

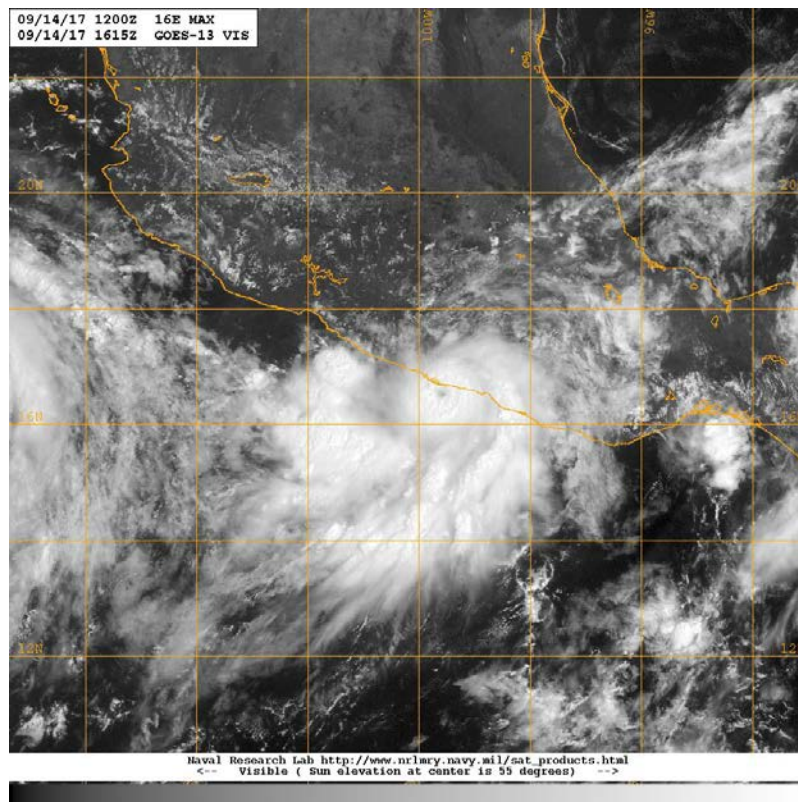


# NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

## HURRICANE MAX (EP162017)

13-15 September 2017

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National Hurricane Center  
12 April 2018<sup>1</sup>



GOES-13 VISIBLE SATELLITE IMAGE OF HURRICANE MAX AT 1615 UTC 14 SEPTEMBER 2017. IMAGE COURTESY OF NAVAL RESEARCH LABORATORY.

Max was a category 1 hurricane (on the Saffir-Simpson Hurricane Wind Scale) that made landfall in the state of Guerrero, Mexico. It was the only landfalling hurricane of the 2017 eastern North Pacific season.

<sup>1</sup> Original report date 29 March 2018. Added short abstract on this page.

# Hurricane Max

13-15 SEPTEMBER 2017

## SYNOPTIC HISTORY

Max appears to have been initiated by the same tropical wave that spawned Atlantic Hurricane Jose. The wave moved westward at low latitudes to the south of Atlantic Hurricane Irma, crossed Central America and entered the east Pacific on 11 September. Vorticity associated with the wave soon became embedded within a broad low-level cyclonic gyre to the south of Mexico. On 13 September, a large area of deep convection associated with this system became more consolidated a couple of hundred n mi southwest of the coast of southern Mexico. By 1200 UTC that day, convective banding had become sufficiently well organized to designate the formation of a tropical depression that was centered about 130 n mi west-southwest of Acapulco, 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<sup>2</sup>.

Max was steered east-northeastward toward the Mexican coast by the flow on the northern side of a mid-level ridge extending westward from Central America. The cyclone was over sea surface temperatures near 30°C and there was strong upper-level divergence over the system. Steady strengthening occurred as a result, and the system became a tropical storm by 1800 UTC 13 September. Max continued to intensify rapidly during the evening and overnight hours, becoming a hurricane shortly before 1200 UTC 14 September, while an eye was evident on both the Acapulco radar (Fig. 4) and geostationary satellite imagery. Max reached a peak intensity of 80 kt just before landfall. The hurricane crossed the coast of Mexico in the eastern part of the state of Guerrero, about 40 n mi east-southeast of Acapulco, around 1800 UTC 14 September. The cyclone then weakened rapidly over the mountainous terrain of Mexico, dropping below hurricane strength by 0000 UTC 15 September and weakening to a tropical depression by 0600 UTC that day. The system dissipated over southeastern Mexico by 1200 UTC 15 September.

## METEOROLOGICAL STATISTICS

Observations in Max (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

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<sup>2</sup> 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* directory, while previous years’ data are located in the *archive* directory.

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 Max.

Max's estimated peak intensity of 80 kt is based on a blend of subjective and objective Dvorak estimates.

Figure 5 is a map of the total rainfall over Mexico during the period of 12-15 September, including that associated with Max. The highest total was 289.8 mm in Ayutla, Guerrero. Other rainfall totals were 266.0 mm at Las Vigas and 257.5 mm at Ometec, both also in the state of Guerrero. No wind or pressure measurements are available from Mexico.

Ship reports of tropical-storm-force winds associated with Max are listed in Table 2.

## CASUALTY AND DAMAGE STATISTICS

Although not confirmed by the government of Mexico, media reports indicate that one person died, apparently due to drowning, in the township of San Marcos in southeastern Guerrero. Over 1,500 homes were reportedly damaged by water or wind across the state of Guerrero. Total damages due to Max are estimated to be around \$13 million.

## FORECAST AND WARNING CRITIQUE

The genesis of Max was reasonably well anticipated at the long range, but less well forecast in the short range. It was first noted in the Tropical Weather Outlook (TWO) 84 hours prior to genesis that an area of low pressure could form a few hundred miles south of southern Mexico in a few days with a low (<40%) chance of formation within 5 days (Table 3). The 5-day probability was raised to medium (40-60%) 78 h before genesis, and to high (>60%) 48 h before genesis. A 2-day probability of genesis in the low category was introduced into the TWO 72 h before genesis, was raised to medium 42 h before genesis, but was not set to the high category until just 6 h before formation. At that time, there was an abrupt increase in the organization of the system from which Max originated.

Verifications of official and model forecasts of track for Max are given in Table 4a and 4b, respectively, and verifications of official and model forecast of intensity are given in Tables 5a and 5b, respectively. Although the sample sizes are very small, the relatively large mean errors in the few official intensity forecasts that were made reflect the fact that Max's strengthening into a hurricane before landfall was not anticipated until shortly before the cyclone reached the coast. As a result, a Hurricane Warning was not issued until 6 h before landfall and a Hurricane Watch was issued only 9 h earlier, just 15 h before landfall (Table 6).

Table 1. Best track for Hurricane Max, 13-15 September 2017.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
13 / 1200	15.9	101.8	1006	30	tropical depression
13 / 1800	16.0	101.6	1005	35	tropical storm
14 / 0000	16.2	101.2	1002	45	"
14 / 0600	16.3	100.8	995	60	"
14 / 1200	16.4	100.2	988	70	hurricane
14 / 1800	16.6	99.2	980	80	"
15 / 0000	16.8	98.6	992	60	tropical storm
15 / 0600	17.0	98.2	1005	25	tropical depression
15 / 1200					dissipated
14 / 1800	16.6	99.2	980	80	maximum wind, minimum pressure, and landfall about 40 n mi east-southeast of Acapulco, Mexico

Table 2. Selected ship reports with winds of at least 34 kt for Hurricane Max, 13-15 September 2017.

