NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

TROPICAL STORM PAINE

(EP172022)

3–5 October 2022

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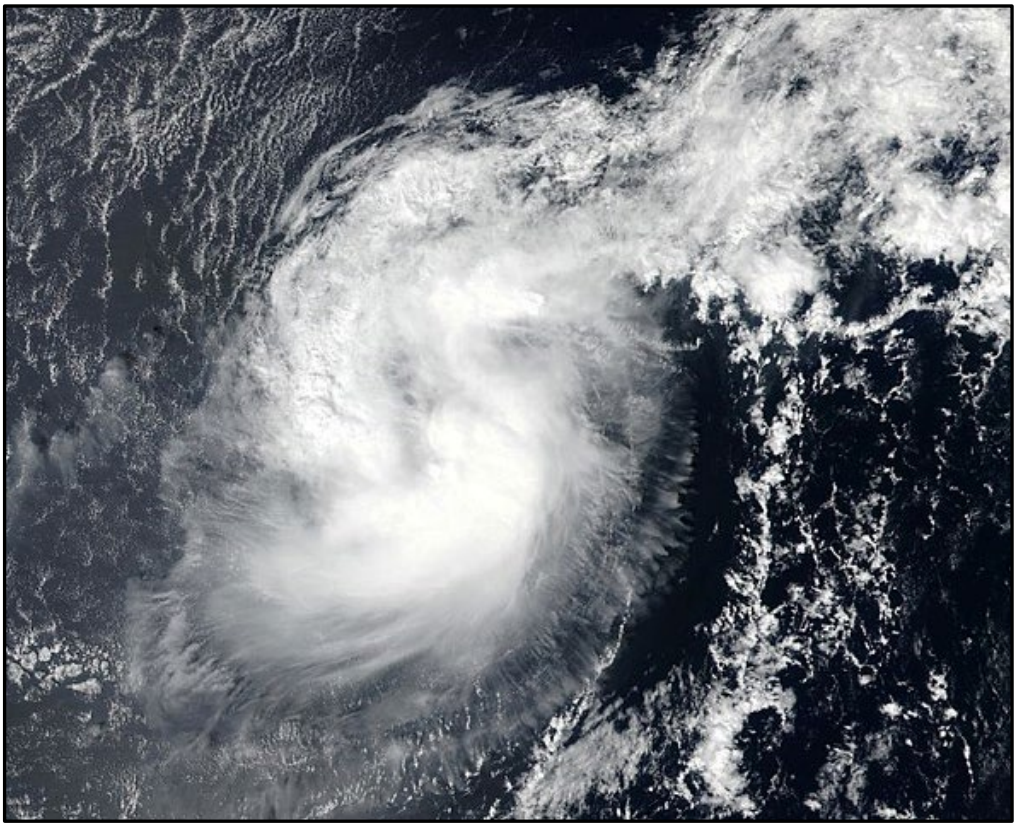

GOES-16 GEOCOLOR SATELLITE IMAGE OF TROPICAL STORM PAINE AT 1910 UTC 4 OCTOBER 2022. IMAGE COURTESY OF NASA.

Paine was a short-lived tropical storm over the central portion of the eastern North Pacific basin that did not affect land.

Tropical Storm Paine

3–5 OCTOBER 2022

SYNOPTIC HISTORY

The origins of Paine can be traced back to a disturbance that developed within the monsoon trough and Intertropical Convergence Zone on 27 September about 850 n mi southwest of the coast of southwestern Mexico. The system initially moved little during the next couple of days, but it began to move northeastward on 30 September in part due to the influence of Hurricane Orlene near the coast of southwestern Mexico. Although the compact disturbance produced persistent deep convection during the next couple of days, it lacked a well-defined center during that time. Satellite images indicated that a well-defined center of circulation formed by 0600 UTC 3 October, marking the formation of a tropical depression about 450 n mi southwest of the coast of southwestern 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[1].

After genesis, the cyclone turned north-northwestward toward a weakness in the subtropical ridge, and it strengthened slowly. Although northeasterly vertical wind shear displaced the associated deep convection to the southwest of the center, the depression still managed to strengthen to Tropical Storm Paine by 1800 UTC 3 October. On 4 October, a mid-level ridge began to build to the north of Paine, causing the cyclone to turn to the northwest, and the vertical wind shear decreased slightly. Paine reached its peak intensity of 40 kt at 1800 UTC that day, at which time deep convection associated with the small system was located over the low-level center (cover image). Shortly thereafter, however, the thunderstorm activity decreased drastically due to intrusions of dry air and an increase in shear, and Paine started to weaken. After failing to produce organized deep convection, the system is estimated to have degenerated into a remnant low by 0600 UTC 5 October about 350 n mi south-southwest of the southern tip of the Baja California peninsula.

Although Paine produced small and short-lived bursts of deep convection later on 5 and 6 October, they were not significant, and the system continued to slowly weaken. The remnant low moved generally westward to northwestward in the low-level flow at a slow forward speed before dissipating by 1800 UTC 7 October about 500 n mi west-southwest of the southern tip of the Baja California peninsula.

[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.

METEOROLOGICAL STATISTICS

Observations in Paine (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), objective Advanced Dvorak Technique (ADT) estimates and Satellite Consensus (SATCON) 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 Paine.

Winds and Pressure

The peak intensity of 40 kt at 1800 UTC 4 October is based on a blend of the 2.5/35 kt subjective Dvorak estimates from TAFB and SAB, and ADT and SATCON estimates between 40 and 45 kt. This was also the time when the satellite appearance of Paine appeared most organized with some banding features noted and the center embedded in the associated deep convection (cover image). The estimated minimum pressure of 1005 mb at 1800 UTC 4 October is based on Dvorak estimates and the Knaff-Zehr-Courtney (KZC) pressure-wind relationship.

There were no reports of tropical-storm-force winds associated with Paine from ships or surface stations.

CASUALTY AND DAMAGE STATISTICS

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

FORECAST AND WARNING CRITIQUE

The genesis of Paine was not particularly well forecast as the cyclone formed sooner than anticipated (Table 2). The potential for development of Paine was first noted in the Tropical Weather Outlook (TWO) with a low (<40%) chance of formation 66 h prior to genesis. The 5-day formation chances were increased to the medium (40–60%) and high (>60%) categories 42 h and only 6 h before Paine formed, respectively. For the 2-day outlook, a low formation chance was also added into the TWO 66 h before formation. The 2-day probabilities were raised to the medium and high categories 30 h and 6 h before Paine developed, respectively. NHC accurately forecast the location of Paine's formation, with the location of genesis occurring in 92% of the tropical cyclone genesis areas depicted in the Graphical Tropical Weather Outlook (Fig. 4).

Due to Paine's short existence, there were only four verifying 12-h forecasts and two verifying 24-h forecasts. Thus, a comprehensive verification of official and guidance track and intensity forecast errors is not provided. The verifying forecasts had average track errors of 18.5 n mi and 31.1 n mi at 12 and 24 h, respectively. Both of these values are slightly below the previous 5-yr means. Regarding the NHC intensity errors, the 12-h forecasts had an average error of 3.8 kt and the two 24-h forecasts had no error. These values are well below the previous 5-yr means.

There were no land-based watches or warnings associated with Paine.

Table 1. Best track for Tropical Storm Paine, 3–5 October 2022.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
03 / 0600	14.9	111.5	1007	30	tropical depression
03 / 1200	15.4	111.7	1007	30	"
03 / 1800	15.9	111.9	1006	35	tropical storm
04 / 0000	16.4	112.2	1006	35	"
04 / 0600	16.8	112.5	1006	35	"
04 / 1200	17.2	112.9	1006	35	"
04 / 1800	17.5	113.2	1005	40	"
05 / 0000	17.8	113.5	1006	35	"
05 / 0600	18.1	113.9	1007	30	low
05 / 1200	18.3	114.3	1007	30	"
05 / 1800	18.3	114.7	1008	25	"
06 / 0000	18.2	114.9	1008	25	"
06 / 0600	18.1	115.1	1009	25	"
06 / 1200	18.1	115.4	1009	25	"
06 / 1800	18.1	115.6	1009	25	"
07 / 0000	18.2	115.9	1009	25	"
07 / 0600	18.5	116.2	1009	20	"
07 / 1200	19.0	116.5	1009	20	"
07 / 1800					dissipated
04 / 1800	17.5	113.2	1005	40	minimum pressure and maximum wind

