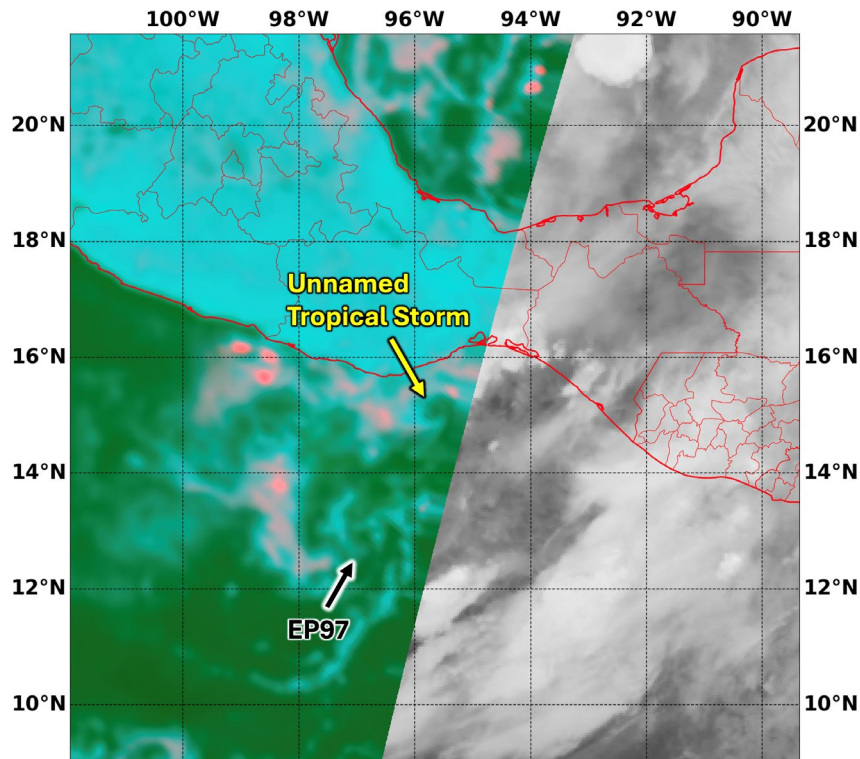# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

UNNAMED TROPICAL STORM (FORMERLY TROPICAL DEPRESSION ELEVEN-E)

(EP112024)

1–3 October 2024

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National Hurricane Center
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AMSR2 COMPOSITE 37-GHZ IMAGE OF THE UNNAMED TROPICAL STORM AT 0830 UTC 2 OCTOBER NEAR PEAK INTENSITY JUST OFFSHORE OF MEXICO (IMAGE COURTESY OF THE NAVAL RESEARCH LABORATORY)

The Unnamed Tropical Storm performed a small loop near the Gulf of Tehuantepec, bringing heavy rains and flooding to portions of southeastern Mexico which resulted in 2 deaths in the state of Veracruz.

Unnamed Tropical Storm (Formerly Tropical Depression Eleven-E)

1–3 OCTOBER 2024

SYNOPTIC HISTORY

The system's formation is linked to a surface trough originally located on the southern side of Atlantic Hurricane Helene in late September. As Helene departed the Caribbean, an inverted trough was left over the western Caribbean Sea on 26 September. The trough moved westward across Central America the next day, reaching the eastern Pacific on 28 September. A large but temporary burst of convection south of El Salvador led to the formation of a mid-level circulation, which moved west-northwestward on 29 September. A new burst of convection early on 30 September centered a couple of hundred miles southwest of Guatemala led to a surface low forming by 1800 UTC that day. While the small low was well defined, it lacked any organized deep convection until the next morning, when satellite imagery indicated that thunderstorms were organized enough for the system to be considered a tropical depression by 1800 UTC 1 October when it was located about 80 n mi south-southeast of Salina Cruz, Mexico. The "best track" chart 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 formation, the depression moved slowly westward and southwestward, undergoing a cyclonic loop within the monsoon trough while also being influenced by another weaker disturbance to the southwest (Invest EP97, see cover image). The depression became a tropical storm by 0600 UTC 2 October, as shown by scatterometer data, but no significant strengthening occurred as the storm struggled to maintain convection. The weaker EP97 was then absorbed by the tropical storm, and then the unnamed storm started moving northeastward within the larger scale southwesterly flow. Vertical wind shear markedly increased on 3 October due to a northerly gap wind event through the Gulf of Tehuantepec opposing the upper-level southwesterly winds. The low-level circulation of the storm dissipated after 1200 UTC 3 October roughly a hundred miles offshore of the southeastern coast of Mexico, not far from where it initially formed. The remnants of this system eventually moved into the southern Gulf of Mexico and contributed to the formation of Hurricane Milton a couple of days later.

