NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

HURRICANE KATIA

(AL132017)

5 – 9 September 2017

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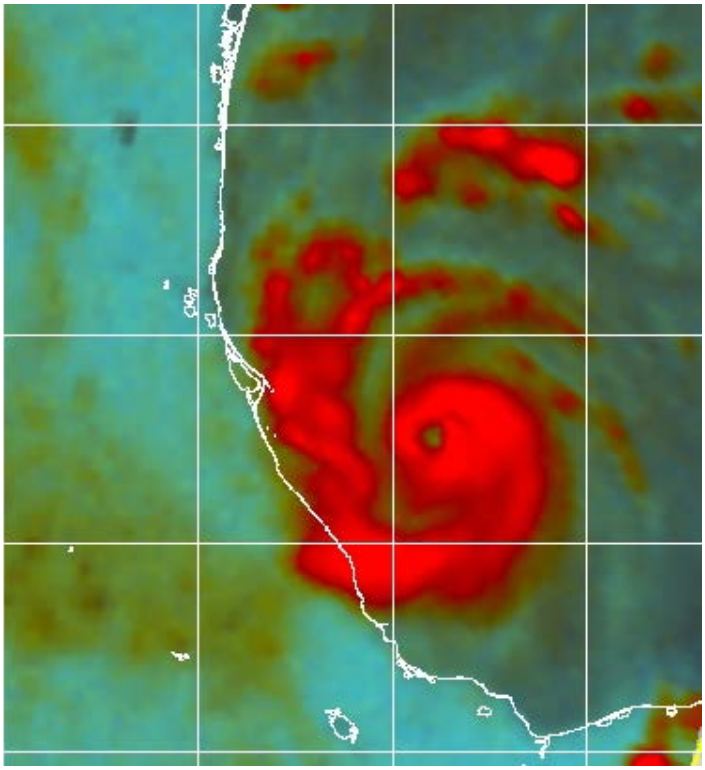
National Hurricane Center
28 November 2017



SSMIS MICROWAVE IMAGE AT 1048 UTC 8 SEPTEMBER 2017 SHOWING THE DISTINCT EYE OF HURRICANE KATIA IN THE SOUTHWESTERN GULF OF MEXICO. IMAGE COURTESY OF THE NAVAL RESEARCH LABORATORY.

Katia was a category 2 hurricane (on the Saffir-Simpson Hurricane Wind Scale) over the extreme southwestern Gulf of Mexico. It weakened and made landfall near Tecolutla, Mexico, as a category 1 hurricane.

Hurricane Katia

5 – 9 SEPTEMBER 2017

SYNOPTIC HISTORY

The origin of Katia can be traced back to a tropical wave that moved off the west coast of Africa on 24 August accompanied by a concentrated area of deep convection. The thunderstorm activity diminished while the wave was moving westward across the tropical Atlantic during the next few days. On 30 August, the wave crossed the southern Windward Islands with some increase in the associated shower activity, and by 3 September, the wave was over Central America interacting with a mid-level trough located over the eastern Gulf of Mexico. As the trough lifted out, the wave spawned a broad area of low pressure over the Bay of Campeche, and the wave continued westward across the Pacific south of Mexico. The shower activity associated with the low markedly increased in the Bay of Campeche while a well-defined low-level circulation gradually developed, and it is estimated that a tropical depression formed at 1200 UTC 5 September just off the coast of the Mexican state of Veracruz. 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].

Under the influence of very light steering currents, the depression began to drift east-southeastward for about a day within a very favorable low-shear environment and over warm waters. The cyclone reached tropical storm status at 0600 UTC 6 September and became a hurricane at 1800 UTC that day. A ridge of high pressure developed over the northern Gulf of Mexico on 7 September and forced Katia to move on a general west-southwest track toward the coast of the state of Veracruz. The hurricane continued to intensify and reached a peak intensity of 90 kt with a minimum pressure of 972 mb at 1800 UTC 8 September. Katia's circulation interacted with land, and the hurricane weakened before the center crossed the coast around 0300 UTC 9 September with 65-kt winds and a minimum pressure of 990 mb just north of Tecolutla, Mexico. Tecolutla is a small coastal town about 100 n mi north of Veracruz. After landfall, Katia rapidly weakened over the high terrain of eastern Mexico and dissipated shortly after 1200 UTC 9 September.

