tropical depression
07 / 1800	23.8	111.8	1007	25	low
08 / 0000	24.2	112.1	1007	25	"
08 / 0600	24.3	112.6	1007	25	"
08 / 1200	24.1	112.8	1008	20	"
08 / 1800	23.9	112.9	1008	20	"
09 / 0000	23.9	112.8	1008	15	"
09 / 0600					dissipated
06 / 1200	21.8	109.0	1002	45	min pressure / max winds

Table 2. Genesis lead-times for Lorena in the NHC Tropical Weather Outlook for the indicated likeliness categories.

Category	Hours Before Genesis	
	48-Hour Outlook	120-Hour Outlook
Low (<30%)	60	132
Medium (30%-50%)	54	126
High (>50%)	18	60

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Lorena. Mean errors for the previous 5-yr period 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	31.3	66.1	93.4	102.7			
OCD5	65.2	136.2	206.2	255.5			
Forecasts	8	6	4	2			
OFCL (2008-12)	27.0	43.1	57.8	71.9			
OCD5 (2008-12)	37.4	73.0	114.9	158.3			



Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Lorena. Errors smaller than the NHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	31.3	66.1	93.4	102.7			
OCD5	65.2	136.2	206.2	255.5			
GFSI	33.0	55.7	78.1	103.7			
GHMI	27.3	56.2	69.7	60.0			
HWFI	31.3	69.0	109.0	103.9			
EMXI	28.0	73.5	128.9	141.6			
CMCI	34.1	51.0	57.1	22.8			
AEMI	29.6	55.9	72.6	82.5			
TVCE	26.5	55.2	78.1	85.7			
LBAR	50.7	84.4	80.5	49.3			
BAMD	43.8	91.3	127.4	120.6			
BAMM	41.8	85.1	117.7	114.9			
BAMS	38.4	71.5	101.3	138.2			
NAMI	44.4	78.1	121.7	154.5			
Forecasts	8	6	4	2			



Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Lorena. Mean errors for the previous 5-yr period 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	1.9	0.8	5.0	2.5			
OCD5	5.0	1.7	5.8	14.5			
Forecasts	8	6	4	2			
OFCL (2008-12)	6.3	10.5	13.4	14.5			
OCD5 (2008-12)	7.6	12.5	16.5	18.8			

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Lorena. Errors smaller than the NHC official forecast are shown in boldface type.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	1.9	0.8	5.0	2.5			
OCD5	5.0	1.7	5.8	14.5			
GFSI	7.5	11.8	11.8	9.5			
EMXI	6.8	10.2	11.3	9.0			
GHMI	3.6	8.5	11.8	13.5			
HWFI	3.5	7.3	17.3	9.5			
DSHP	4.1	5.7	9.3	17.5			
LGEM	4.6	4.5	9.3	17.5			
IVCN	3.8	3.0	9.5	8.5			
Forecasts	8	6	4	2			



Table 5. Watches and warnings issued for Lorena.

Date/Time (UTC)	Action	Location
5 / 1500	Tropical Storm Watch issued	Agua Blanca to Buenavista
6 / 0300	Tropical Storm Watch changed to Tropical Storm Warning	Agua Blanca to Buenavista
6 / 0300	Tropical Storm Watch issued	Santa Fe to Agua Blanca
6 / 1500	Tropical Storm Watch issued	Buenavista to La Paz
7 / 0600	Tropical Storm Watch discontinued	All
7 / 0600	Tropical Storm Warning discontinued	All