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[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 the unnamed storm (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, and the Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats (TROPICS) satellites, among others, were also useful in constructing the best track.

Winds and Pressure

The estimated peak intensity of 35 kt is primarily based on a pair of scatterometer passes with winds of about 35 kt at 0315 UTC and 0400 UTC 2 October. In real time, the system was not assessed to have attained tropical storm status, primarily due to questions about data quality of those ASCAT overpasses, given the overall poor conventional satellite organization of the cyclone and questionable data flags.   A further investigation of the flags suggested that the uncertainty was in the wind direction, not the actual wind speed, and these wind speeds are now considered reliable. Additionally, a Synthetic Aperture Radar (SAR) pass near 1200 UTC that day (Fig. 4) showed winds over tropical-storm force in all quadrants and a very small radius of maximum winds, suggestive that the systems very likely had sustained winds of at least 35 kt.

The estimated minimum central pressure of 1001 mb was extrapolated based on data from ship VRQK3 (Otago Bay), which observed 1004.8 mb with 16 kt at 0700 UTC 2 October. The pressure then is estimated to have gradually fallen over the next day due to large-scale environmental pressure falls seen in model and other peripheral observations.

Rainfall

The storm spawned heavy rainfall over portions of southern Mexico (Fig. 5), especially in Oaxaca and Veracruz. The highest totals were 329.5 mm (12.97 inches) in Ixtepec, Oaxaca and 275.6 mm (10.85 inches) in Juchitan, Oaxaca, with a fairly large area of greater than 125 mm (~ 5 inches) over the southern and eastern portions of the state.

CASUALTY AND DAMAGE STATISTICS

Two direct fatalities[2] from flooding were reported by the Mexican government in association with the unnamed storm in the state of Veracruz. Even though the cyclone stayed offshore, heavy rainfall from days of onshore winds near mountainous terrain caused flooding over extreme southeastern Mexico, with dozens of people rescued according to a Telemundo report [3]. No damage estimates are available.

FORECAST AND WARNING CRITIQUE

The genesis forecasts for this system were poor. Table 2 provides the number of hours in advance of formation with the first NHC Tropical Weather Outlook (TWO) forecast in each likelihood category. A low (<40%) chance of genesis during the next 7 days was first indicated in the TWO less than 2 days before formation. Additionally, several genesis forecasts were made the day before for a different system (EP97), in the vicinity of where the unnamed system formed. For the 2-day forecast period, the precursor disturbance was given a low and medium chance of genesis 42 and 20 hours (on a special TWO) before formation, respectively. The 7- and 2-day genesis forecasts only reached the high category 18 hours before formation. The forecasts for the cyclone's genesis location were accurate and had a 100% hit rate, lying within every genesis area depicted in NHC's Graphical TWO (Fig. 6), though that's not too surprising with a short lead time and slow motion of the system.

A verification of NHC official track forecasts for this system is given in Table 3. Official track forecast errors were greater than the mean official errors for the previous 5-yr period throughout the period, though with a small sample. A homogeneous comparison of the official track errors with selected guidance models is not shown because of the small sample size. An inspection of the first couple of NHC official forecasts showed that they were closer to the ECMWF model than many of the others, and that model did not do well with this system over its limited lifetime, bringing it onshore instead of dissipating offshore.

A verification of NHC official intensity forecasts is given in Table 4. Official intensity forecast errors were lower than the mean official errors for the previous 5-yr period at all applicable forecast times, although with the same small sample which precluded a meaningful comparison of official and guidance intensity errors. While NHC forecasts correctly anticipated little significant strengthening, they had a slight high bias.

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[2] Deaths occurring as a direct result of the forces of the tropical cyclone are referred to as "direct" deaths. These would include those persons who drowned in storm surge, rough seas, rip currents, and freshwater floods. Direct deaths also include casualties resulting from lightning and wind-related events (e.g., collapsing structures). Deaths occurring from such factors as heart attacks, house fires, electrocutions from downed power lines, vehicle accidents on wet roads, etc., are considered "indirect" deaths.

[3]   https://www.telemundo.com/noticias/noticias-telemundo-en-la-noche/desastres-naturales/video/la-depresion-once-e-provoca-deslaves-y-destrozos-en-el-sureste-mexicano-tmvo12773109

Coastal watches and warnings associated with the Unnamed Tropical Storm are given in Table 5.