Date/Time (UTC)	Ship call sign	Latitude (°N)	Longitude (°W)	Wind dir/speed (kt)	Pressure (mb)
14 / 0000	A8MW6	17.3	101.3	110° / 35	1008.5
14 / 0600	A8MW6	16.8	100.2	090° / 45	1010.0

Table 3. 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%)	72	84
Medium (40%-60%)	42	78
High (>60%)	6	48

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Max, 13-15 September 2017. 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	72	96	120
OFCL	24.4	35.2	<b>33.0</b>				
OCD5	50.3	137.8	258.1				
Forecasts	6	4	2	0	0	0	0
OFCL (2012-16)	22.2	33.9	43.8	54.8	80.0	108.9	145.1
OCD5 (2012-16)	35.7	72.0	112.2	150.2	217.0	271.0	340.2



Table 4b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Max, 13-15 September 2017. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 4a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	26.1	37.8	25.9				
OCD5	62.7	174.0	289.1				
AEMI	34.5	46.1	<b>24.9</b>				
GFSI	54.0	91.4	96.6				
CMCI	<b>18.2</b>	55.0	38.9				
EMXI	40.3	88.8	126.9				
HCCA	<b>25.8</b>	<b>30.5</b>	<b>11.5</b>				
HMNI	43.2	70.1	46.9				
HWFI	<b>24.2</b>	57.9	54.0				
NAMI	47.1	83.0	72.6				
NVGI	26.2	<b>18.9</b>	47.5				
TABD	34.3	37.8	<b>16.6</b>				
TABM	43.4	47.9	34.5				
TABS	37.8	49.4	<b>11.5</b>				
TVCA	31.4	46.1	<b>18.2</b>				
TVCX	29.6	<b>36.5</b>	<b>13.0</b>				
Forecasts	3	1	1				



Table 5a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Max, 13-15 September 2017. Mean errors for the previous 5-yr period are shown for comparison. Official errors were larger than the 5-yr means at all forecast periods.

	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	16.7	31.3	17.5				
OCD5	19.3	25.0	20.5				
Forecasts	6	4	2	0	0	0	0
OFCL (2012-16)	5.8	9.4	11.8	13.2	15.0	15.7	14.9
OCD5 (2012-16)	7.6	12.2	15.7	18.1	20.6	21.8	20.0



Table 5b. Homogeneous comparison of selected intensity forecast guidance models (kt) for Hurricane Max, 13-15 September 2017. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be small than that shown in Table 5a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	13.3	40.0	35.0				
OCD5	50.0	55.0	45.0				
GFSI	35.7	55.0	50.0				
DSHP	20.7	46.0	35.0				
EMXI	23.0	42.0	<b>26.0</b>				
HCCA	20.7	40.0	<b>34.0</b>				
HMNI	26.0	<b>12.0</b>	<b>4.0</b>				
HWFI	24.7	<b>38.0</b>	37.0				
ICON	21.0	44.0	35.0				
IVCN	20.7	42.0	38.0				
LGEM	17.7	49.0	35.0				
Forecasts	3	1	1				



Table 6. Watch and warning summary for Hurricane Max, 13-15 September 2017.

<b>Date/Time (UTC)</b>	<b>Action</b>	<b>Location</b>
<b>13 / 1500</b>	Tropical Storm Watch issued	Zihuatanejo to Punta Maldonado
<b>13 / 2100</b>	Tropical Storm Watch changed to Tropical Storm Warning	Zihuatanejo to Punta Maldonado
<b>14 / 0300</b>	Hurricane Watch issued	Zihuatanejo to Punta Maldonado
<b>14 / 1200</b>	Tropical Storm Warning changed to Hurricane Warning	Zihuatanejo to Punta Maldonado
<b>14 / 1200</b>	Hurricane Watch discontinued	All
<b>14 / 1500</b>	Tropical Storm Warning issued	Punta Maldonado to Lagunas de Chacahua
<b>14 / 1500</b>	Hurricane Watch issued	Punta Maldonado to Lagunas de Chacahua
<b>15 / 0000</b>	Tropical Storm Warning modified to	Acapulco to Lagunas de Chacahua
<b>15 / 0000</b>	Hurricane Watch discontinued	All
<b>15 / 0000</b>	Hurricane Warning discontinued	All
<b>15 / 0600</b>	Tropical Storm Warning discontinued	All

