NATIONAL HURRICANE CENTER
TROPICAL CYCLONE REPORT

TROPICAL STORM LESTER

(EP132022)

15–17 September 2022

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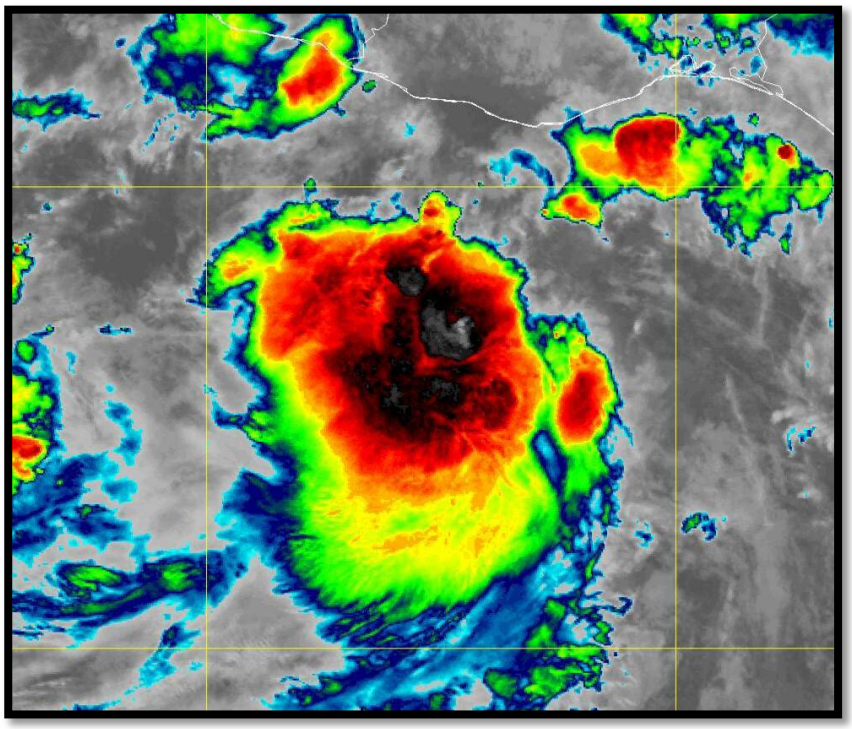

GOES-16 INFRARED SATELLITE IMAGE OF TROPICAL STORM LESTER AT 0600 UTC 16 SEPTEMBER 2022. IMAGE COURTESY NOAA/NESDIS/STAR.

Lester was a short-lived, sheared tropical storm that formed offshore of southern Mexico and weakened to a tropical depression by the time it moved inland over the Mexican state of Oaxaca.

Tropical Storm Lester

15–17 SEPTEMBER 2022

SYNOPTIC HISTORY

Lester appears to have originated from an area of disturbed weather that formed along the eastern North Pacific monsoon trough. A broad area of cloudiness, showers and thunderstorms formed on 13 September a couple of hundred n mi offshore of the coast of southern Mexico. The convective activity briefly waned that night but then increased in coverage on 14 September, and a mid-level cyclonic circulation became evident in visible satellite imagery later that day. However, the surface circulation was elongated and poorly defined as observed in satellite-derived wind data. Another burst of showers and thunderstorms early on 15 September led to a gradual improvement in the low-level structure of the disturbance, and scatterometer data suggest a well-defined area of low pressure formed by 1200 UTC 15 September, about 215 n mi south-southeast of Puerto Angel, Mexico. The convective organization increased later that morning with a curved band of convection developing over the western and southwestern portions of the circulation around that time. A tropical depression is estimated to have formed by 1800 UTC that day when it was located about 200 n mi south-southeast of Puerto Angel. The depression initially meandered within weak steering currents that evening but began to move slowly northwestward overnight. Scatterometer data indicated that the depression strengthened into Tropical Storm Lester (cover photo) by 0600 UTC 16 September, while centered about 165 n mi south-southeast of Puerto Angel. The "best track" chart of Lester'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].

Lester moved generally northwestward on 16 September within the flow between a broad cyclonic gyre to its west and a mid-level ridge that extended across Texas and northern Mexico. Despite very warm sea-surface temperatures around 29°C and sufficient mid-level moisture, Lester was unable to intensify due to the negative effects of around 20 kt of deep-layer northeasterly shear over the cyclone. The limited convection associated with Lester was consistently displaced downshear of the low-level center (Fig. 4a and 4b), which was partially exposed in visible satellite imagery for much of the day. Early on 17 September, the shallow vortex turned northward and north-northeastward within increasing south-southwesterly low-level monsoonal flow partially related to Tropical Storm Madeline[2] located farther west. The deep-layer shear further increased over Lester and stripped away most of its remaining convection (Fig. 4c), and the cyclone was weakening as it approached the coast of southern Mexico. Based on passive microwave imagery and surface observations, it is estimated that Lester moved onshore around

[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.