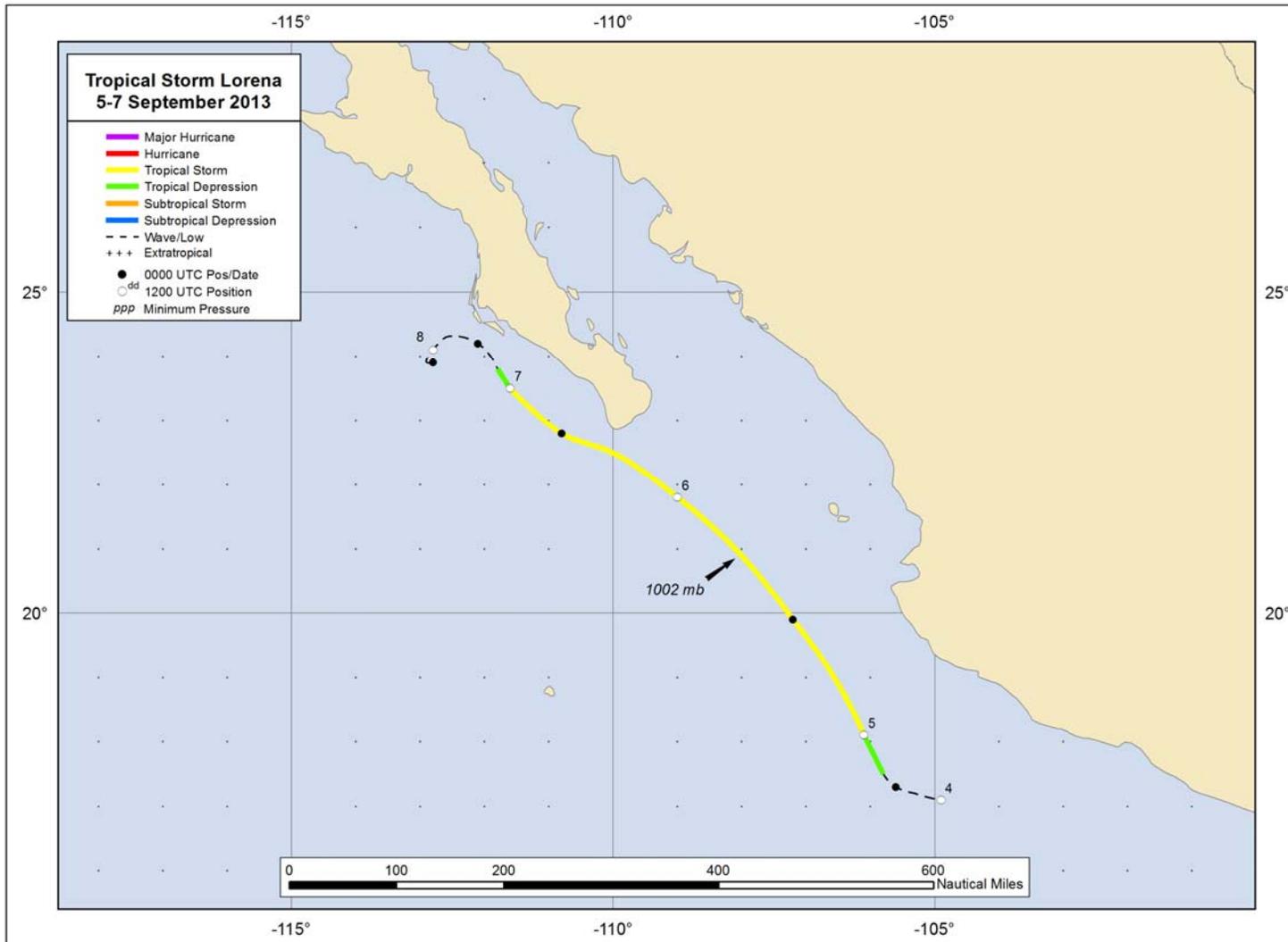


Figure 1. Best track positions for Tropical Storm Lorena, 5-7 September 2013.