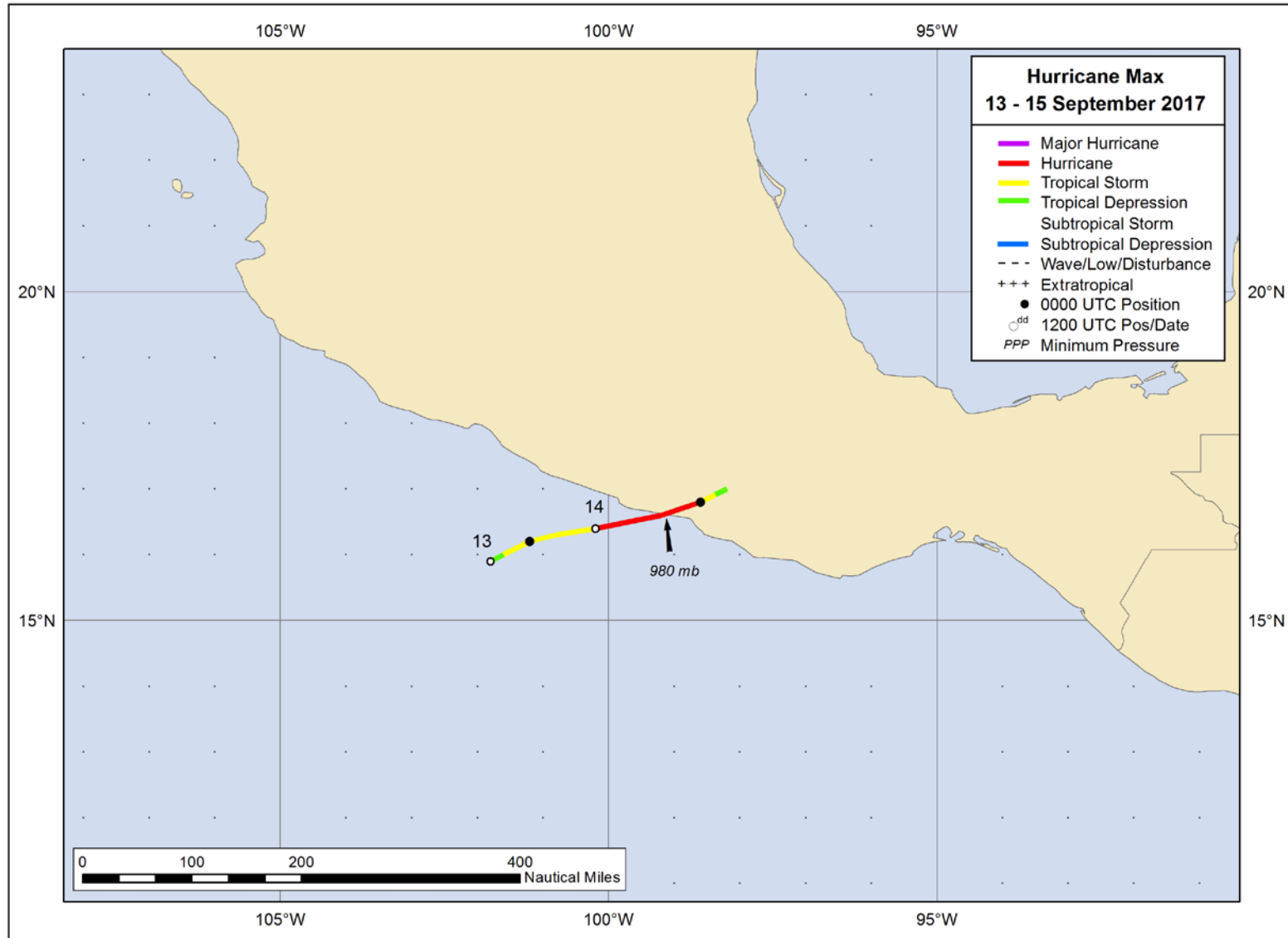


Figure 1. Best track positions for Hurricane Max, 13-15 September 2017.