[2] https://www.nhc.noaa.gov/data/tcr/EP142022_Madeline.pdf

1200 UTC 17 September as a 30-kt tropical depression near Puerto Escondido, Mexico (Fig. 4d). Lester quickly dissipated later that morning over the mountainous terrain of southern Mexico.

METEOROLOGICAL STATISTICS

Observations in Lester (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 Lester.

There were no reports of tropical-storm-force winds associated with Lester from land stations, ships, or buoys.

Winds and Pressure

Lester's peak intensity of 35 kt is based primarily on scatterometer data. A couple of ASCAT-B passes from 0316 UTC and 1549 UTC 16 September and an ASCAT-C pass from 0409 UTC that day showed believable peak winds between 30–35 kt to the southwest of Lester's center. Lester's estimated landfall intensity of 30 kt is based on the degraded satellite structure of the cyclone when it reached the coast. The higher satellite intensity estimates on 17 September are deemed to be unrepresentative of Lester's intensity because the center fixes are too far west compared to the final best track positions.

The Puerto Escondido International Airport (MMPS) reported a sustained wind of 25 kt at 1154 UTC 17 September, and an automated weather station in Puerto Angel measured a wind gust of 33 kt at 2150 UTC 16 September.

The estimated minimum pressure of 1005 mb is based on a blend of the Knaff-Zehr-Courtney (KZC) pressure-wind relationship with the SATCON and Dvorak estimates.

Rainfall and Flooding

Moisture associated with Lester and a broad cyclonic circulation to the west that became Madeline resulted in heavy rainfall over the Mexican states of Guerrero and Oaxaca (Fig. 5), with the highest totals occurring near the coast of southern Mexico. Coyuca de Benitez reported a total of 14.31 inches (363.5 mm) of rain, and 10.04 inches (255.0 mm) was measured in Laguna de Coyuca. Elsewhere, 8.94 inches (227.2 mm) was reported in Ometepec and 8.13 inches (206.4 mm) was measured in Puerto Angel. The heavy rainfall resulted in flash and riverine flooding as well as some landslides.

CASUALTY AND DAMAGE STATISTICS

There is one known direct death[3] associated with Lester. In a media interview, the Secretary of Civil Protection for the state of Guerrero reported that a fisherman drowned when his boat was capsized by large waves off the coast of La Bocana.

Media reports and interviews indicate that heavy rainfall resulted in flooding that affected more than 400 homes across the state of Guerrero. In the municipality of Chilpancingo, 12 people were rescued from floodwaters, and three injuries were reported. Three other water rescues occurred in the municipality of Petatlán. In the municipality of Tixtla, rivers and streams overflowed their banks and flooded over two dozen homes. Damage was also reported in the state of Oaxaca, where some vehicles were disabled and roadways were blocked by floodwaters and debris from landslides.

FORECAST AND WARNING CRITIQUE

While the genesis potential for Lester was highlighted well in advance, the timing of genesis was not as well forecast (Table 2). The disturbance from which Lester developed was introduced into the Tropical Weather Outlook (TWO) with a low (<40%) chance of formation 144 h prior to genesis, and the 5-day formation chance was increased to medium (40–60%) 108 h before Lester formed. A high (>60%) formation chance was originally shown in the 5-day TWO 90 h before genesis. However, the forecast was complicated by the presence of another disturbance (which later became Madeline) that also had development potential to the west of the pre-Lester system. The global models struggled in predicting whether these features would develop or interact, and it was unclear if they would remain discrete systems or merge. Based on the lack of consistency in the models, the 5-day formation chance was lowered to the medium category at 1200 UTC 14 September. Ultimately, the disturbance was not raised back to the high category until just 6 h before genesis occurred. For the 2-day outlook, a low formation chance was added into the TWO 90 h before formation. The 2-day probabilities were raised to the medium and high categories 24 h and 6 h before Lester developed, respectively.

The location of the genesis of Lester was not well forecast (Fig. 6). Only 28% of the graphical TWO genesis areas correctly captured the location where Lester formed, with a distinct north and west bias noted for all probability categories. The global models were not consistent with the evolution of the pre-Lester and pre-Madeline disturbances, and there was a time when it appeared that the two areas would merge. Not surprisingly, the highest concentration of formation areas for Lester (Fig. 6a) ultimately fell in between the genesis locations of Lester and Madeline.

[3] 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.