[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 Hurricane Katia (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. Observations also include flight-level, stepped frequency microwave radiometer (SFMR) observations from flights of the 53rd Weather Reconnaissance Squadron of the U. S. Air Force Reserve Command. 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 Katia.

There were 5 missions flown by the Air Force Reserve Hurricane Hunters into Katia that provided very valuable data from this small but strong hurricane. Data from the aircraft mission around 1300 UTC 8 September indicate the both flight-level and surface winds were 82 kt. It was then estimated that Katia reached its peak intensity of 90-kt at 1800 UTC 8 September when the eye became quite distinct and both subjective and objective Dvorak T-numbers peaked. This peak in intensity occurred in between two Air Force missions. The pressure at landfall was estimated to be lower than the pressure observed by the reconnaissance aircraft because the dropsonde used to construct the vortex message measured 39-kt winds, indicating that the drop missed the center.

NOAA buoy 42055 located in the Bay of Campeche reported sustained winds of 35 kt at 0121 UTC 7 September with a gust of 43 kt at 1352 UTC the same day. Katia produced heavy rainfall, primarily in the state of Veracruz, as displayed in Figure 4. The highest 24-h amount was measured was 11 inches (279.3 mm) near the town of Canseco, Veracruz.

CASUALTY AND DAMAGE STATISTICS

According to Mexican authorities, rains from Hurricane Katia caused a mudslide that left two people dead in Xalapa, the capital of the state of Veracruz. There were reports of widespread power failures and many mudslides, but the hurricane did not appear to cause any major damage in the region.

FORECAST AND WARNING CRITIQUE

The genesis of Katia was not well forecast. Due to the proximity to land of the initial disturbance, the probabilities of tropical cyclone formation were assumed to be low. The disturbance was introduced in the Tropical Weather Outlook 36 h prior to genesis with only a 10

percent chance of development during the next 5 days. The chances of formation were increased to the medium category only 24 h before genesis (Table 2). However, the disturbance unexpectedly and uncommonly moved eastward away from land and genesis occurred.

A verification of NHC official track forecasts for Katia is given in Table 3a. Official forecast track errors were lower than the mean official errors for the previous 5-yr period. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. Only the multi-model consensus TVCX and TVCA errors were consistently smaller than the official errors.

A verification of NHC official intensity forecasts for Katia is given in Table 4a. Official forecast intensity errors were greater than the mean official errors for the previous 5-yr period. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The large NHC intensity errors were the result of the unexpected of rapid increases and decreases in intensity of Katia. Model errors were also larger than normal, but in general, the intensity model errors were lower than those of the NHC forecast.

Watches and warnings associated with Hurricane Katia are given in Table 5.

Table 1. Best track for Hurricane Katia, 5-9 September 2017.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
05 / 1200	22.2	97.2	1010	25	tropical depression
05 / 1800	22.4	97.0	1008	30	"
06 / 0000	22.4	96.7	1008	30	"
06 / 0600	22.2	96.4	1006	35	tropical storm
06 / 1200	22.0	95.8	1004	45	"
06 / 1800	21.8	95.2	992	65	hurricane
07 / 0000	21.7	94.9	989	70	"
07 / 0600	21.6	94.6	989	70	"
07 / 1200	21.6	94.6	982	70	"
07 / 1800	21.6	94.6	982	70	"
08 / 0000	21.5	95.0	982	75	"
08 / 0600	21.4	95.3	977	80	"
08 / 1200	21.1	95.7	973	85	"
08 / 1800	21.1	96.2	972	90	"
09 / 0000	20.8	96.9	988	70	"
09 / 0600	20.3	97.4	1001	35	tropical storm
09 / 1200	20.1	97.7	1004	30	tropical depression
09 / 1800					dissipated
09 / 0300	20.6	97.1	990	65	landfall at Tecolutla
08 / 1800	21.1	96.2	972	90	max winds/ minimum pressure

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	**120-Hour Outlook**
Low (<40%)	36	36
Medium (40%-60%)	18	24
High (>60%)	-	-

Table 3a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Katia. 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	**18.1**	**29.1**	**29.9**	**25.0**	**46.3**		
OCD5	32.8	77.9	132.1	195.6	345.8		
Forecasts	14	12	10	8	4		
OFCL (2012-16)	24.9	39.6	54.0	71.3	105.8	155.4	208.9
OCD5 (2012-16)	47.3	103.9	167.8	230.3	343.1	442.6	531.0

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Katia. 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 3a due to the homogeneity requirement.

Model ID	Forecast Period (h)						
	12	24	36	48	72	96	120
OFCL	17.6	29.7	30.0	25.7	37.8		
OCD5	35.2	83.1	135.7	201.1	376.8		
GFSI	20.9	40.0	47.2	47.1	**33.9**		
HWFI	21.4	**28.1**	33.6	56.8	127.8		
EMXI	**16.6**	35.0	46.4	38.6	42.6		
CMCI	22.6	36.2	59.9	82.0	70.3		
AEMI	19.9	41.2	49.8	51.9	54.7		
HCCA	18.8	31.2	35.2	33.1	45.5		
TVCX	**16.4**	**24.6**	**26.5**	**19.8**	54.8		
GFEX	17.6	36.2	45.7	37.8	**37.2**		
TVCN	**16.5**	**24.6**	**24.4**	**22.6**	61.5		
TABS	34.0	71.6	105.0	142.2	227.2		
TABM	24.7	47.0	78.3	96.7	162.6		
TABD	22.8	31.2	48.1	63.6	129.0		
CTCI	26.0	40.2	44.3	59.3	111.8		
Forecasts	9	9	8	6	2	0	0

Table 4a. NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Katia. 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	11.8	17.1	18.0	19.4	18.8		
OCD5	13.8	19.3	17.9	21.6	25.8		
Forecasts	14	12	10	8	4		
OFCL (2012-16)	5.5	8.2	10.5	12.0	13.4	14.0	14.5
OCD5 (2012-16)	7.1	10.5	13.0	15.1	17.4	18.2	20.6

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Katia. 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	8.3	16.1	17.5	20.0	15.0		
OCD5	10.8	16.8	18.1	24.0	30.5		
HWFI	14.4	**15.6**	**15.6**	**14.0**	19.0		
IVCN	12.0	**14.2**	**13.0**	**13.2**	20.0		
HCCA	12.2	**13.7**	**12.3**	**12.2**	16.0		
DSHP	10.2	**14.8**	**15.4**	**17.7**	24.0		
LGEM	12.4	16.9	**17.0**	20.0	27.0		
GFSI	13.6	**13.6**	**14.0**	**19.0**	**8.5**		
EMXI	12.6	**14.9**	**15.4**	**19.5**	**13.0**		
ECOI	13.7	**15.8**	**14.6**	**18.8**	18.5		
Forecasts	9	9	8	6	2	0	0

Table 5. Watch and warning summary for Hurricane Katia, 5-9 September 2017.

Date/Time (UTC)	Action	Location
6 / 2100	Hurricane Watch issued	Tuxpan to Laguna Verde
7 / 0300	Hurricane Watch modified to	Cabo Rojo to Laguna Verde
7 / 0900	Hurricane Watch changed to Hurricane Warning	Cabo Rojo to Laguna Verde
7 / 0900	Tropical Storm Warning issued	Cabo Rojo to Rio Panuco
7 / 0900	Tropical Storm Warning issued	Laguna Verde to Puerto Veracruz
9 / 0600	Tropical Storm Warning modified to	Rio Panuco to Puerto Veracruz
9 / 0600	Hurricane Warning discontinued	All
9 / 1200	Tropical Storm Warning discontinued	All

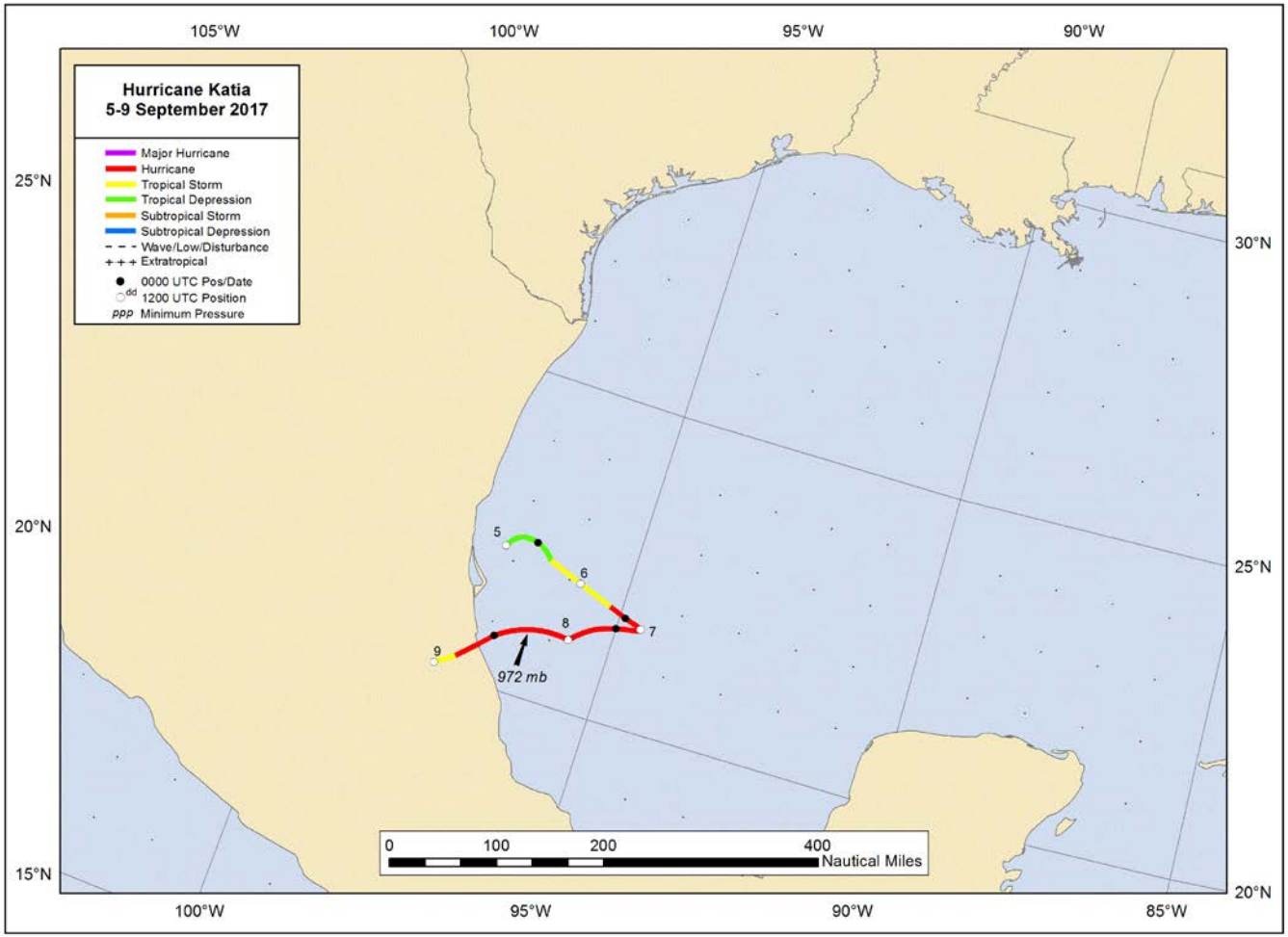


Figure 1. Best track positions for Hurricane Katia, 5-9 September 2017.

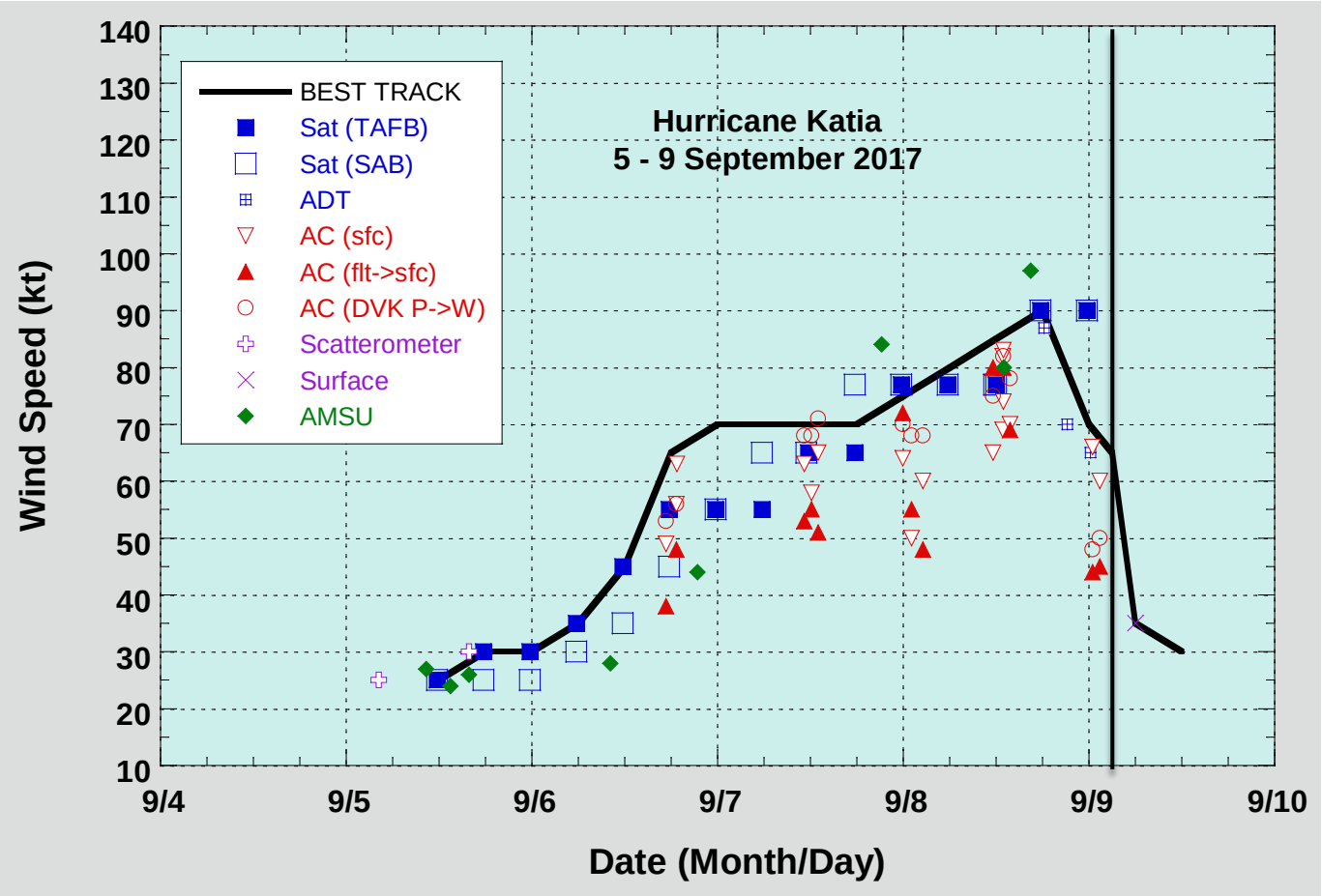


Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Katia, 5-9 September 2017. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% adjustment factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Advanced 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, and solid vertical lines correspond to landfalls.