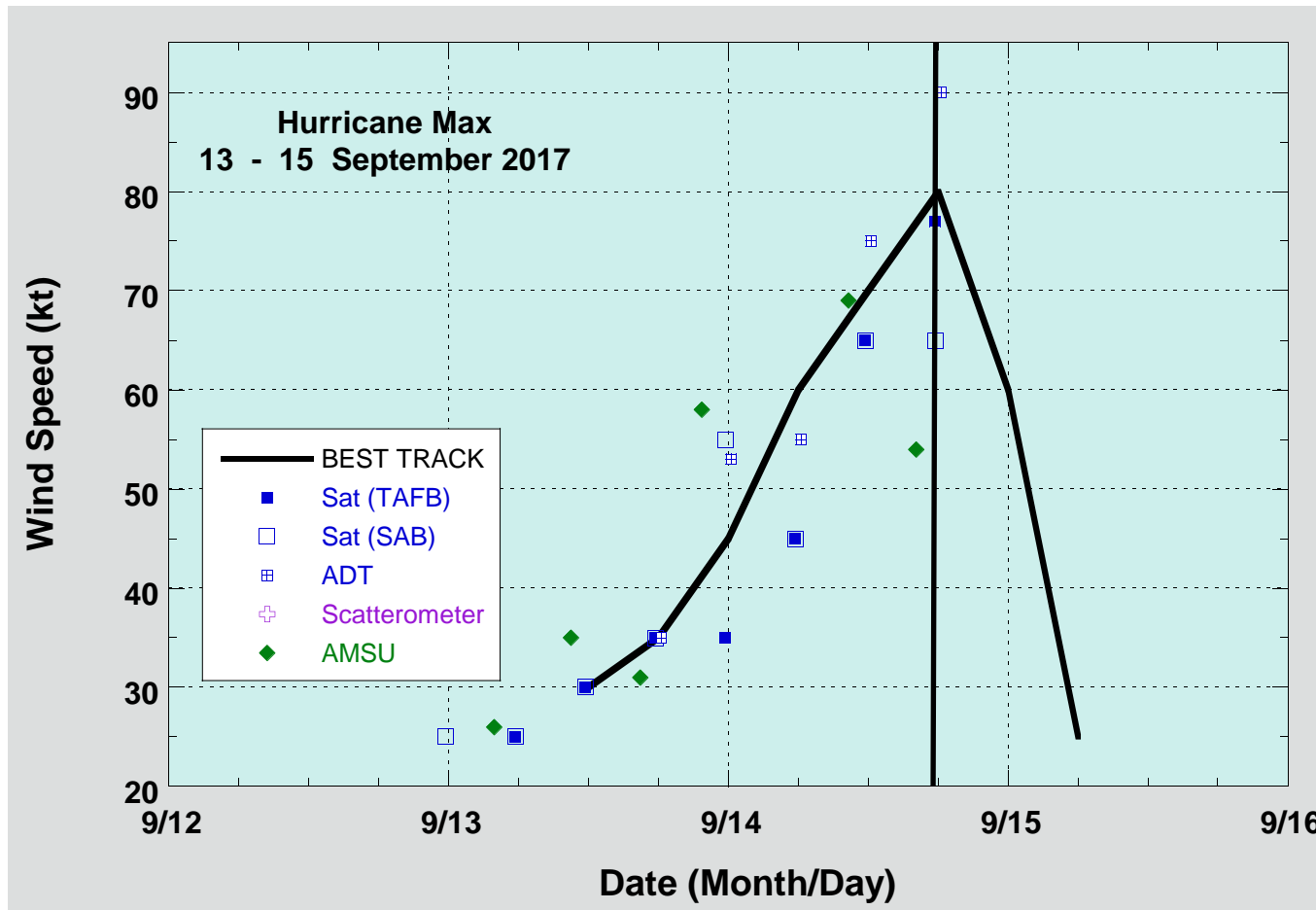


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Max, 13-15 September 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. Dashed vertical lines correspond to 0000 UTC. Solid vertical line corresponds to landfall.