A verification of NHC official track and intensity forecasts for Lester is given in Tables 3 and 4, respectively. Official track forecast errors were much greater than the mean official errors for the previous 5-yr period, albeit for a relatively small sample size (only four verifying 24-h forecasts and two 36-h forecasts). The much larger-than-average track errors are a result of the shallow cyclone's interaction with Madeline. While the NHC forecast and the model consensus called for Lester to move northwestward around a mid-level ridge through landfall, the shallow cyclone became increasingly steered by the low-level monsoonal flow that strengthened when Madeline formed. As a result, Lester unexpectedly turned northward and north-northeastward before moving onshore along the coast of southern Mexico. Based on post-analysis of limited surface observations and satellite data (some of which were not available in real time), the final cyclone track was adjusted farther east compared to the operational assessment. Official intensity forecast errors were lower than or comparable to the mean official errors for the previous 5-yr period. Due to Lester's brief existence as a tropical cyclone, no meaningful comparisons can be made with the model track or intensity guidance.

Coastal watches and warnings associated with Lester are given in Table 5.

ACKNOWLEDGEMENTS

Rainfall data (Fig. 4) was provided by CONAGUA and the National Meteorological Service of Mexico. Philippe Papin created the composite TWO verification graphic (Fig. 5).

Table 1. Best track for Tropical Storm Lester, 15–17 September 2022.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
15 / 1200	12.4	95.1	1008	25	low
15 / 1800	12.6	95.0	1007	30	tropical depression
16 / 0000	12.8	95.1	1006	30	"
16 / 0600	13.1	95.4	1005	35	tropical storm
16 / 1200	13.5	96.1	1005	35	"
16 / 1800	14.0	96.8	1005	35	"
17 / 0000	14.4	97.3	1005	35	"
17 / 0600	15.1	97.4	1005	35	"
17 / 1200	15.8	97.0	1006	30	tropical depression
17 / 1800					dissipated
16 / 0600	13.1	95.4	1005	35	Maximum wind and minimum pressure
17 / 1200	15.8	97.0	1006	30	Landfall near Puerto Escondido, Mexico

Table 2. Number of hours in advance of formation of Lester associated with the first NHC Tropical Weather Outlook (TWO) forecast in the indicated likelihood category. The number in parentheses ( ) indicates the number of hours in advance of formation when the disturbance was re-introduced into that respective category in the TWO. 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%)	90	144
Medium (40%-60%)	24	108
High (>60%)	6	90 (6)

Table 3. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Tropical Storm Lester, 15–17 September 2022. 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	45.2	62.5	109.9					
OCD5	46.7	81.6	111.1					
Forecasts	6	4	2					
OFCL (2017-21)	21.9	33.8	45.6	56.9	74.8	79.9	99.5	121.3
OCD5 (2017-21)	35.8	72.3	112.7	155.0	198.7	239.0	309.2	372.2

Table 4. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Tropical Storm Lester, 15–17 September 2022. 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	**4.2**	**8.8**	12.5					
OCD5	7.2	21.2	34.5					
Forecasts	6	4	2					
OFCL (2017-21)	5.5	9.1	11.1	12.9	15.3	15.6	16.4	17.0
OCD5 (2017-21)	7.0	12.2	15.8	18.6	20.4	21.2	22.3	21.8

Table 5. Watch and warning summary for Tropical Storm Lester, 15–17 September 2022.

Date/Time (UTC)	Action	Location
15/2100	Tropical Storm Watch issued	Laguna de Chacahua to Zihuatanejo
16/0900	Tropical Storm Warning issued	Punta Maldonado to Zihuatanejo
16/0900	Tropical Storm Watch issued	Zihuatanejo to Lazaro Cardenas
16/2100	Tropical Storm Warning modified to	Puerto Escondido to Zihuatanejo
17/1800	Tropical Storm Watches and Warnings discontinued	All