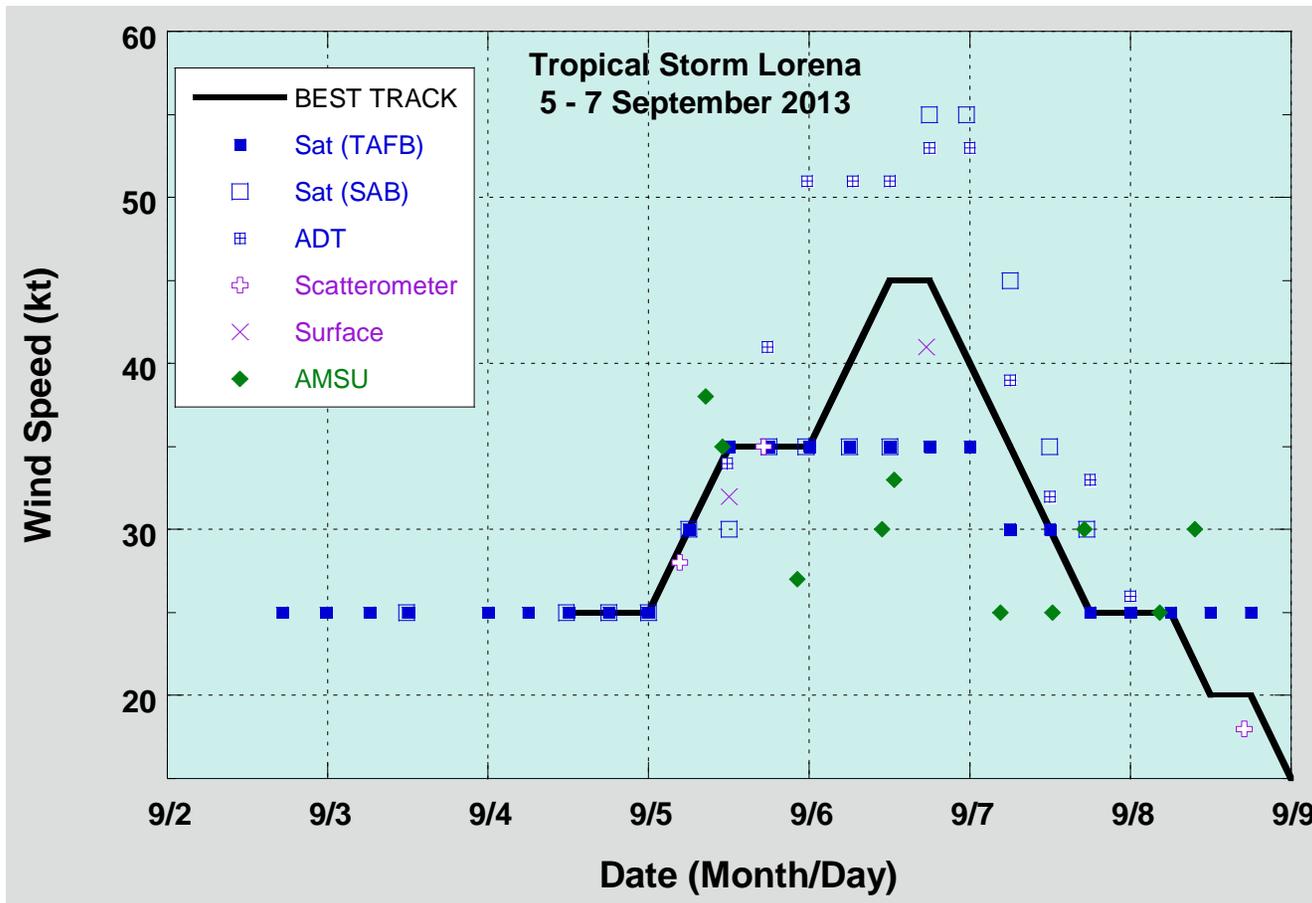


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Lorena. Advanced Dvorak Technique estimates represent the current intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