Table 1.   Best track for the Unnamed Tropical Storm, 1–3 October 2024.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
30 / 1800	13.6	95.6	1007	25	low
01 / 0000	13.8	95.5	1007	25	"
01 / 0600	14.1	95.3	1007	25	"
01 / 1200	14.5	94.9	1006	30	"
01 / 1800	14.9	94.6	1006	30	tropical depression
02 / 0000	15.2	95.0	1005	30	"
02 / 0600	15.2	95.5	1003	35	tropical storm
02 / 1200	14.8	95.9	1003	35	"
02 / 1800	14.4	96.3	1002	35	"
03 / 0000	14.4	96.1	1001	35	"
03 / 0600	14.5	95.6	1001	35	"
03 / 1200	14.7	95.1	1001	35	"
03 / 1800					dissipated
03 / 0000	14.4	96.1	1001	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	168-Hour Outlook
Low (<40%)	36	42
Medium (40%-60%)	20	20
High (>60%)	18	18

Table 3.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for the Unnamed Tropical Storm, 1–3 October 2024. Mean errors for the previous 5-yr period are shown for comparison.

	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	65.4	112.2	135.8					
OCD5	100.5	170.4	219.6					
Forecasts	6	4	2	0	0	0	0	0
OFCL (2019-23)	22.6	34.4	46.0	57.6	69.6	83.5	112.4	137.2
OCD5 (2019-23)	38.2	75.5	117.0	160.0	203.5	247.6	329.5	404.4

Table 4.   NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for the Unnamed Tropical Storm, 1–3 October 2024. 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	60	72	96	120
OFCL	**0.8**	**6.2**	**7.5**					
OCD5	2.5	6.5	7.5					
Forecasts	6	4	2	0	0	0	0	0
OFCL (2019-23)	5.5	8.7	10.8	12.7	14.5	15.6	17.1	18.0
OCD5 (2019-23)	7.2	12.2	15.9	18.6	19.9	20.0	19.6	18.7

Table 5.   Coastal watch and warning summary for the Unnamed Tropical Storm, 1–3 October 2024.

Date/Time (UTC)	Action	Location
1 / 2100	Tropical Storm Watch issued	Mexico/Guatemala border to Boca de Pijijiapan
1 / 2100	Tropical Storm Warning issued	Boca de Pijijiapan to Puerto Angel
2 / 0900	Tropical Storm Watch discontinued	All
2 / 0900	Tropical Storm Warning modified to	Boca de Pijijiapan to Lagunas de Chacahua
3 / 1800	Tropical Storm Warning modified to	Boca de Pijijiapan to Puerto Angel
3 / 2100	Tropical Storm Warning discontinued	All Mainland Mexico
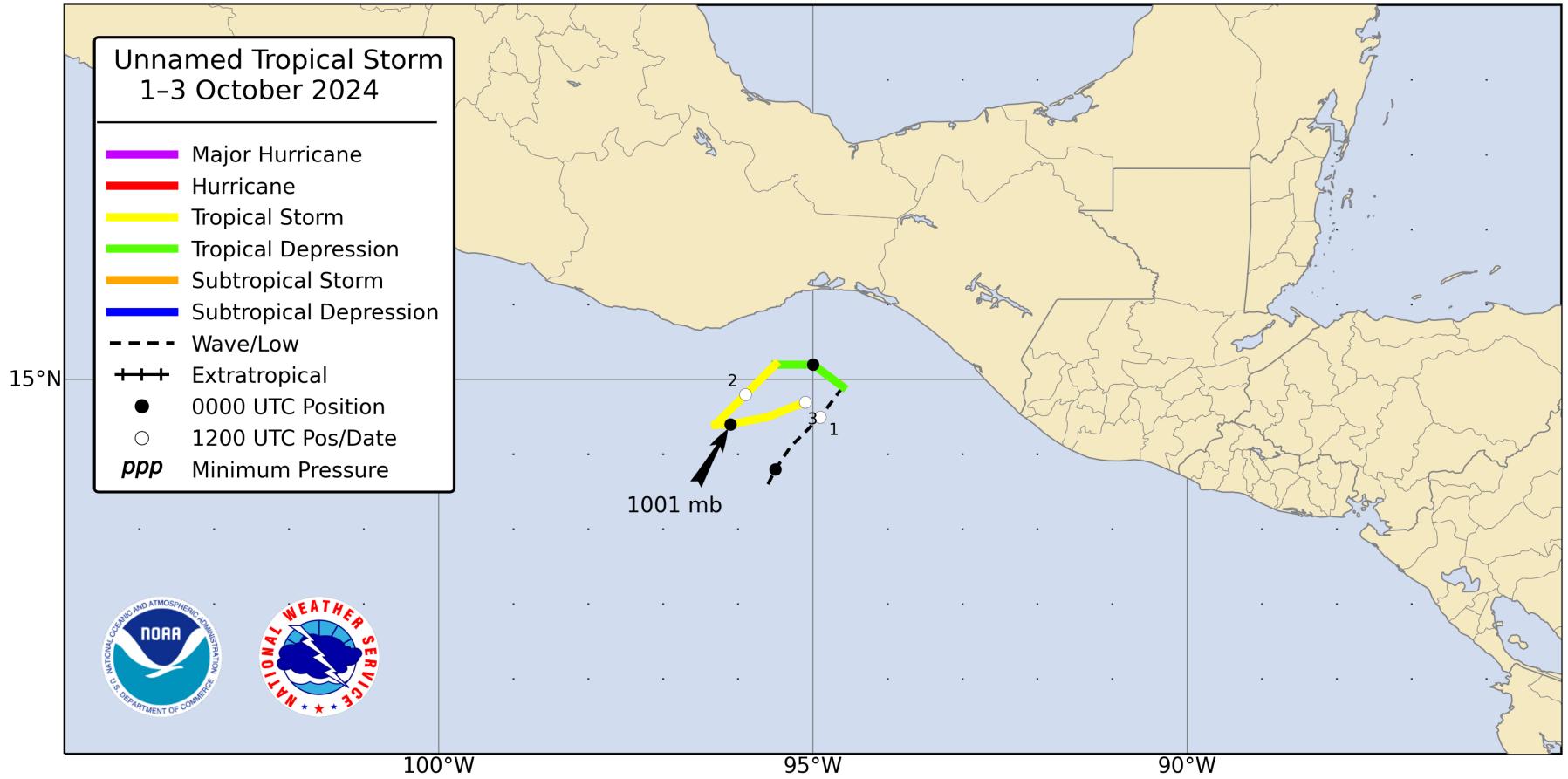
Figure 1.   Best track positions for the Unnamed Tropical Storm, 1–3 October 2024.
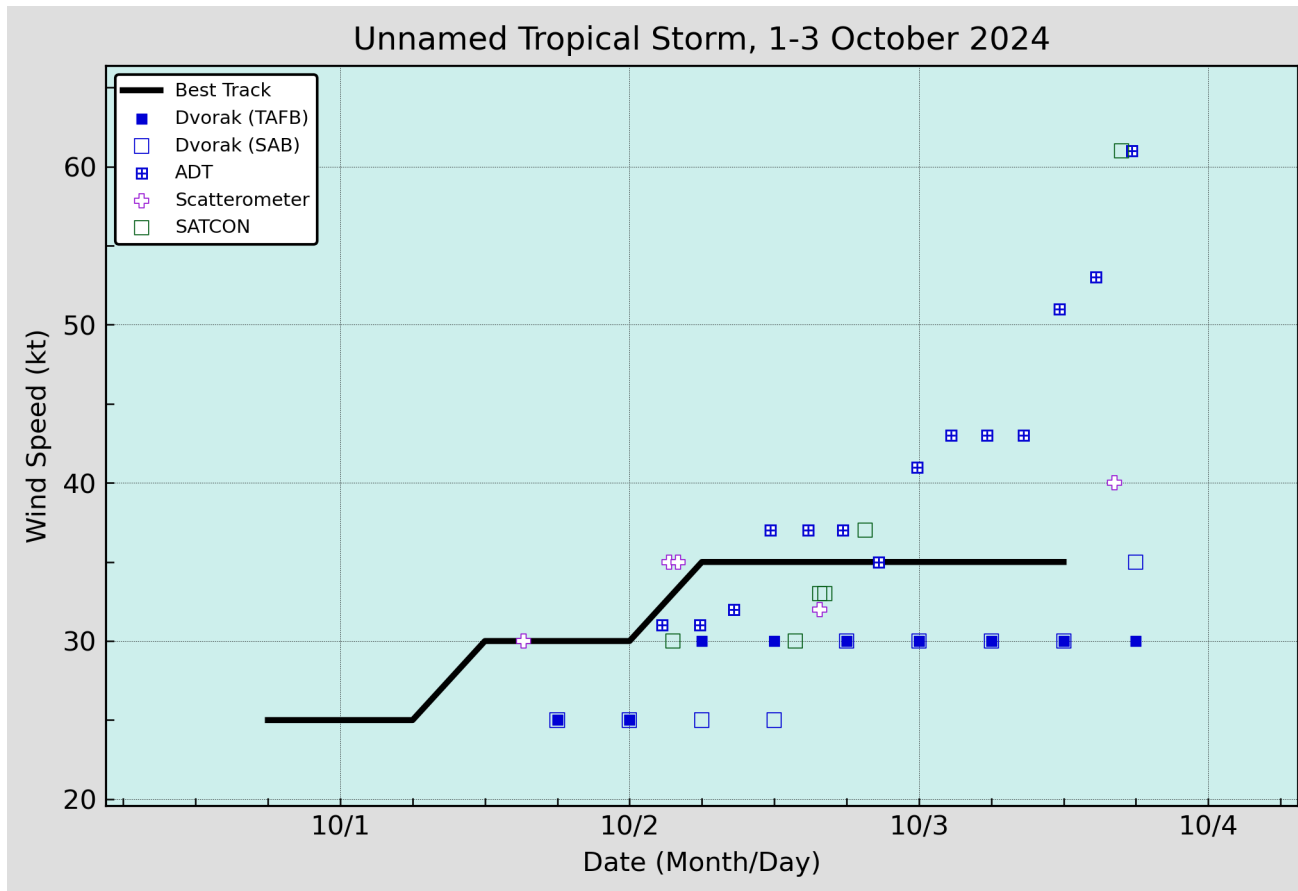
Figure 2.   Selected wind observations and best track maximum sustained surface wind speed curve for the Unnamed Tropical Storm, 1–3 October 2024. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.
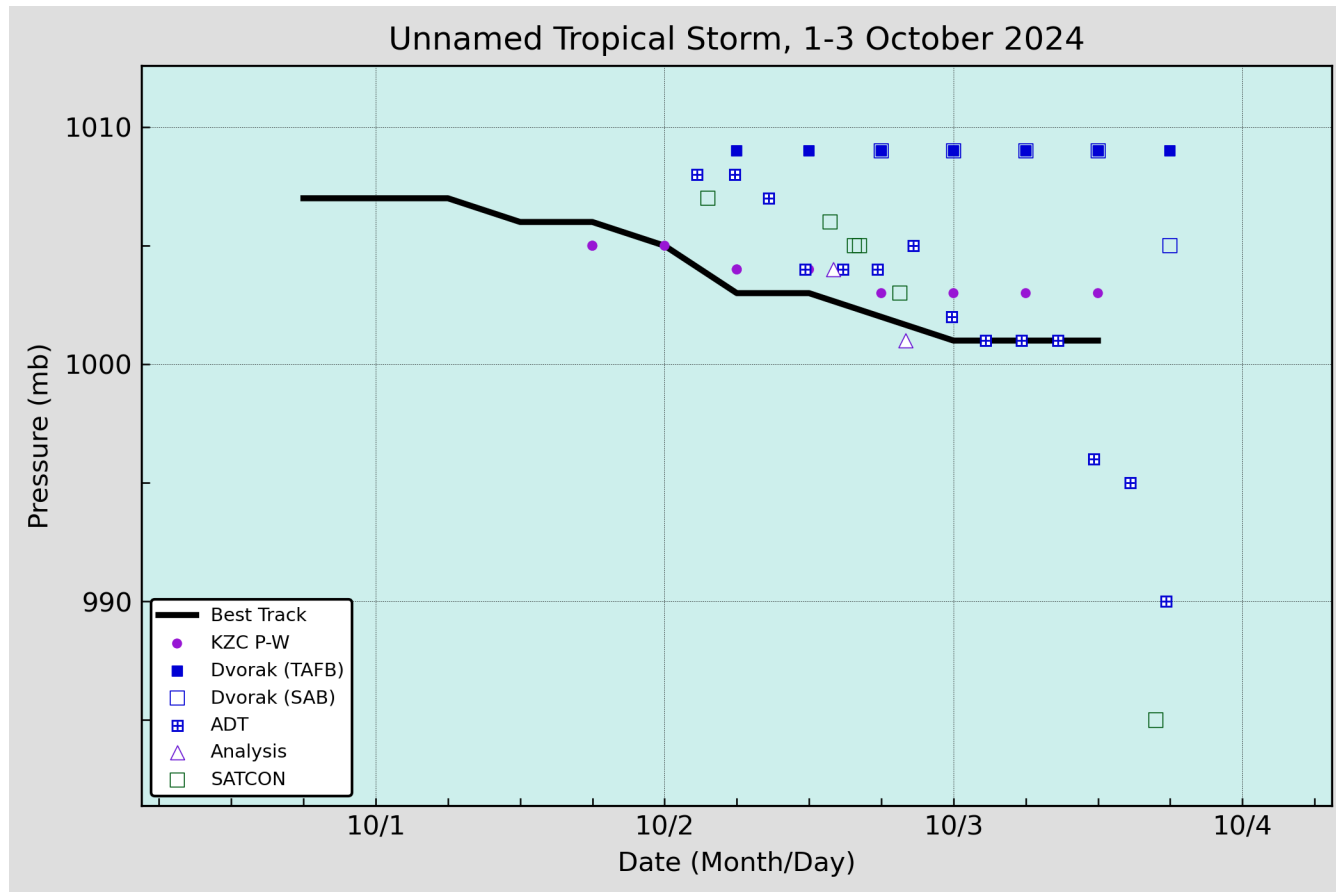