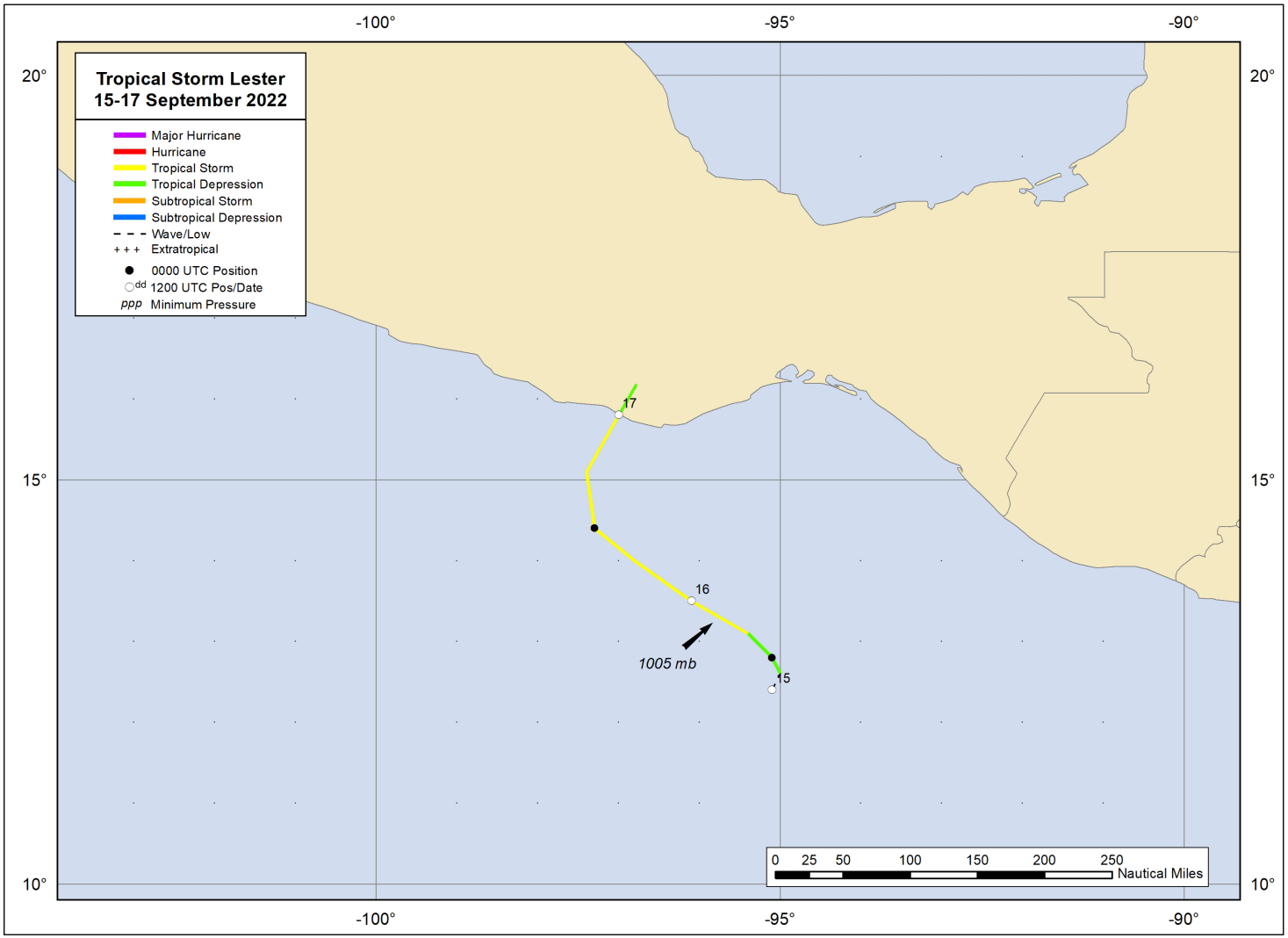

Figure 1. Best track positions for Tropical Storm Lester, 15–17 September 2022.