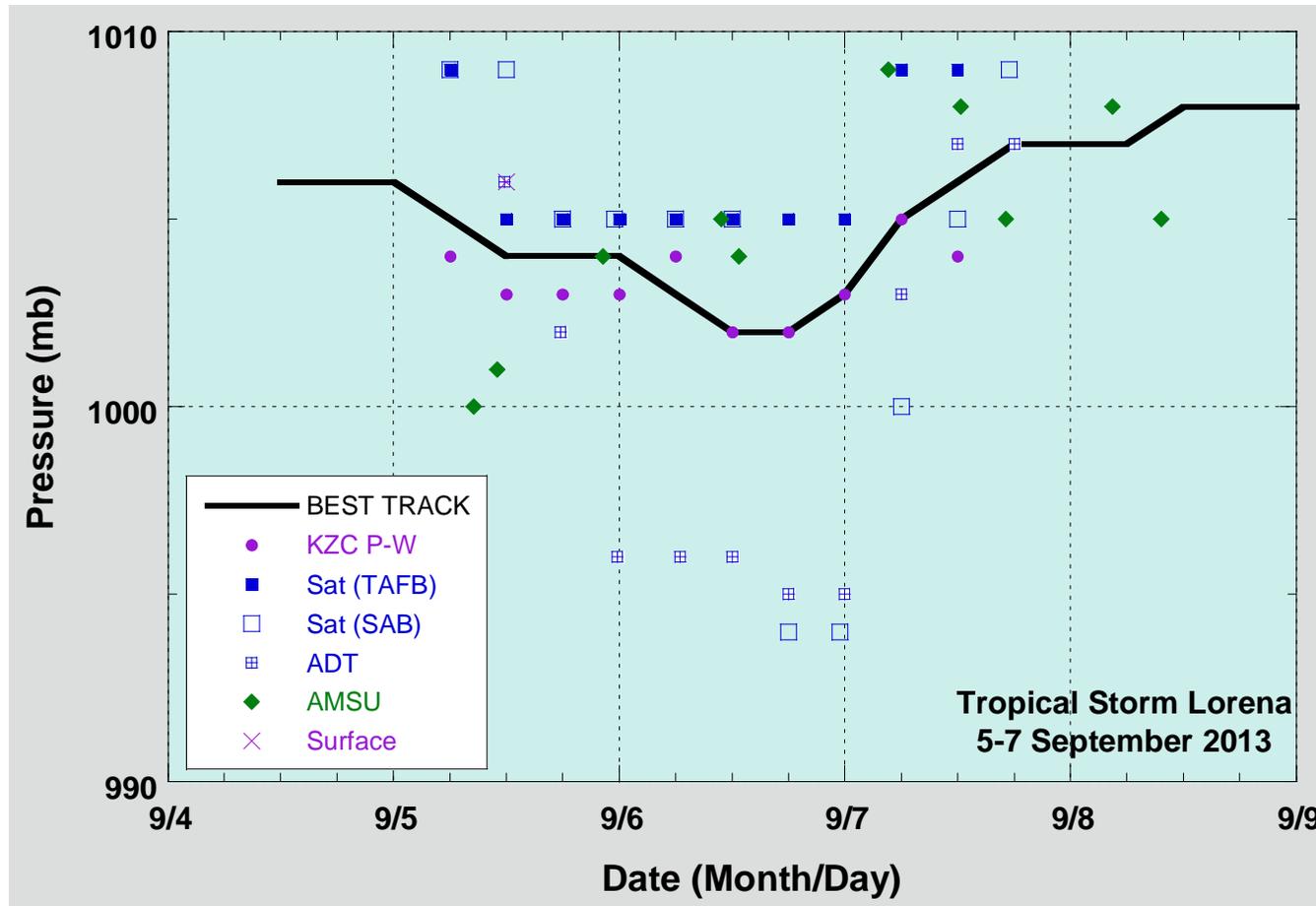


Figure 3. Selected pressure observations and best track minimum central pressure curve for Lorena. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC.