# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT[1]

# TROPICAL DEPRESSION TWENTY-ONE

(AL212023)

23–24 October 2023

Andrew B. Hagen
National Hurricane Center
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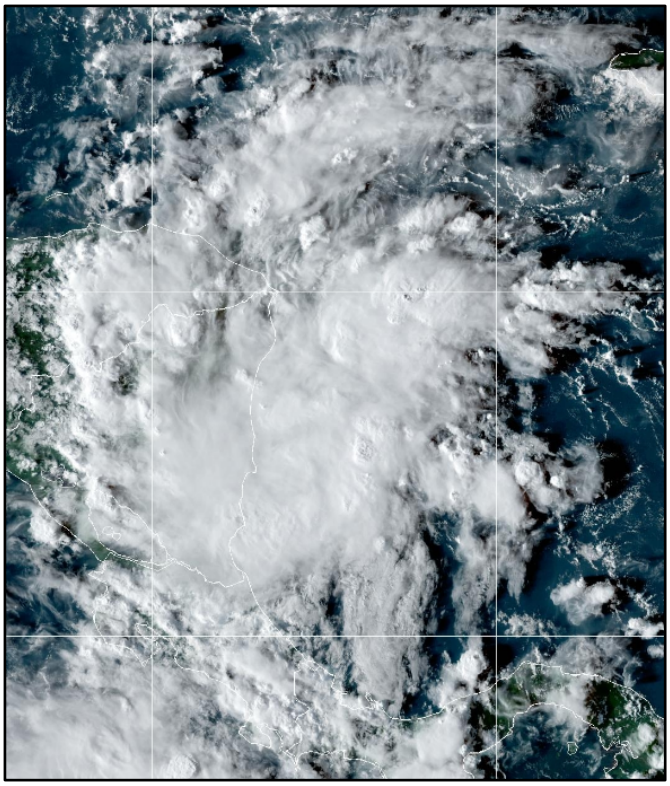

GOES-16 GEOCOLOR IMAGE OF TROPICAL DEPRESSION TWENTY-ONE OFFSHORE NICARAGUA AT 2140 UTC ON 23 OCTOBER 2023. PHOTO COURTESY OF NOAA/NESDIS/STAR.

Tropical Depression Twenty-One was a short-lived tropical cyclone that formed in the far western Caribbean Sea, moved inland into Nicaragua, and then dissipated.

[1] This is an abbreviated Tropical Cyclone Report since there were no coastal watches or warnings issued and no direct fatalities reported in association with Tropical Depression Twenty-One.

# Tropical Depression Twenty-One

**23–24 OCTOBER 2023**

## BEST TRACK

The "best track[2]" positions and intensities for Tropical Depression Twenty-One are listed in Table 1. The best track chart of Tropical Depression Twenty-One's path is given in Fig. 1, with the wind and pressure histories along with available observations[3] shown in Figs. 2 and 3, respectively.

There were no reported winds of tropical storm force from ships or land stations in association with Tropical Depression Twenty-One.

### *Origin*

Tropical Depression Twenty-One originated from an area of disturbed weather along the eastern portion of the eastern Pacific monsoon trough near Panama on 21 October. The disturbance drifted northwestward, and a broad area of low pressure formed early the next day over the southwestern Caribbean Sea. Convection increased in organization as scatterometer data indicated that the system had also acquired a well-defined center. As a result, the system was designated a tropical depression at 1200 UTC 23 October, when it was located about 70 n mi east of the coast of southern Nicaragua.

### *Peak Intensity and Minimum Pressure*

Tropical Depression Twenty-One attained an estimated peak intensity of 25 kt. The peak intensity is based on an ASCAT-C pass from 1443 UTC 23 October, an ASCAT-B pass from 1530 UTC, and Dvorak classifications from TAFB and SAB, which all suggested a 25-kt intensity. Satellite imagery indicates that the depression did not become any better organized after genesis, and it made landfall around 0130 UTC 24 October along the coast of southern Nicaragua with estimated maximum winds of 25 kt. The estimated minimum central pressure of 1007 mb is based on the Knaff-Zehr-Courtney pressure-wind relationship as well as a surface observation of 1007.1 mb with 5-kt winds at 2200 UTC 23 October at Bluefields, Nicaragua.

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[2] 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.

[3] Observations 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 Tropical Depression Twenty-One.

### *Rainfall*

Data provided by the Nicaraguan Meteorological Service indicate that Tropical Depression Twenty-One produced 3 to 5 inches (~75 to 125 mm) of rainfall with locally higher amounts over a limited area of southeastern Nicaragua, near and to the south of where the center made landfall (Fig. 4). Bluefields, Nicaragua, recorded 5.13 inches (130.2 mm) during the 48-h period from 23-24 October.

## CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Tropical Depression Twenty-One.

## FORECAST AND WARNING VERIFICATION

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 probability of formation (<40%) was first introduced in the 7-day and 2-day Tropical Weather Outlook 84 h and 66 h prior to formation, respectively. These probabilities were raised to the medium category (40-60%) 24 h prior to formation. The system never reached the high category (>60%) before formation occurred in the best track. Figure 5 shows composites of 7-day TWO genesis areas for each category prior to the formation of Tropical Depression Twenty-One. Each 7-day outlook issued correctly captured the location of genesis.

There was only one NHC forecast that verified at 12 h due to the short-lived nature of the cyclone. The one 12-h track forecast had an error of 64 n mi, which is significantly larger than the mean official errors for the previous 5-yr period. Satellite imagery and available observations suggest that the center re-formed to the north around the time of landfall, which likely contributed to the larger-than-normal track error. The one 12-h intensity forecast had an error of 5 kt. A homogeneous comparison of the official track and intensity errors with selected guidance models is not shown due to the small sample size.

Since the NHC forecasters did not anticipate any strengthening of the system before landfall, no coastal watches or warnings were issued for Tropical Depression Twenty-One.

Table 1. Best track for Tropical Depression Twenty-One, 23-24 October 2023.

| Date/Time (UTC) | Latitude (°N) | Longitude (°W) | Pressure (mb) | Wind Speed (kt) | Stage |
|---|---|---|---|---|---|
| 23 / 1200 | 11.4 | 82.6 | 1007 | 25 | tropical depression |
| 23 / 1800 | 11.5 | 83.2 | 1007 | 25 | ” |
| 24 / 0000 | 12.2 | 83.4 | 1007 | 25 | ” |
| 24 / 0130 | 12.4 | 83.5 | 1007 | 25 | ” |
| 24 / 0600 | 13.0 | 83.8 | 1007 | 25 | ” |
| 24 / 1200 | 13.5 | 84.4 | 1007 | 20 | low |
| 24 / 1800 | | | | | dissipated |
| 23 / 1200 | 11.4 | 82.6 | 1007 | 25 | minimum pressure & maximum wind |
| 24 / 0130 | 12.4 | 83.5 | 1007 | 25 | landfall 30 n mi NNE of Bluefields, Nicaragua |

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%) | 66 | 84 |
| Medium (40%-60%) | 24 | 24 |
| High (>60%) | - | - |

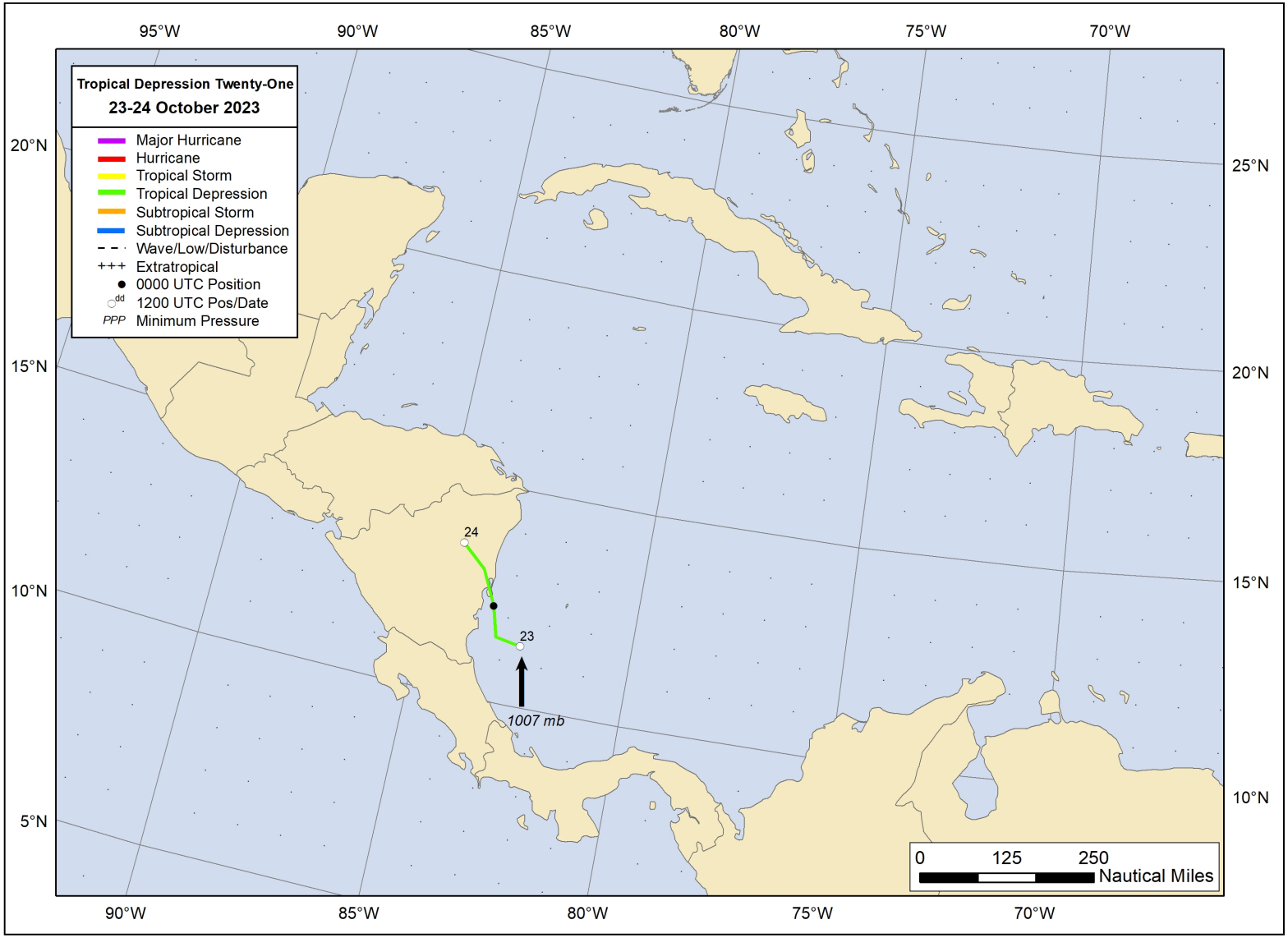


Figure 1. Best track positions for Tropical Depression Twenty-One, 23-24 October 2023.

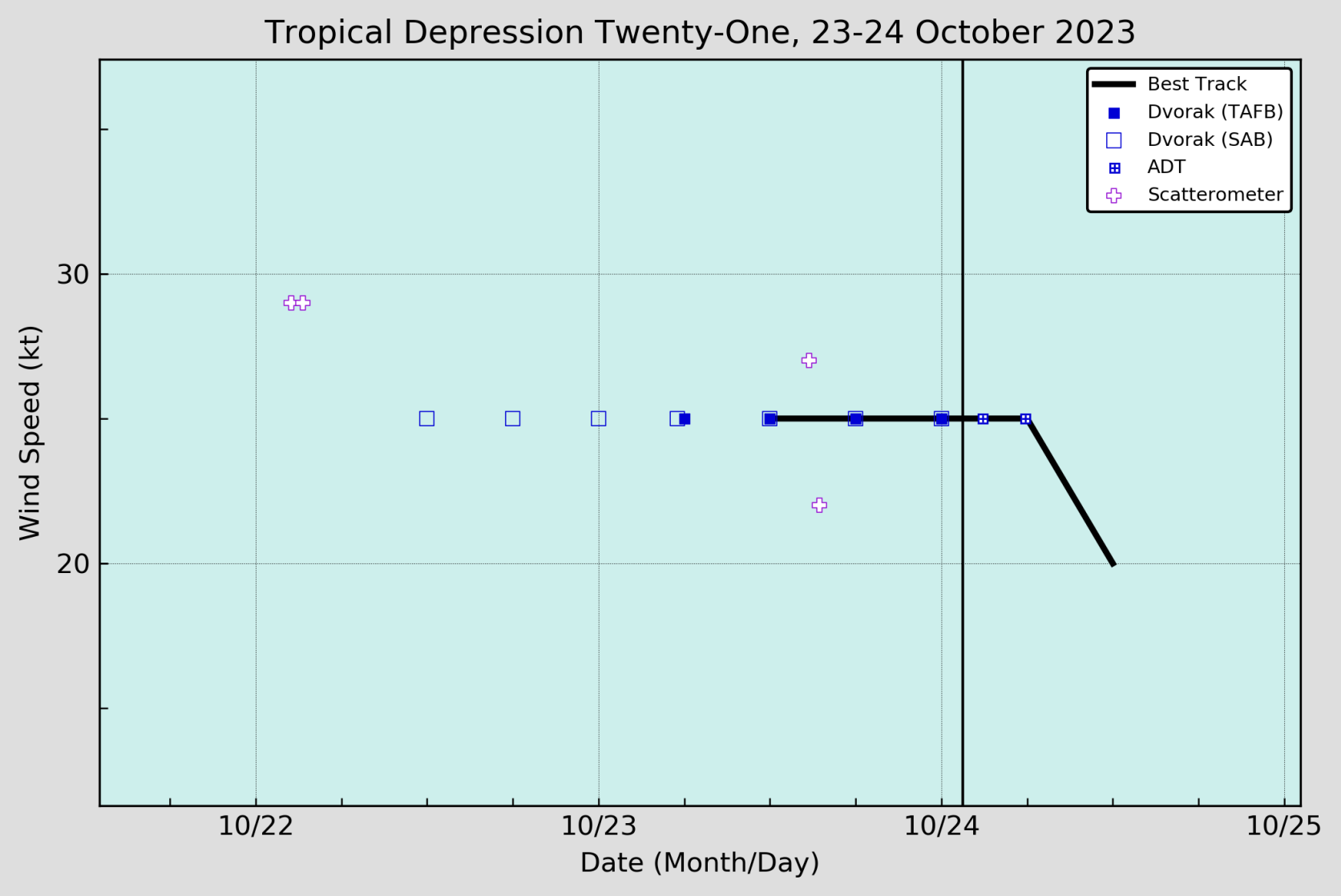


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Tropical Depression Twenty-One, 23-24 October 2023. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. Dashed vertical lines correspond to 0000 UTC, and solid vertical line corresponds to landfall.

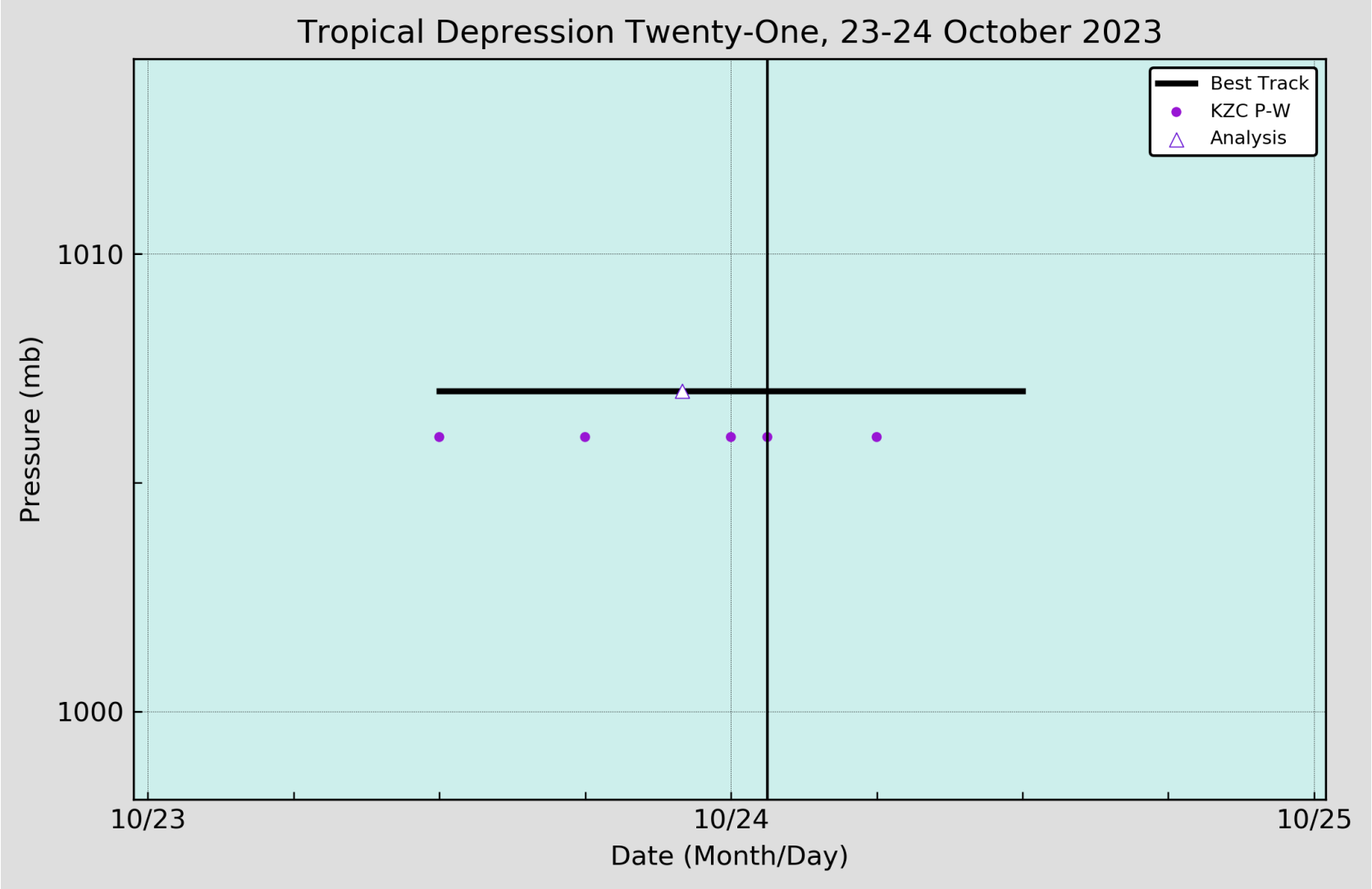


Figure 3. Selected pressure observations and best track minimum central pressure curve for Tropical Depression Twenty-One, 23-24 October 2023. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC, and solid vertical line corresponds to landfall.


Figure 4. Rainfall accumulation (mm) map from 23-24 October 2023 provided by the Nicaraguan Meteorological Service. Tropical Depression Twenty-One's track is based on operational location estimates.