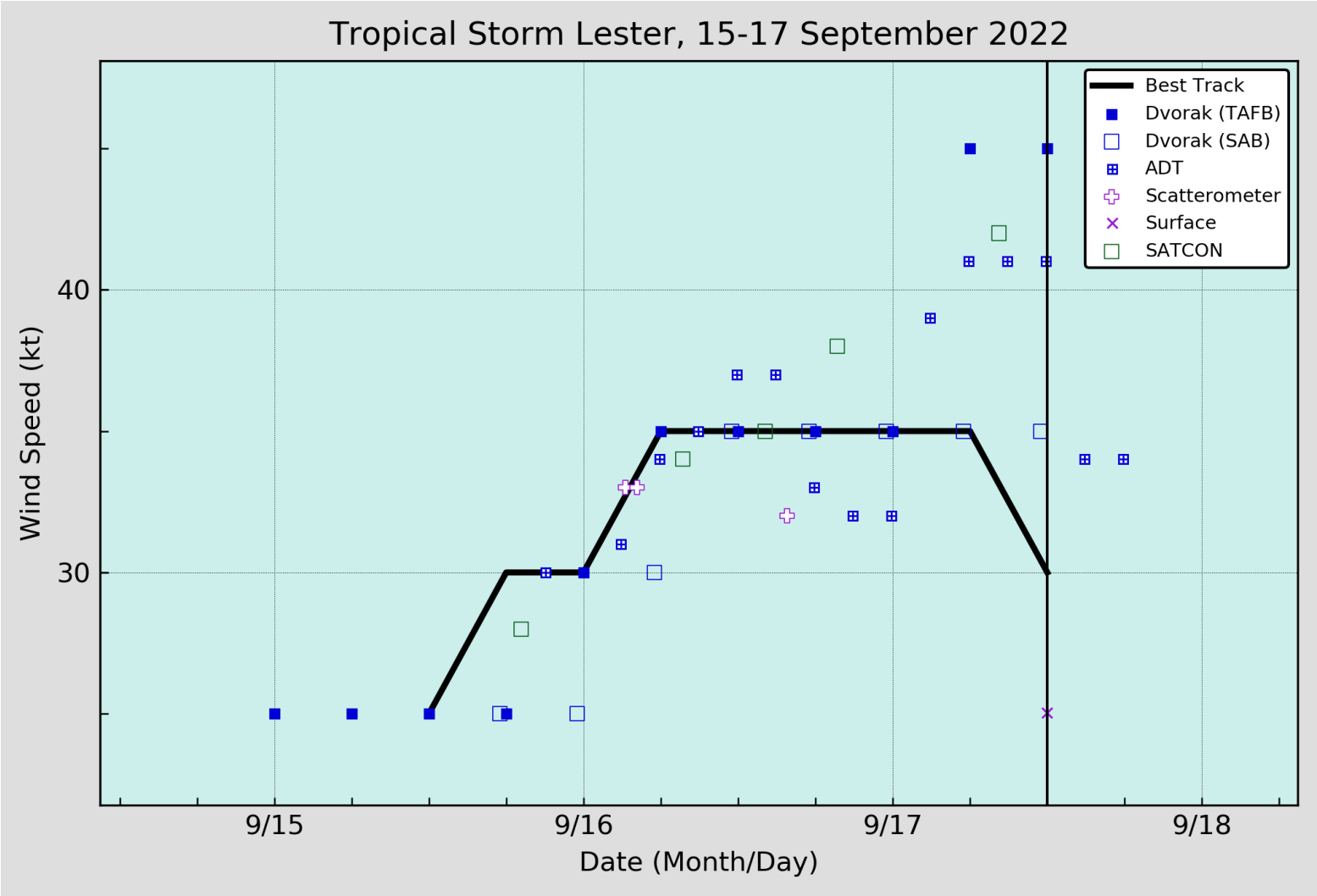

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Storm Lester, 15–17 September 2022. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Dashed vertical lines correspond to 0000 UTC.