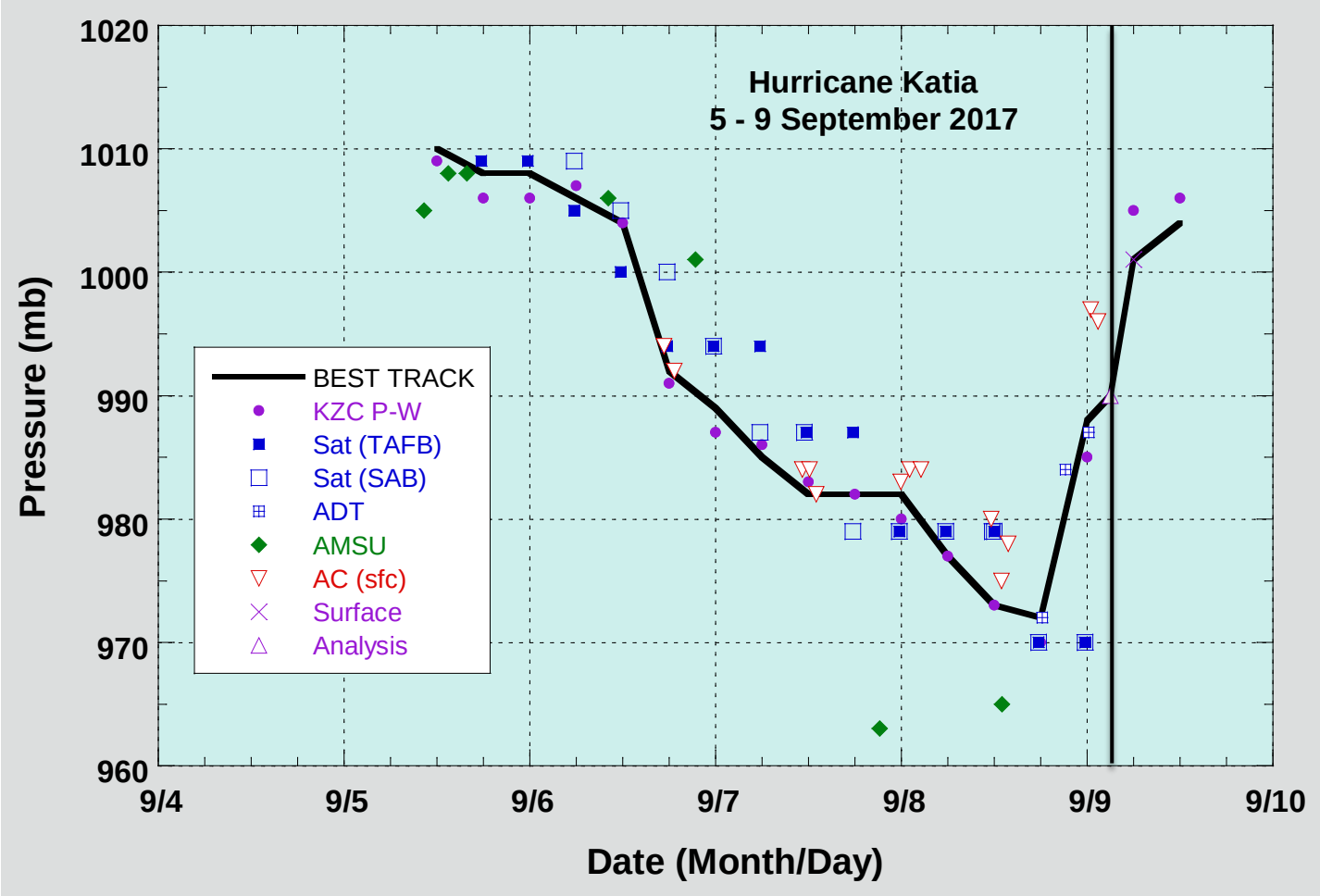


Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Katia, 5-9 September 2017. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. AMSU intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies technique. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical line correspond to 0000 UTC, and the solid vertical line corresponds to landfall.

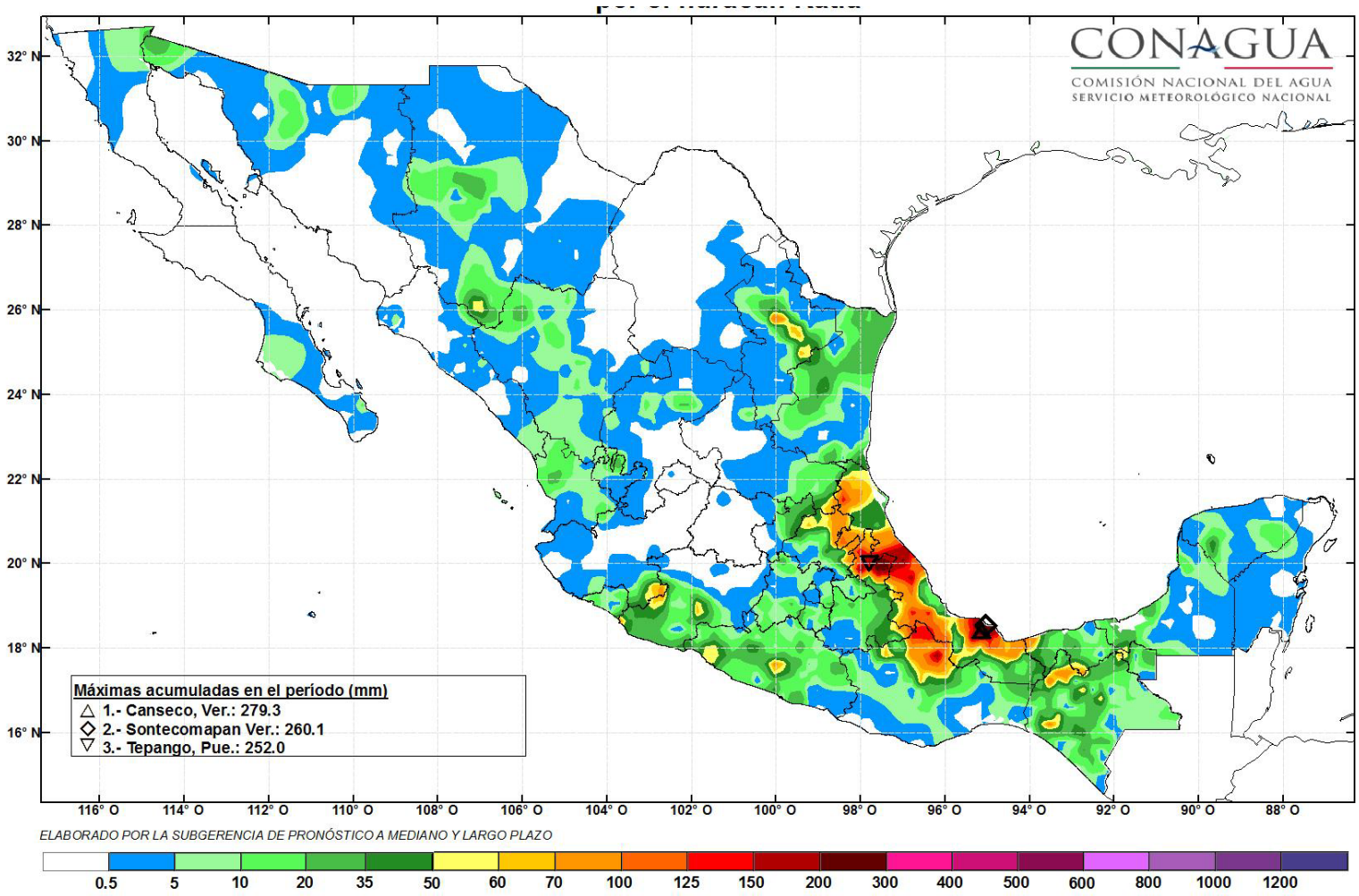


Figure 4. Observed rainfall (mm) in Mexico for the 24-h period ending at 8 AM CDT 9 September 2017 associated with Hurricane Katia. Image courtesy of the National Meteorological Service of Mexico.