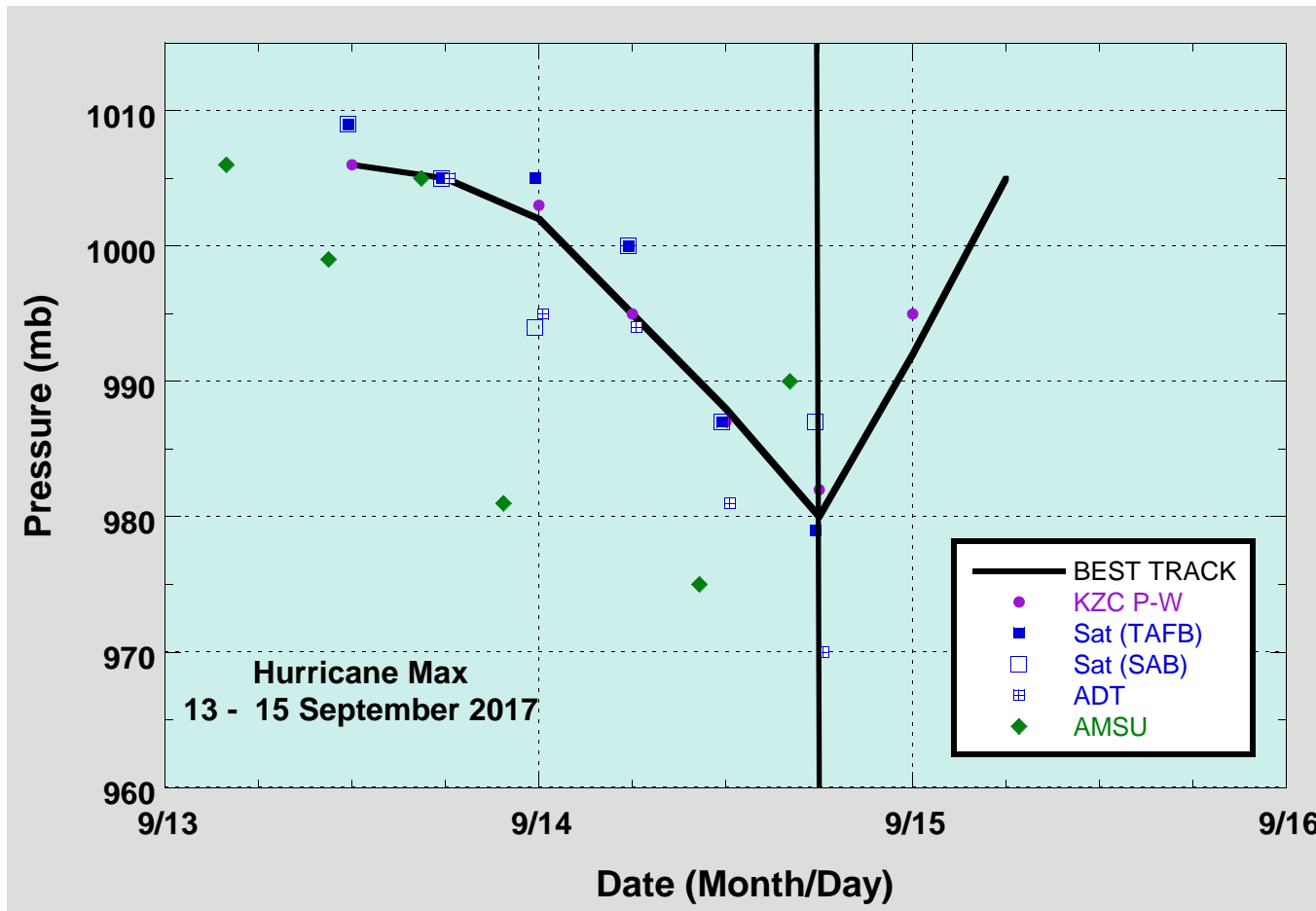


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Max, 13-15 September 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Solid vertical line corresponds to landfall.

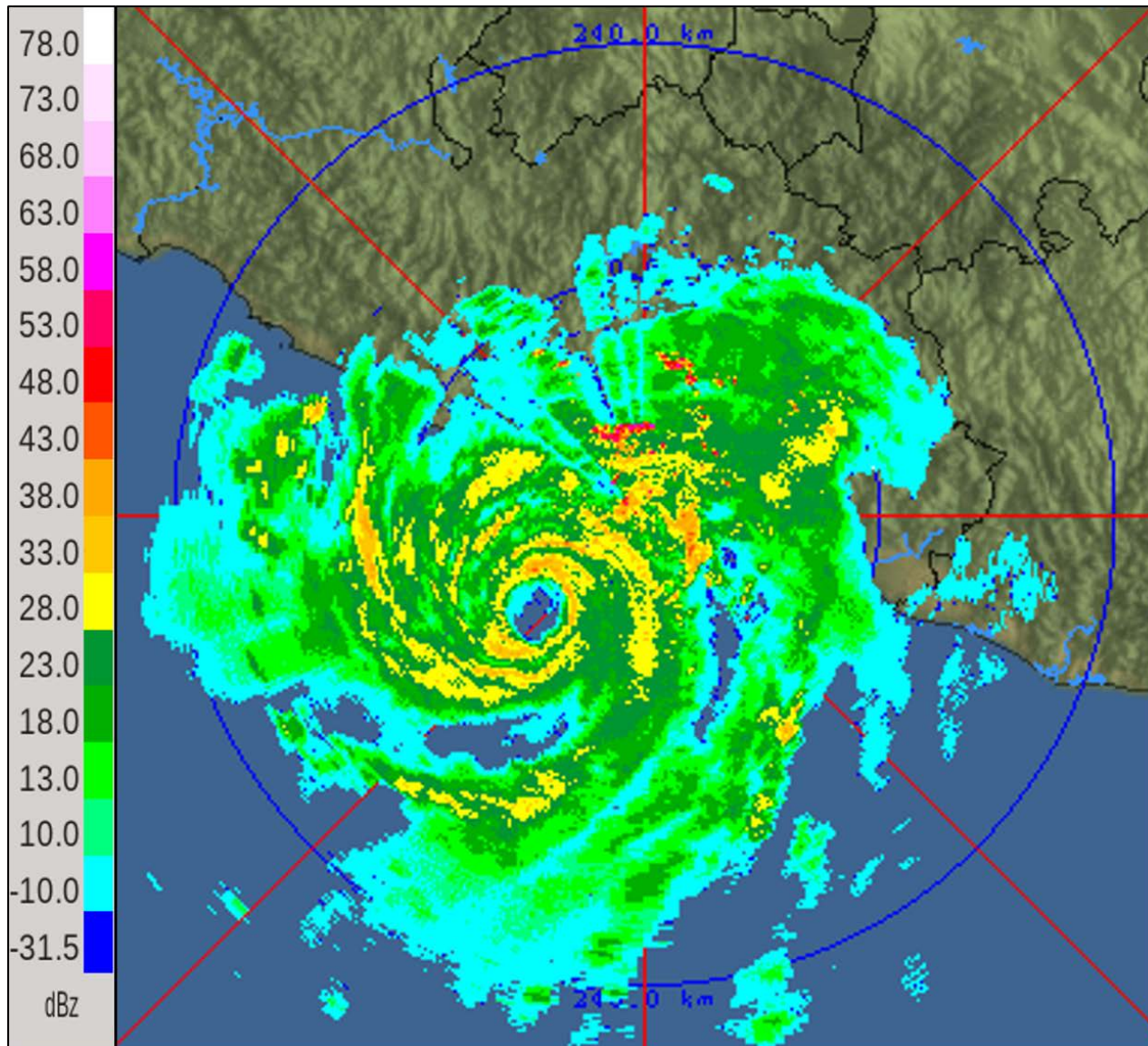


Figure 4. Acapulco, Mexico radar image at 1112 UTC 14 September 2017; elevation angle is 1.0 degrees. Image courtesy of SMN, Mexico.