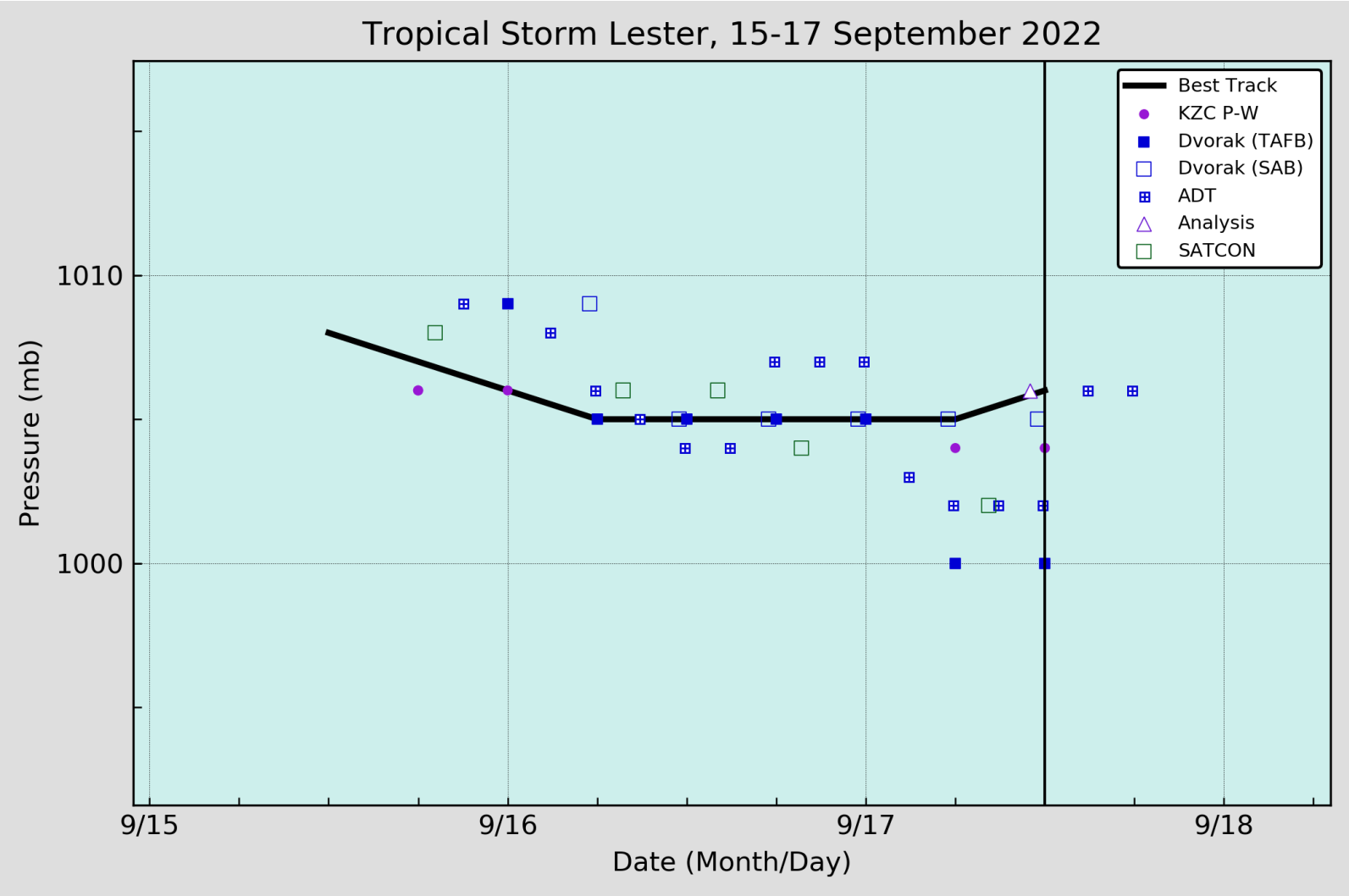

Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Storm Lester, 15–17 September 2022. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for 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.

