

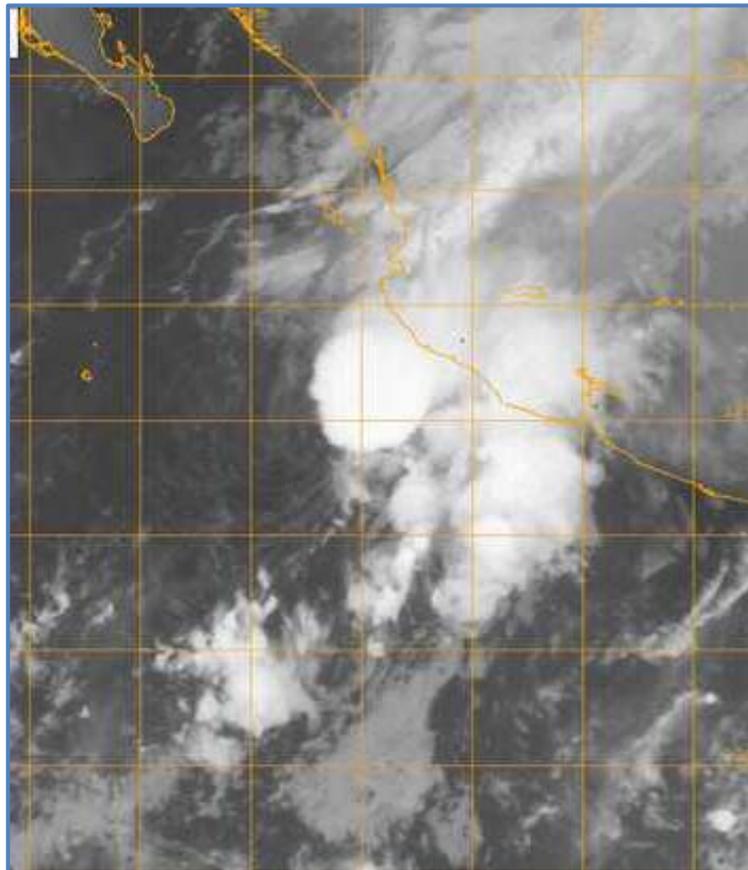


NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM TINA (EP212016)

13 – 14 November 2016

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INFRARED SATELLITE IMAGE OF TINA AT 1200 UTC 13 NOVEMBER. IMAGE COURTESY OF NRL MONTERREY.

Tina was a weak and short-lived late-season tropical storm that formed off of the southwestern coast of Mexico and soon dissipated due to high shear.

Tropical Storm Tina

13 – 14 NOVEMBER 2016

SYNOPTIC HISTORY

Tina's pre-cursor system had an unusual origin. A low- to mid-level trough, extending from the eastern Gulf of Mexico through the western subtropical Atlantic, sagged southward into the northern Caribbean Sea the last few days of October. A piece of vorticity fractured from the western end of the trough by 2 November and slowly moved southwestward into Panama and Costa Rica around 5 November. This disturbance moved south of Central America and southern Mexico while the intensity of its associated deep convection fluctuated diurnally during the next few days. After the system reached 100°W on 8 November, the disturbance spawned a small low pressure area. Deep convection increased significantly in coverage and intensity between 105°W and 110°W, when the low encountered a large mid- to upper-level trough that extended from the central United States southwestward into the eastern Pacific. Widespread cloudiness and disorganized thunderstorms continued in association with the low during the next few days, but became more persistent, possibly as a result of the passage of a convectively coupled Kelvin wave that was moving across the eastern portion of the eastern Pacific basin around this time.

The low turned northwestward and northward around the southwestern periphery of a low- to mid-level high over Mexico on 10 and 11 November while becoming broader and less defined in an environment of increasing southwesterly shear. By 12 November, deep convection increased substantially in coverage and intensity, taking the form of a long band without much curvature. A 1622 UTC ASCAT pass that day indicated that the low's broad circulation had become better defined while the system was moving slowly north-northeastward toward the southwestern coast of Mexico. Late on 12 November, a smaller-scale low-level circulation was forming within the broader low well to the north, closer to the deep convection. The circulation of this feature gradually became dominant and well defined, and deep convection formed closer to this center by early on 13 November. It is estimated that a tropical storm formed around 0600 UTC 13 November about 185 n mi west-southwest of Manzanillo, 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 1¹.