Table 2. Number of hours in advance of formation of Paine 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%)	66	66
Medium (40%-60%)	30	42
High (>60%)	6	6

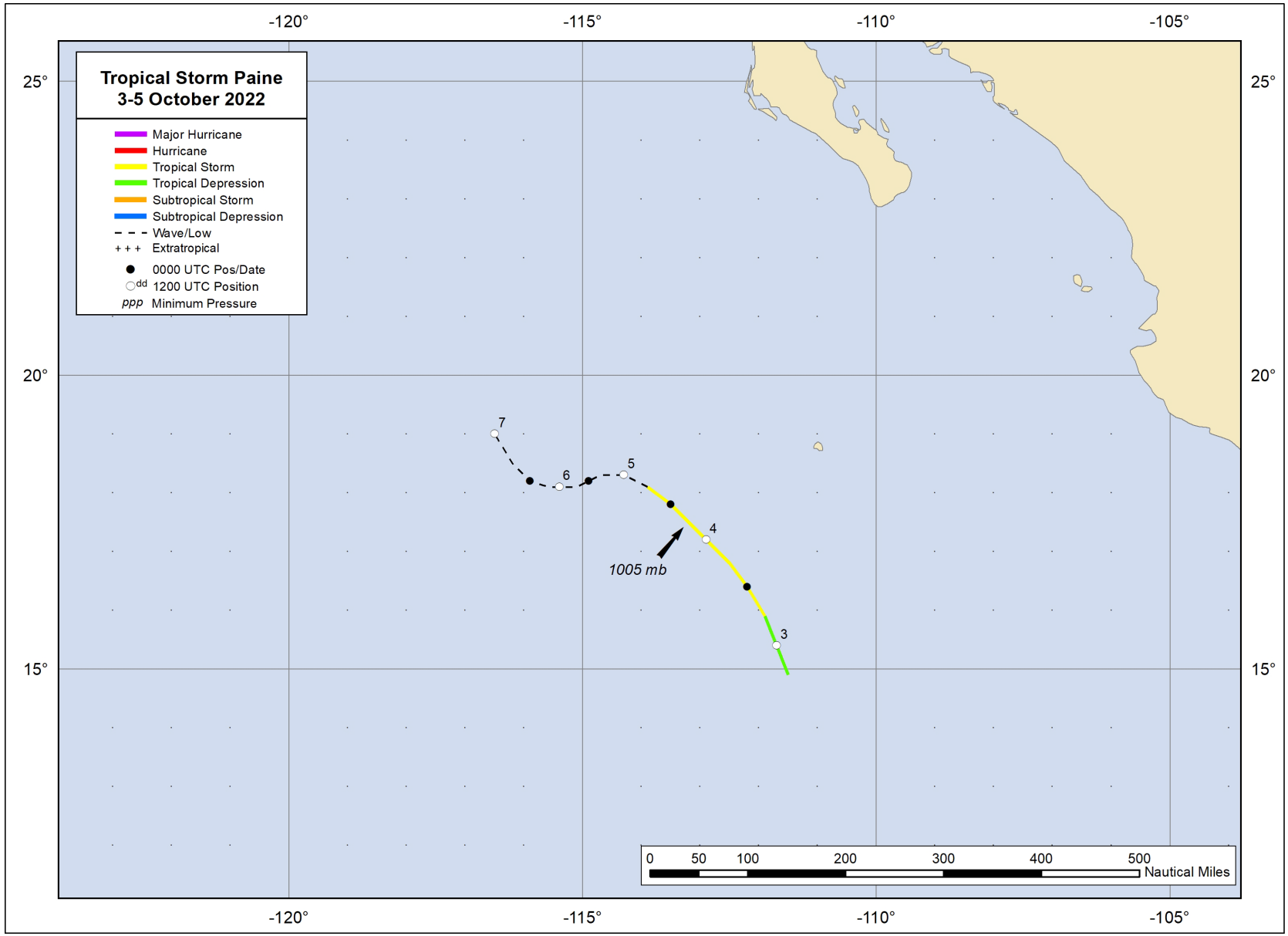

Figure 1. Best track positions for Tropical Storm Paine, 3–5 October 2022.