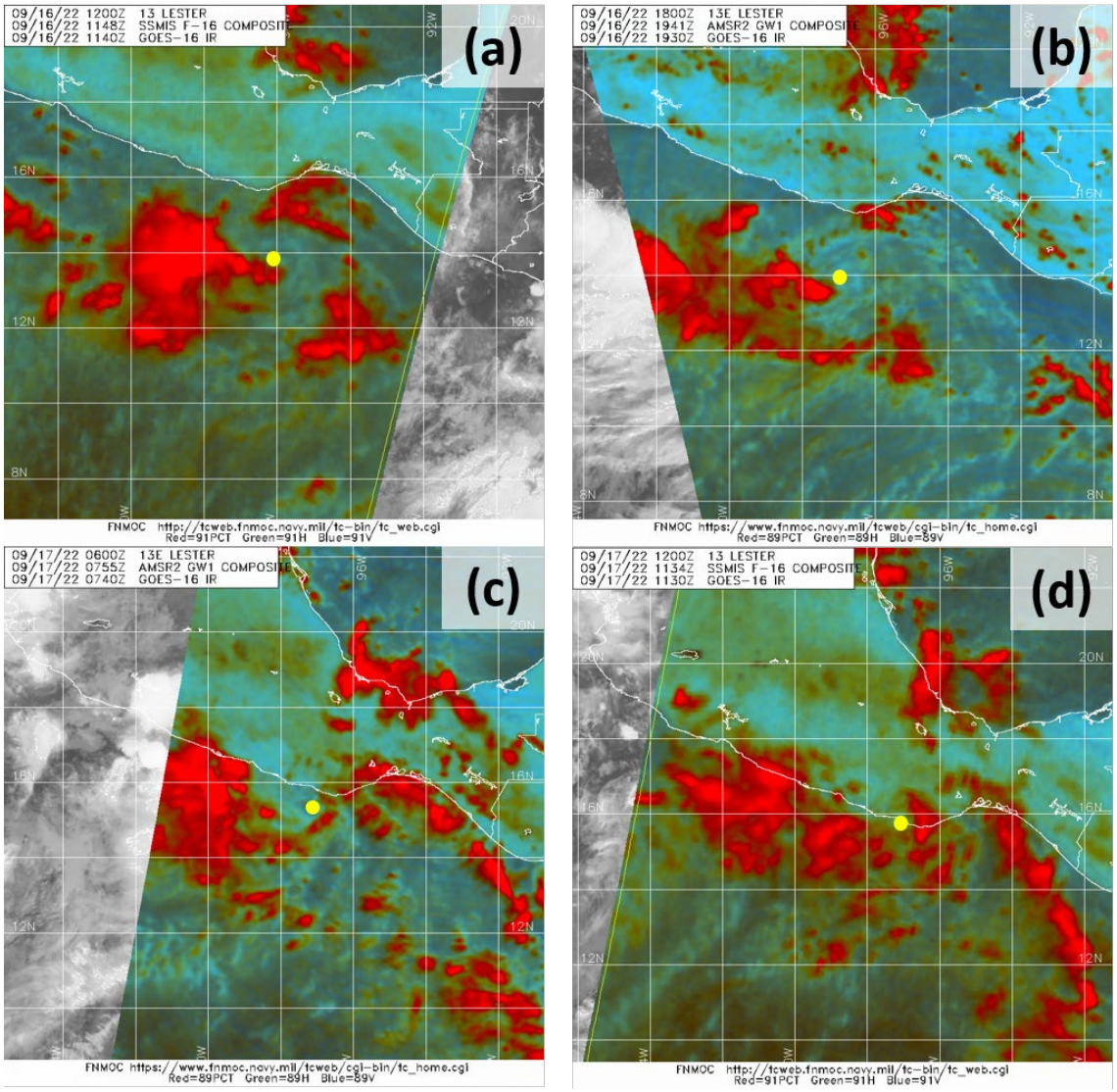

Figure 4. A series of color composite 89–91-GHz passive microwave images of Lester on 16–17 September 2022 as it approached the coast of southern Mexico. The yellow circle indicates the estimated location of the low-level center. Images courtesy of the U.S. Navy's Fleet Numerical Meteorology and Oceanography Center tropical cyclone webpage.

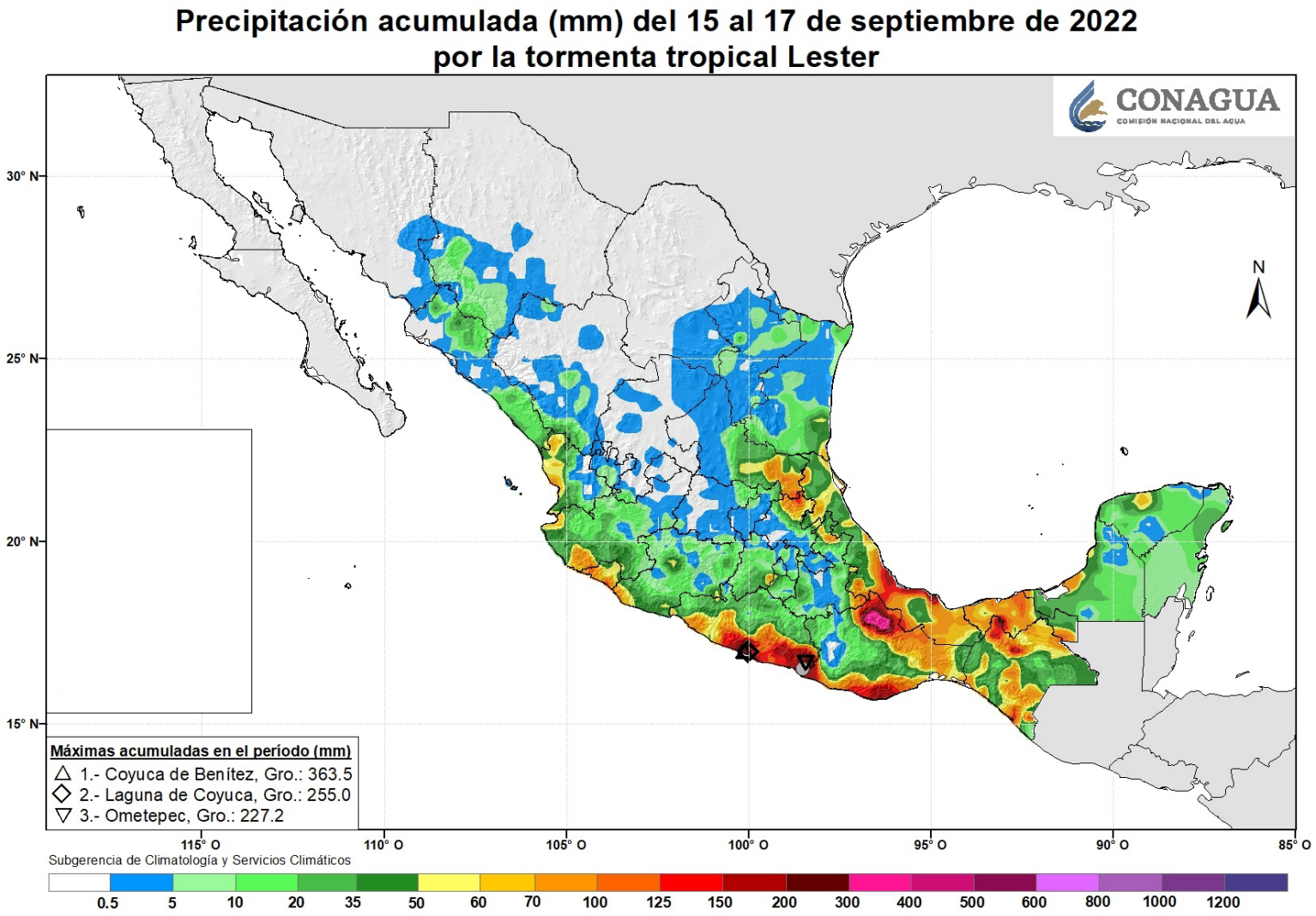

Figure 5. Rainfall accumulations (mm) from 15–17 September 2022 as Tropical Storm Lester approached the southern coast of Mexico. Image courtesy of CONAGUA and the National Meteorological Service of Mexico.