Tina drifted north-northeastward and then northward in a deep-layer south-southwesterly flow ahead of the mid- to upper-level trough to its northwest. The cyclone's cloud pattern appeared best organized between 0600 and 1200 UTC on 13 November (front cover figure), although the low-level center was exposed to the southwest of the cyclone's main convective mass due to about 30 kt of southwesterly 850-200-mb shear. Although Tina's deep convection diminished significantly later on 13 November, another short-lived burst occurred around 0000

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*k directory, while previous years' data are located in the *archive* directory.

UTC 14 November. Tina's heading turned northwestward early on 14 November when the cyclone's low- and mid-level centers began to separate. With much of the deep convection now greatly reduced in coverage, the shallower cyclone began to move west-northwestward and westward in the low-level flow around the eastern Pacific subtropical ridge. The shear then increased further while the atmosphere in which the tropical cyclone was embedded dried out significantly, and Tina weakened to a depression at 0600 UTC 14 November and became a remnant low 6 h later. The remnant low moved westward for several days, eventually dissipating shortly after 1200 UTC 18 November about 350 n mi southwest of the southern tip of the Baja California peninsula.

METEOROLOGICAL STATISTICS

Observations in Tina (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 Global Precipitation Mission (GPM), 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 Tina.

There were no land or ship reports of winds of tropical storm force associated with Tina.

Tina's estimated peak intensity of 35 kt is based on an ASCAT pass from 1622 UTC 13 November.

Heavy rains associated with Tina affected portions of Colima and western Jalisco in Mexico. Storm-total rainfall accumulations in these areas were generally under a few inches, and there were no reports of significant flooding.

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Tina was poorly forecast. The system from which Tina developed was introduced in the 48-h and extended-range Tropical Weather Outlook 108 h prior to genesis. Table 2. However, genesis probabilities were never raised to the medium category until after tropical cyclone formation had occurred in post-analysis. [Table 2](#) provides the number of hours



in advance of formation associated with the first NHC Tropical Weather Outlook (TWO) forecast in each likelihood category. It was thought that the high-shear environment in which Tina's precursor disturbance was embedded would preclude the development of a tropical cyclone, especially since November tropical cyclone formations in the eastern Pacific are rare. Although a consensus of global models did indicate the possibility of a weak tropical cyclone forming about 72 h prior to genesis, the guidance also suggested that the cyclone would only exist for a short time. It is not uncommon for NHC genesis forecasts for short-lived and weak tropical cyclones to have a low bias, as was the case for Tina, since many of these systems form in marginal or hostile environments.

There were no official track or intensity forecasts for Tina that verified since the cyclone was so short-lived.

There were no coastal tropical cyclone watches or warnings associated with Tina.



Table 1. Best track for Tropical Storm Tina, 13 - 14 November, 2016.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
13 / 0600	17.5	107.3	1005	35	tropical storm
13 / 1200	17.7	107.2	1004	35	"
13 / 1800	17.9	107.2	1005	35	"
14 / 0000	18.3	107.2	1005	35	"
14 / 0600	18.6	107.7	1006	30	tropical depression
14 / 1200	18.8	108.3	1007	30	low
14 / 1800	18.9	108.8	1008	30	"
15 / 0000	19.0	109.4	1009	25	"
15 / 0600	19.0	110.0	1009	25	"
15 / 1200	19.0	110.5	1009	25	"
15 / 1800	19.0	111.0	1009	25	"
16 / 0000	19.0	111.5	1010	20	"
16 / 0600	18.9	112.0	1011	20	"
16 / 1200	18.9	112.5	1011	20	"
16 / 1800	18.9	112.8	1012	20	"
17 / 0000	18.8	112.9	1013	20	"
17 / 0600	18.8	113.0	1013	20	"
17 / 1200	18.9	113.1	1013	20	"
17 / 1800	18.9	113.4	1014	15	"
18 / 0000	18.9	113.7	1014	15	"
18 / 0600	18.9	114.2	1014	15	"
18 / 1200	19.1	114.7	1014	15	"
18 / 1800					dissipated
13 / 1200	17.7	107.2	1004	35	minimum pressure and maximum winds



Table 2. Number of hours in advance of formation associated with the first NHC Tropical Weather Outlook forecast in the indicated likelihood category. Note that the timings for the “Low” category do not include forecasts of a 0% chance of genesis.

	Hours Before Genesis	
	48-Hour Outlook	120-Hour Outlook
Low (<40%)	108	108
Medium (40%-60%)		
High (>60%)		

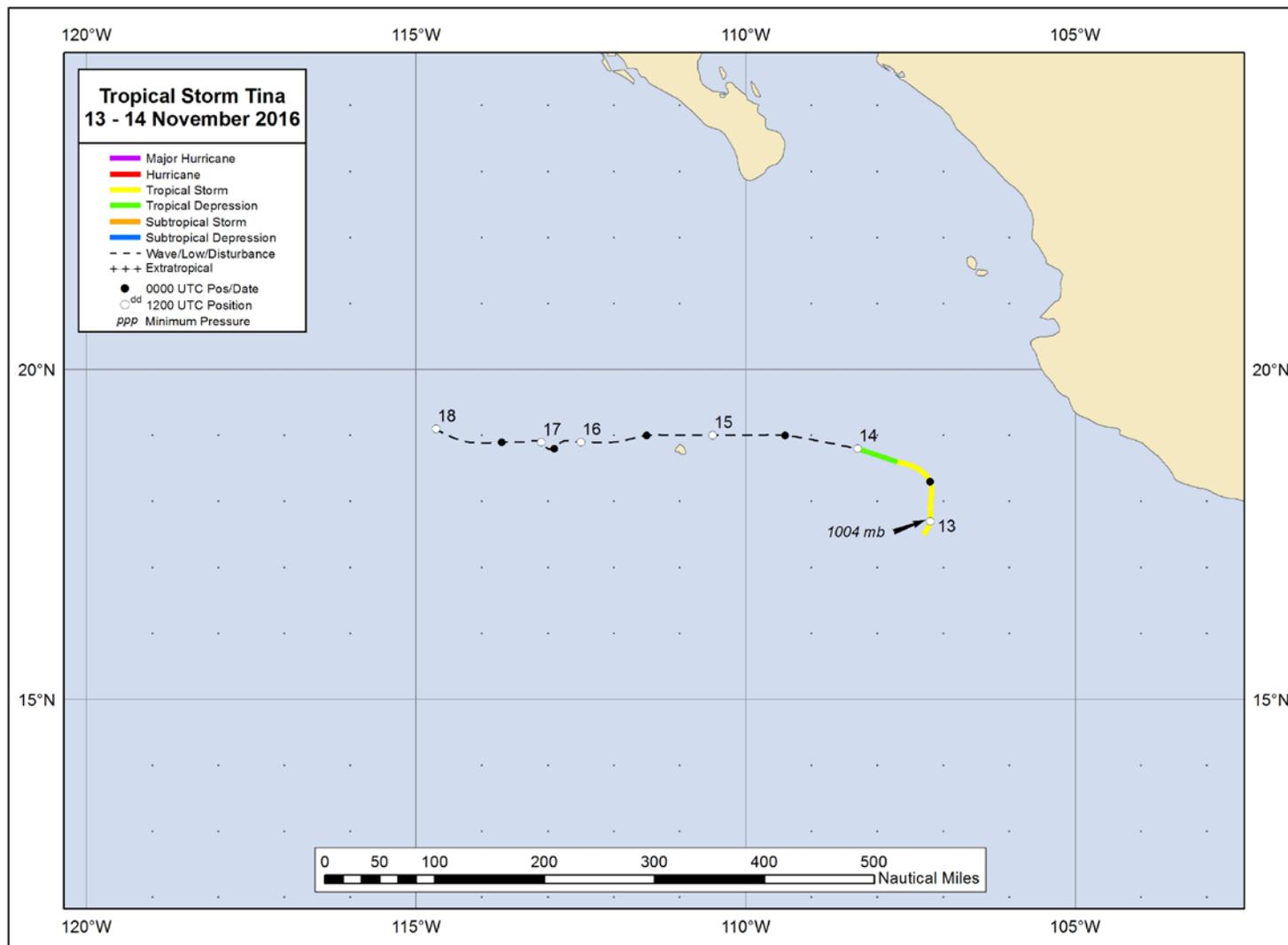


Figure 1. Best track positions for Tropical Storm Tina, 13 - 14 November, 2016.

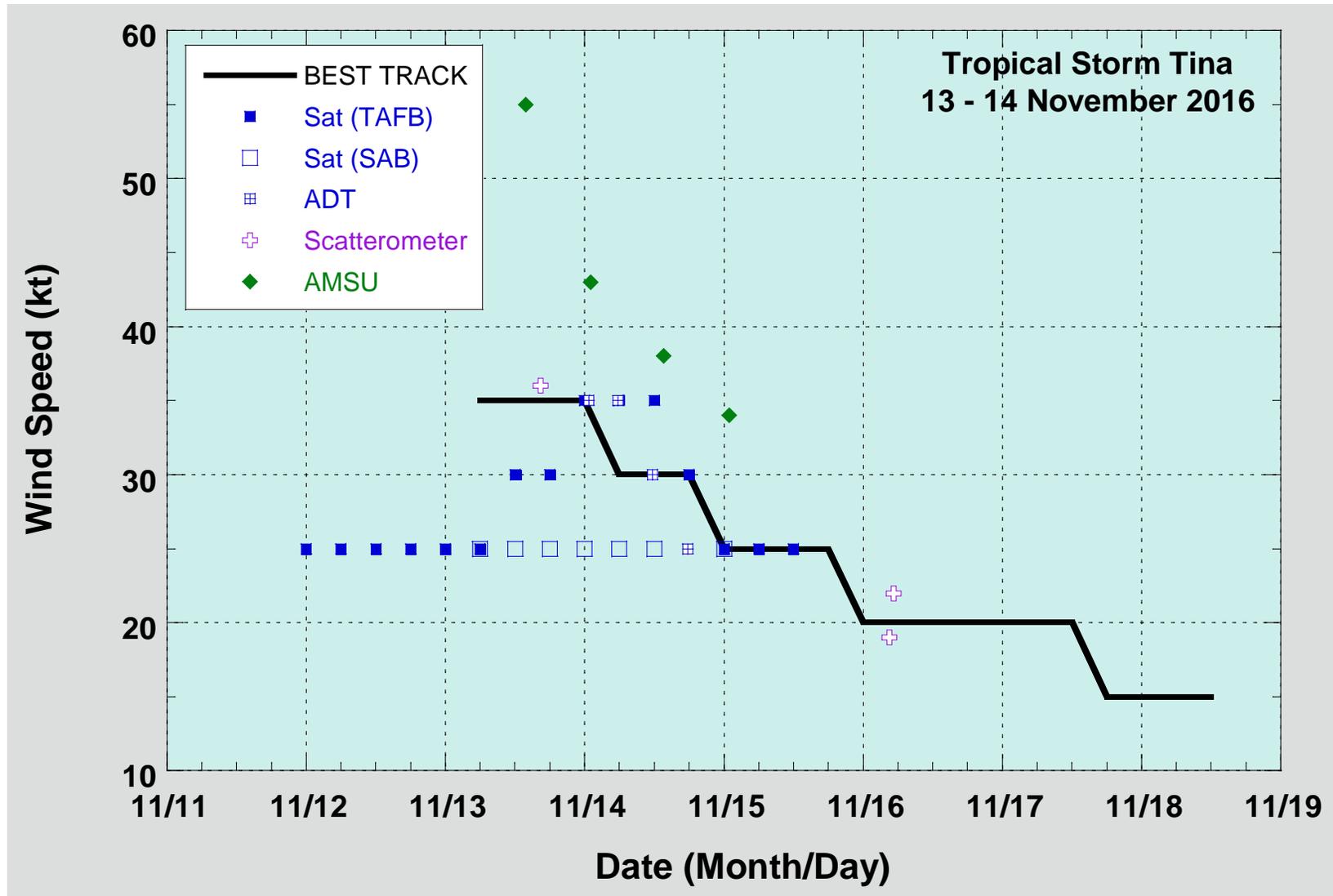


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Tina, 13 - 14 November, 2016. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC.

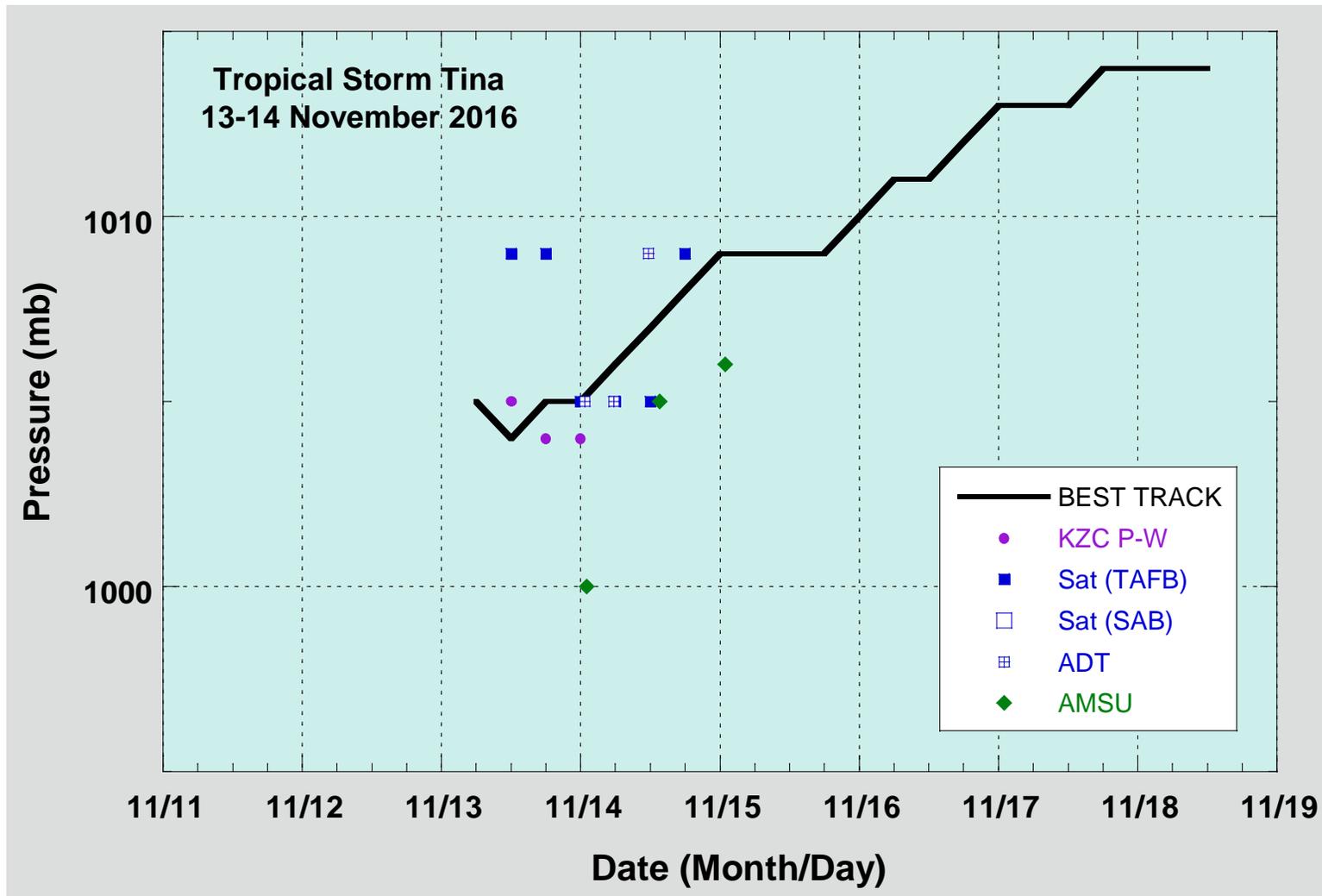


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Tina, 13 - 14 November, 2016. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for 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.