Figure 3.   Selected pressure observations and best track minimum central pressure curve for the Unnamed Tropical Storm, 1–3 October 2024.   Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological 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.
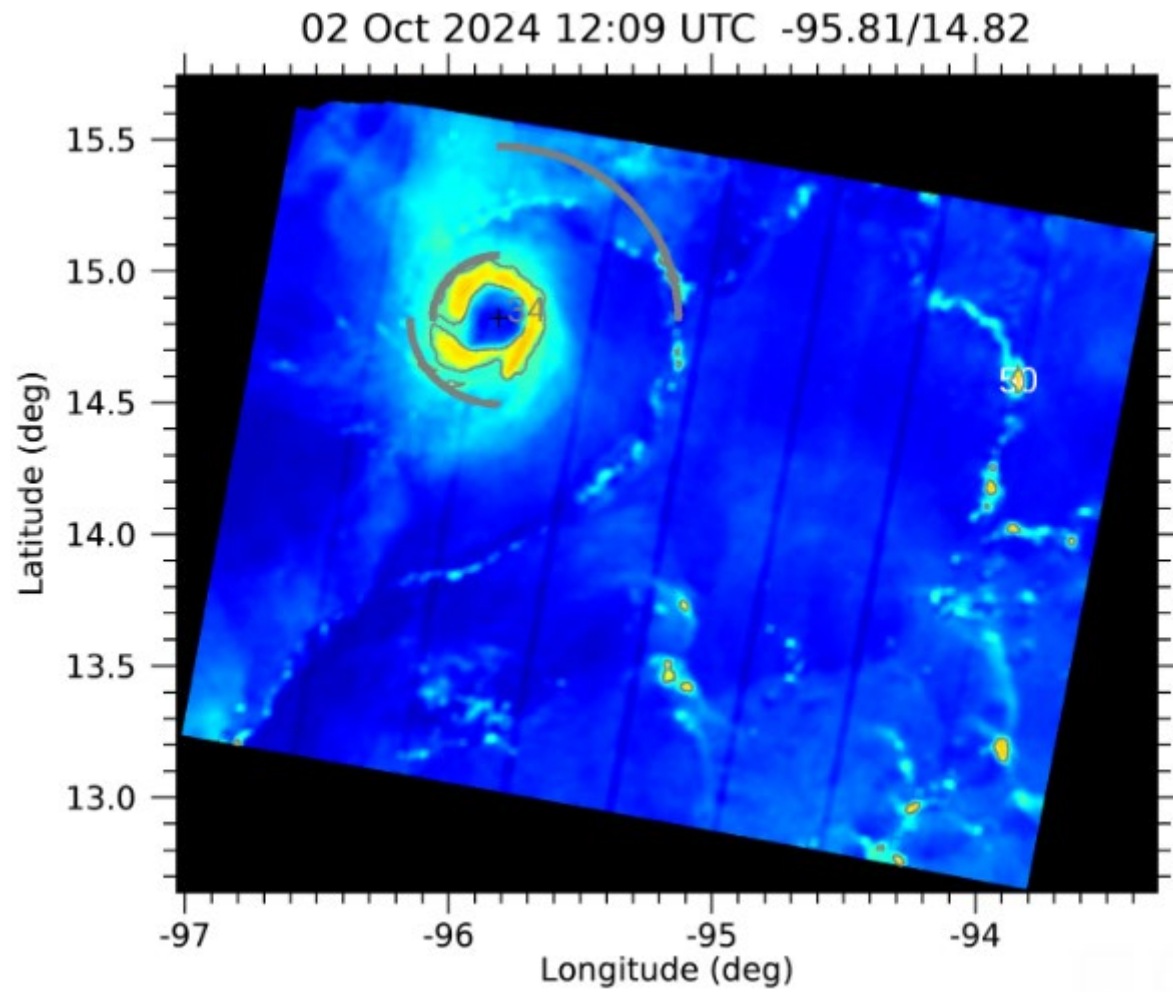
Figure 4.   A Synthetic-Aperture-Radar (SAR) pass over the Unnamed Tropical Storm at 1209 UTC 2 October 2024. Data courtesy NOAA/NESDIS.