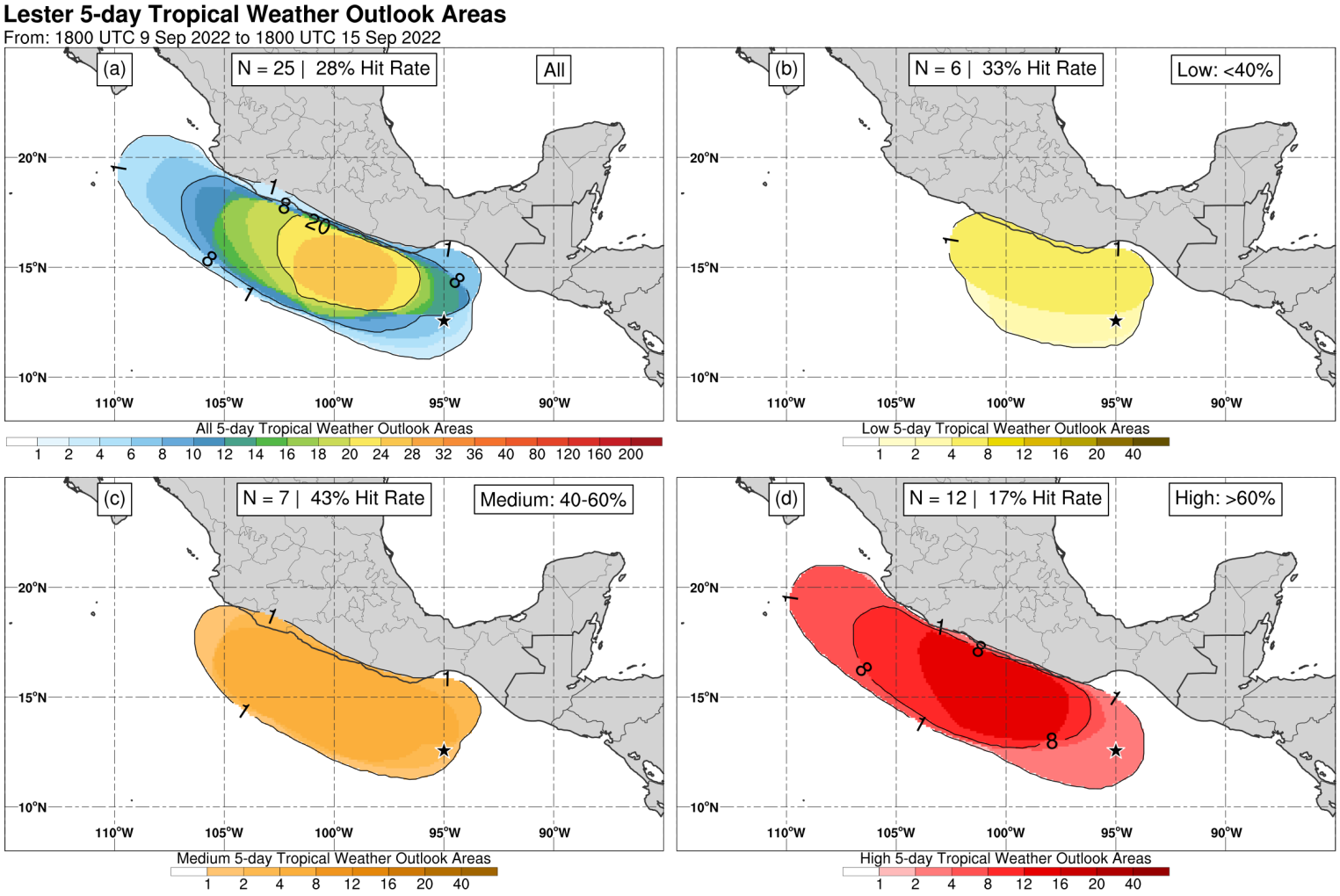

Figure 6. Composite of 5-day Tropical Weather Outlook areas associated with the disturbance that developed into Lester for (a) all probability areas (10–100%, multi-color shading), (b) low probability areas (< 40%, yellow shading), (c) medium probability areas (40–60%, orange shading), and (d) high probability areas (< 60%, red shading). The black star in each panel indicates the genesis location of Lester. The hit rate in each plot indicates the percentage of outlook areas that capture the location of genesis.