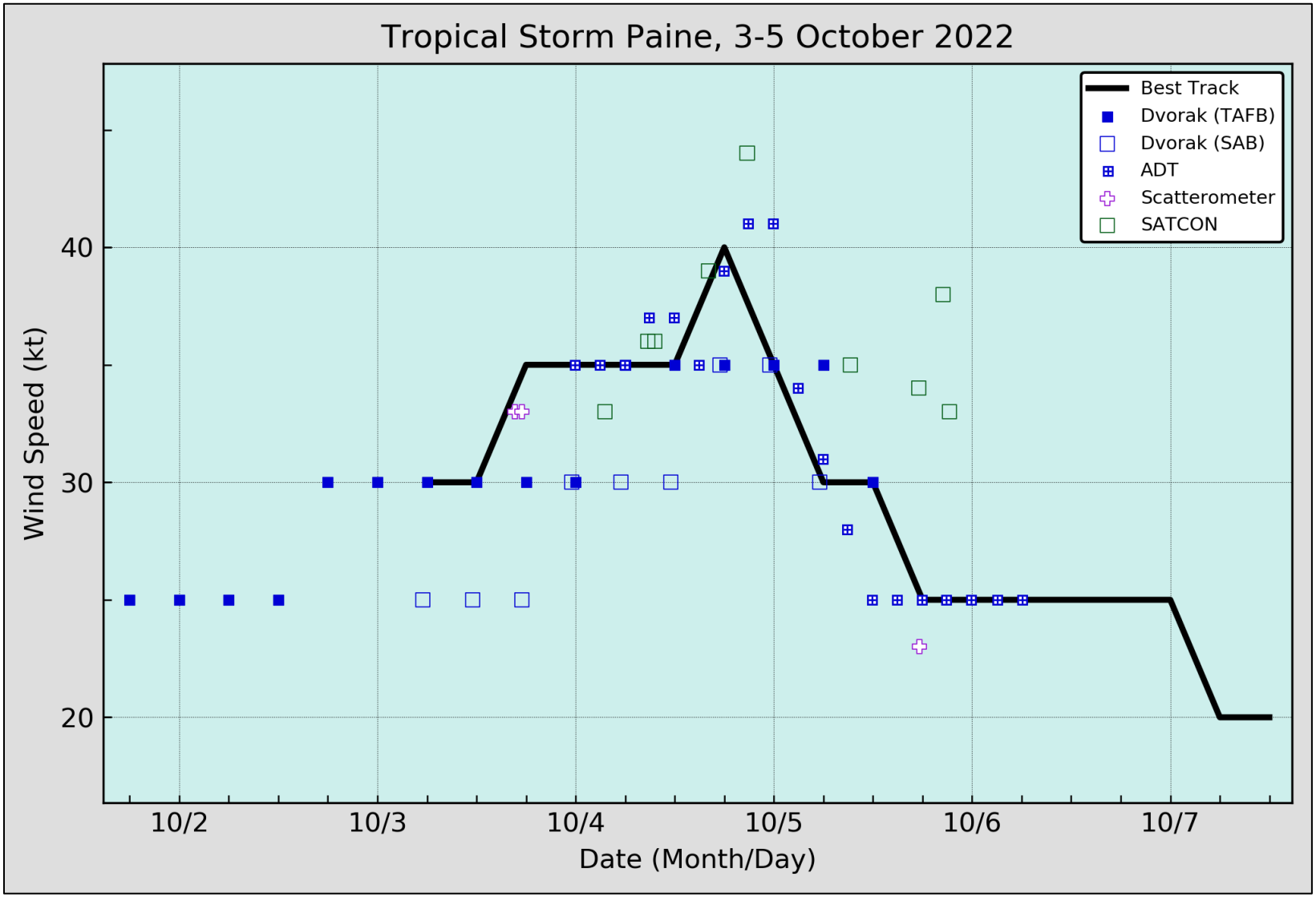

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Paine, 3–5 October 2022. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