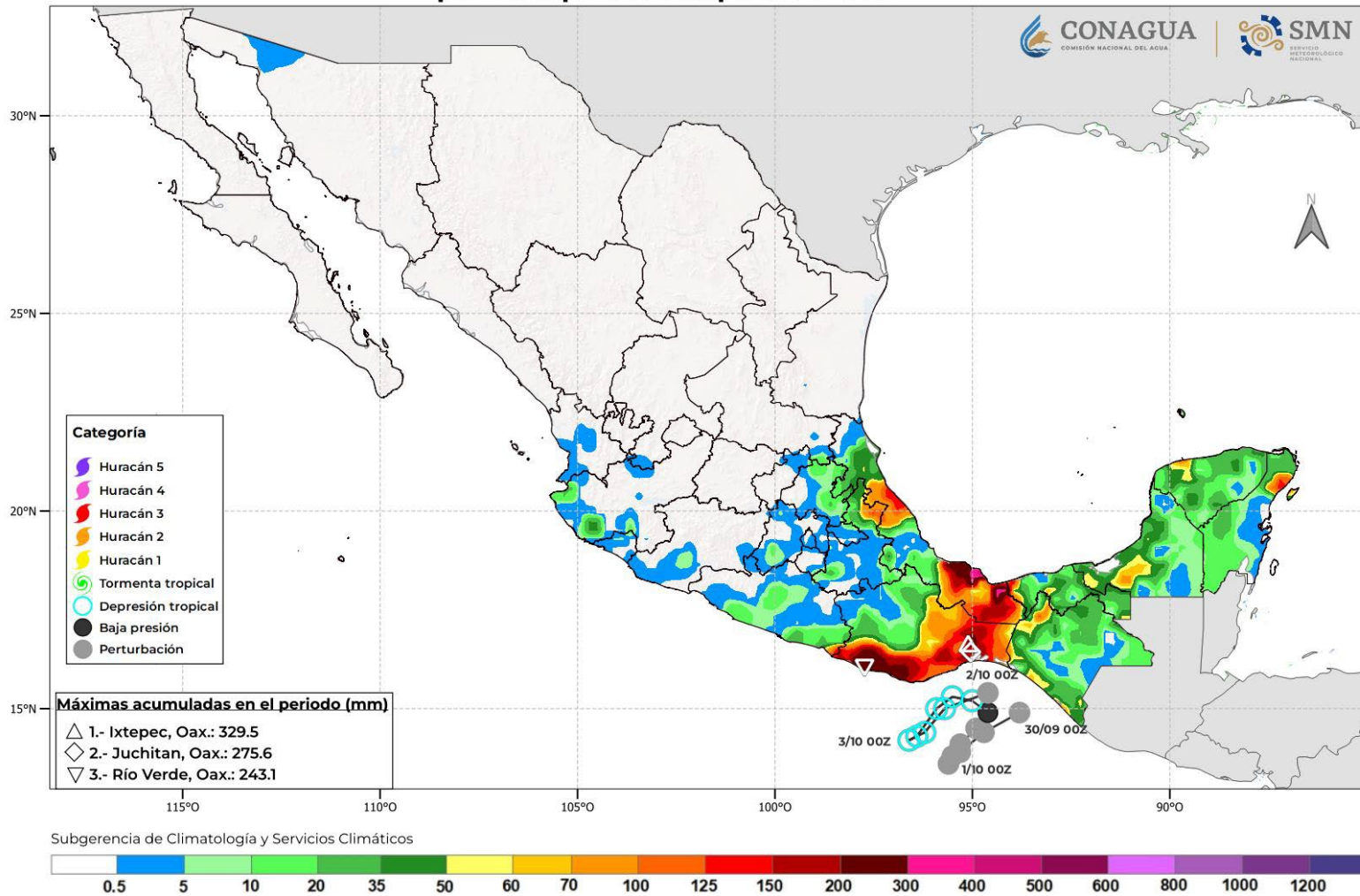
Figure 5.   Rainfall accumulations (mm) in Mexico from 1-3 October 2024, including the effects of the Unnamed Tropical Storm. The track shown is based on operational location and intensity estimates. Note that not all rainfall depicted is directly related to the Unnamed Tropical Storm. Image courtesy of CONAGUA, the National Meteorological Service of Mexico.