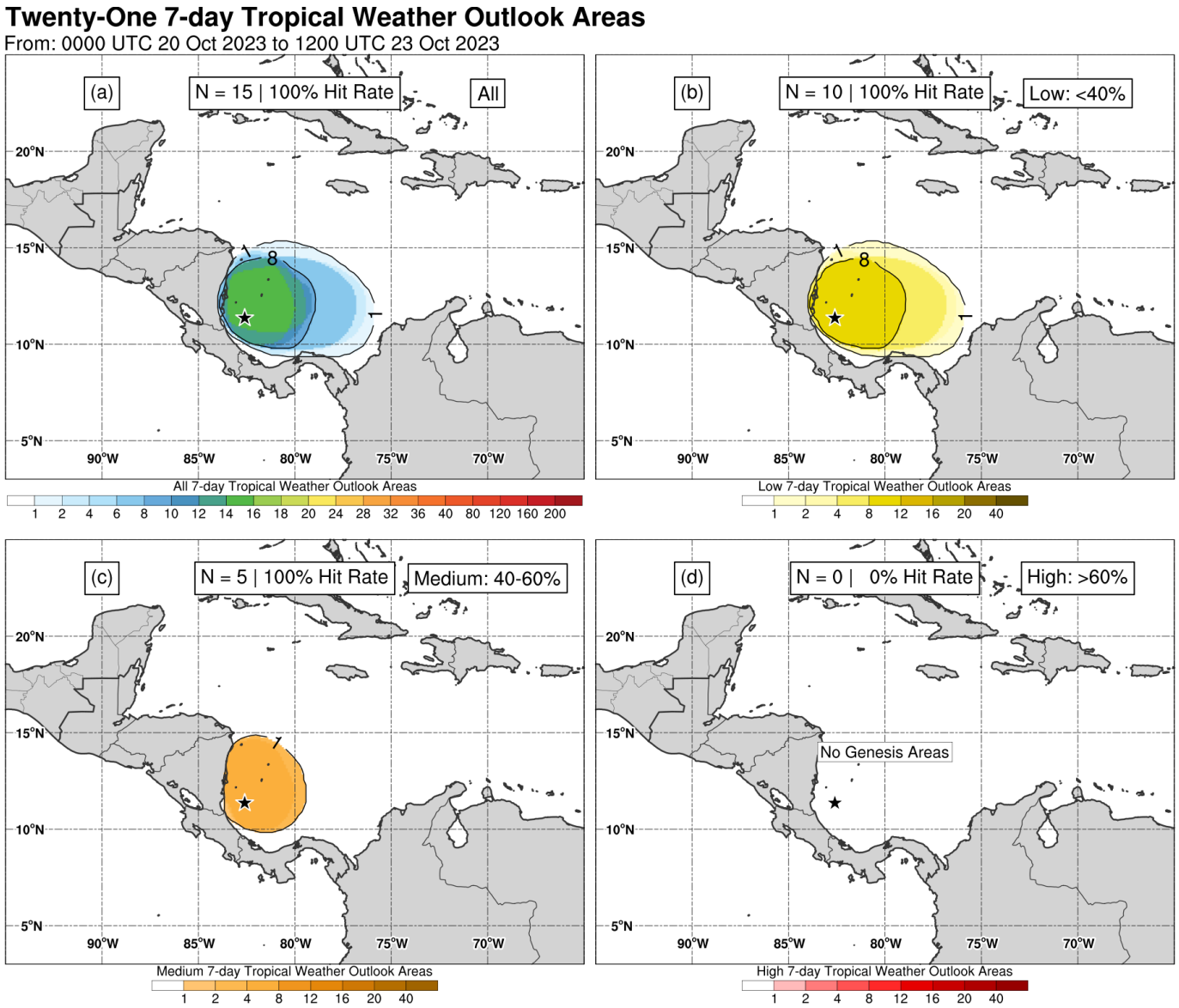


Figure 5. Composites of 7-day tropical cyclone genesis areas depicted in NHC's Tropical Weather Outlooks prior to the formation of Tropical Depression Twenty-One for (a) all probabilistic genesis categories, (b) the low (<40%) category, (c) medium (40–60%) category, and (d) high (>60%) category. The location of genesis is indicated by the black star.