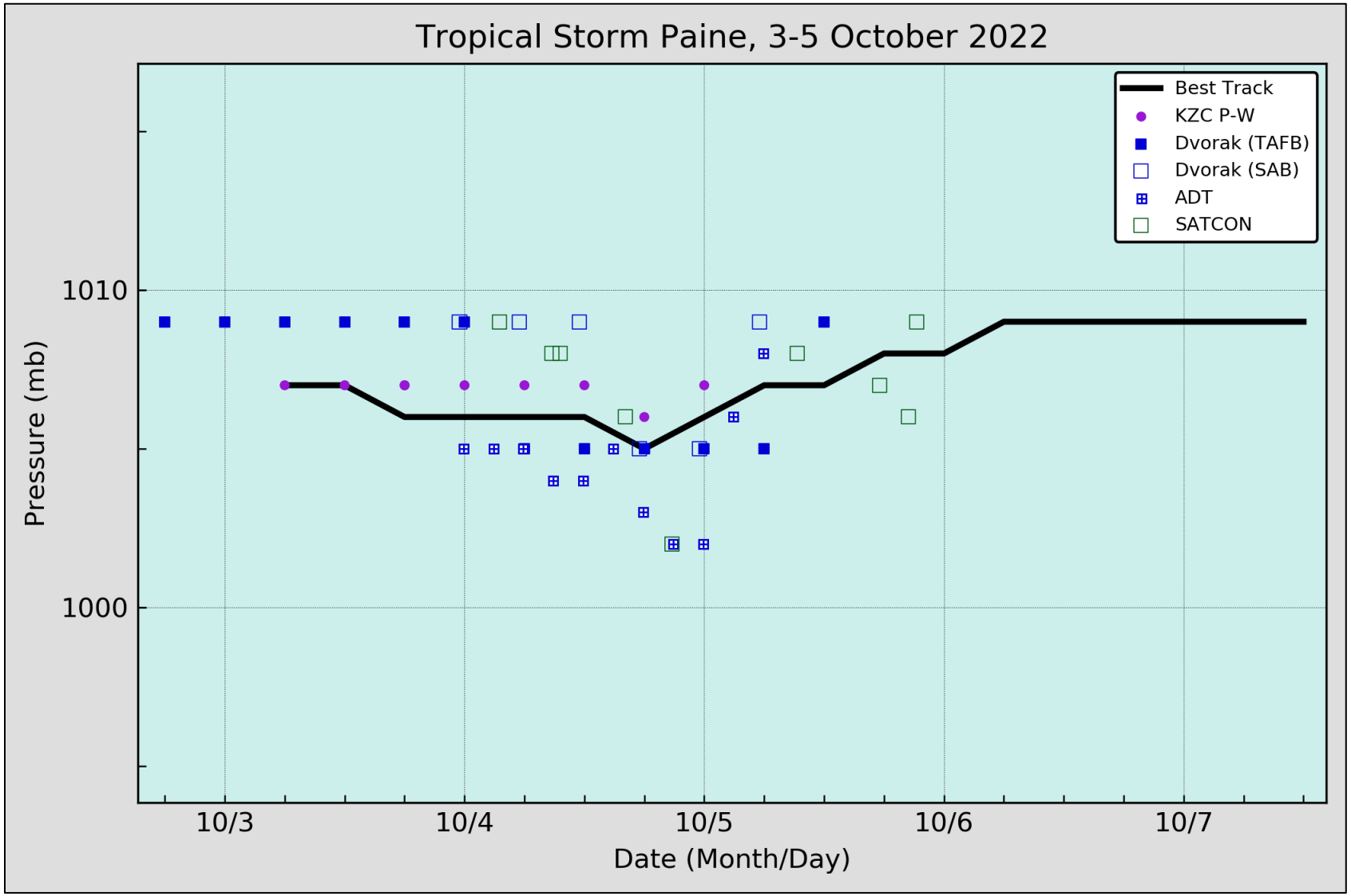

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Paine, 3–5 October 2022. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC.