Eleven-E 7-day Tropical Weather Outlook Areas
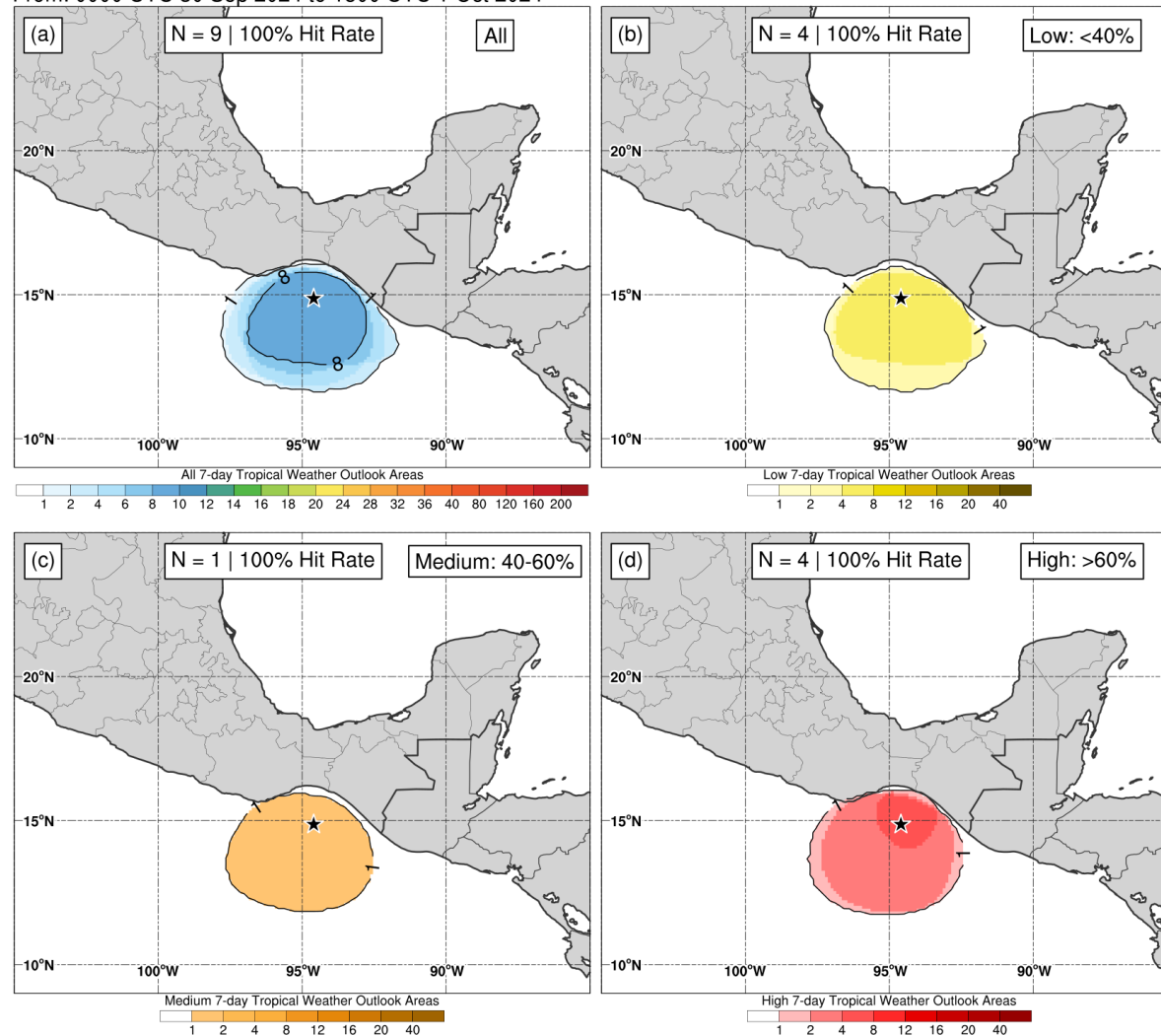From: 0000 UTC 30 Sep 2024 to 1800 UTC 1 Oct 2024

Figure 6.   Composites of 7-day tropical cyclone genesis areas depicted in NHC's Tropical Weather Outlooks prior to the formation of the Unnamed Storm for (a) all probabilistic genesis categories, (b) the low (<40%) category, (c) medium (40–60%) category, and (d) high (>60%) category. The location of genesis is indicated by the black star.