### Precipitación acumulada (mm) del 12 al 15 de septiembre de 2017 por el huracán Max

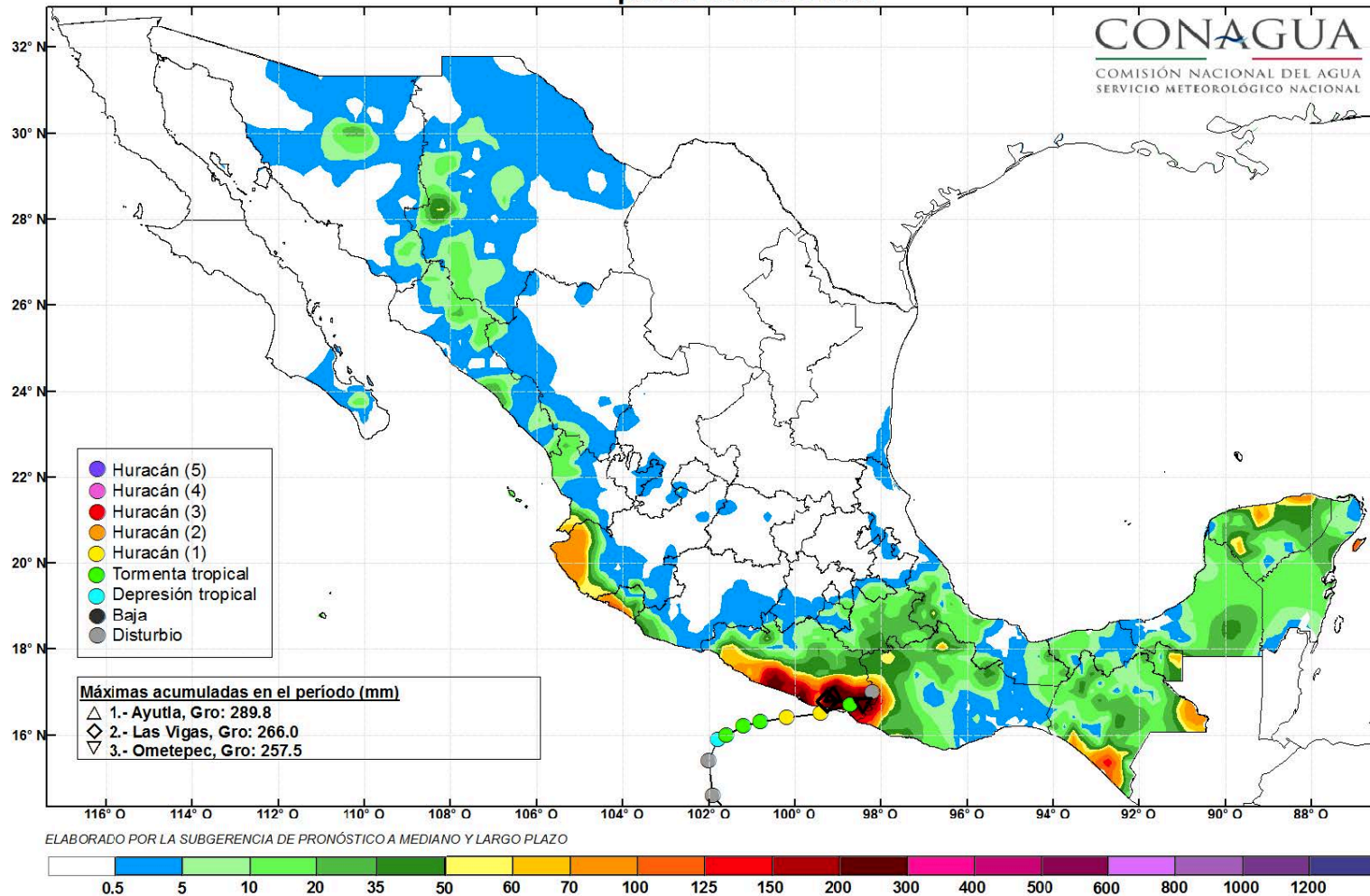


Figure 5. Rainfall over Mexico during 12-15 September, including that associated with Max. Figure courtesy of CONAGUA, Mexico.