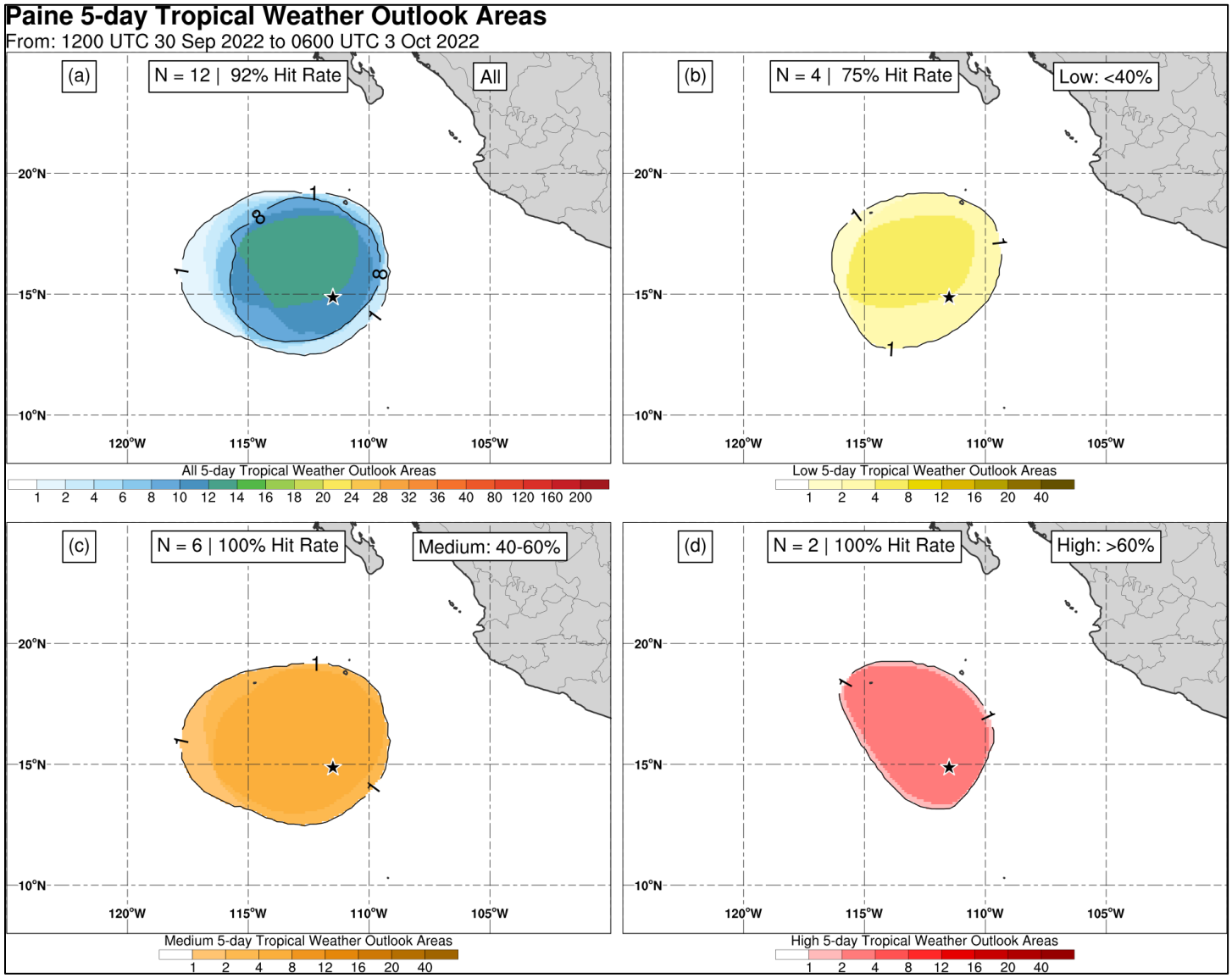

Figure 4. Composites of 5-day tropical cyclone genesis areas depicted in NHC's Tropical Weather Outlooks prior to the formation of Tropical Storm Paine for (a) all probabilistic genesis categories, (b) the low (<40%) category, (c) medium (40-60%) category, and (d) high (>60%) category. Paine's location of genesis is indicated by the black star.