NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT

SUBTROPICAL STORM ALPHA

(AL242020)

17–19 September 2020

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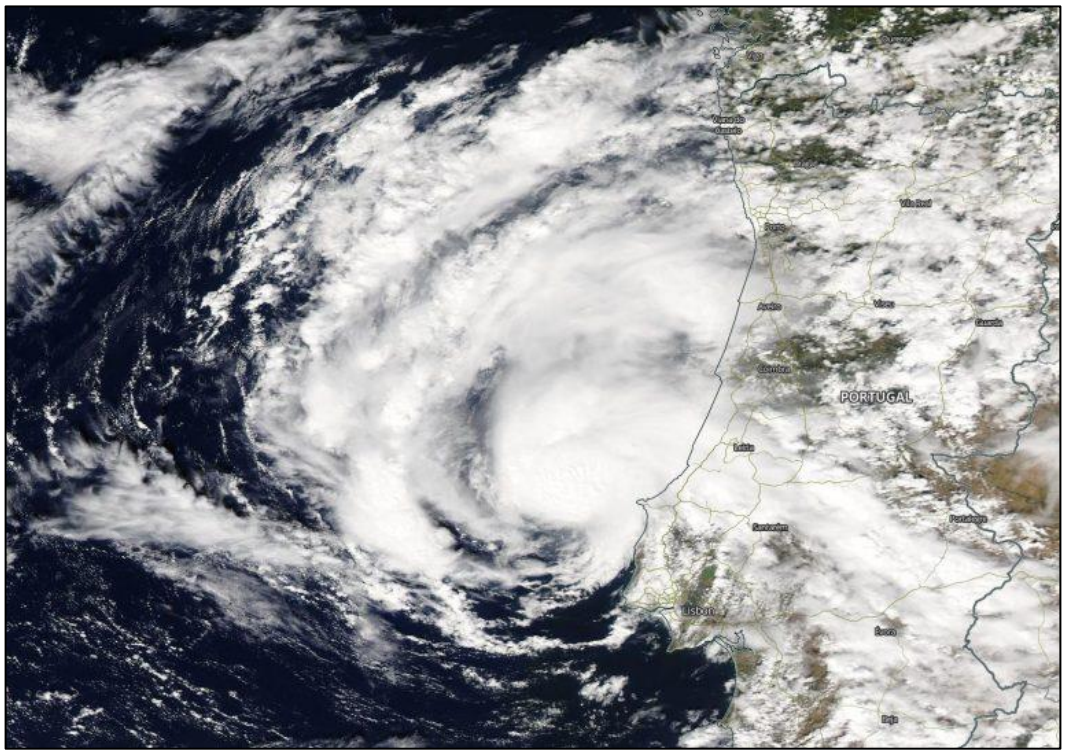

NASA AQUA VISIBLE SATELLITE IMAGE OF SUBTROPICAL STORM ALPHA APPROACHING THE WEST COAST OF PORTUGAL AT 1410 UTC 18 SEPTEMBER 2020

Alpha was a subtropical storm that formed over the northeastern Atlantic and made landfall with an estimated intensity of 45 kt on the Iberian Peninsula. Alpha is the first known subtropical or tropical cyclone to make landfall in mainland Portugal.

Subtropical Storm Alpha

17–19 SEPTEMBER 2020

SYNOPTIC HISTORY

Alpha developed from a large extratropical low-pressure area that formed over the northeastern Atlantic Ocean on 14 September. The surface low formed when a strong upper-level trough dug southeastward and became a cut-off low a little more than 500 n mi north of the Azores. The interaction between the upper-level low and a surface front induced the formation of a frontal low about 575 n mi north-northeast of the easternmost Azores by 1200 UTC 14 September. The frontal low was producing gale-force winds at the time of its formation, and it quickly deepened, reaching a peak intensity of 60 kt by 0000 UTC 15 September. By that time, the low had an expansive area of gale-force winds that extended outward up to 270 n mi from the center. The extratropical low was initially nearly stationary, but it began moving southward, and then south-southeastward after reaching its peak intensity. The low gradually weakened by midday on 15 September, and by 0000 UTC 16 September its winds had decreased to 40 kt when it was located about 375 n mi north-northeast of the easternmost Azores.

On 16 September, the size of the wind field decreased as the system began to shed its frontal features. The low continued to move south-southeastward well to the northeast of the easternmost Azores. Sea-surface temperatures of around 22°C and 500-mb temperatures of -12°C to -15°C provided enough instability for fragmented bands of convection to form around the eastern portion of the circulation that day. By early 17 September, the intensity of the low had decreased to 35 kt, but the convection became more concentrated near the center. The convection continued to organize over the next several hours, and by 0600 UTC 17 September it gained enough organization for the system to be classified as a subtropical storm when it was located about 350 n mi east of the Azores. The “best track” chart of Alpha’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].

After becoming a subtropical cyclone, the wind field continued to contract, and the area of 34-kt winds extended outward 40 to 60 n mi from the center. Convective banding gradually increased around the center, and the subtropical cyclone began to strengthen while it moved southeastward, embedded within the large deep-layer trough and upper-low. Alpha turned eastward and reached its peak intensity of 45 kt by 0000 UTC 18 September when it was located over the far eastern Atlantic about 225 n mi west-southwest of Lisbon, Portugal. Still embedded within the southeastern portion of the mid- to upper-level low, Alpha turned northeastward and maintained its intensity while approaching the west coast of Portugal (cover photo). The center of Alpha passed west of Lisbon and Cape Roca, Portugal, around 1200 UTC 18 September, and

[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.

made landfall about 10 n mi south of Figueira da Foz, Portugal, around 1840 UTC that day with an estimated intensity of 45 kt. Satellite imagery and radar data from Portugal showed that the convective banding wrapped around much of the southern and western portions of the circulation at the time of landfall (Figure 4). After landfall, the subtropical storm quickly weakened and became a subtropical depression by 0000 UTC 19 September when it was located over north-central Portugal. The circulation dissipated shortly thereafter over the mountainous terrain of northeastern Portugal. The remnants of Alpha brought gusty winds and locally heavy rainfall to portions of Spain on 19 September.

METEOROLOGICAL STATISTICS

Observations in Alpha (Figs. 2 and 3) include subjective satellite-based Hebert-Poteat subtropical technique intensity estimates from the Tropical Analysis and Forecast Branch (TAFB). 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, along with radar data from Lisbon and Arouca, Portugal, were also useful in constructing the best track of Alpha.

Winds and Pressure

The ship *Rio Grande Express* (call sign KRIH) reported winds as high as 62 kt during Alpha's extratropical phase, and observations from this ship along with scatterometer data were helpful in analyzing the intensity and wind field of the extratropical low. There were no ship reports of winds of 34-kt or greater in association with Alpha when it was a subtropical storm.

Alpha's estimated peak intensity as a subtropical storm of 45 kt is based on ASCAT data which revealed peak winds of around 43 kt late on 17 September and 40-kt winds a little before 1200 UTC 18 September. The estimated landfall intensity of 45 kt is supported by a 10-minute wind of 39 kt that was measured at Sao Pedro de Moel (Table 2). That wind observation converts to a 43-kt 1-minute wind when applying a World Meteorological Organization (WMO) conversion factor to obtain a 1-minute wind speed. A peak wind gust of 55 kt was also reported at that site.

The 996-mb estimated minimum pressure at landfall is based on an observation of 999 mb with 31-kt winds at Monte Real around 1800 UTC 18 September. A wind gust of 48 kt was also reported at that station. Unofficial weather stations along the west coast of Portugal near and south of the landfall location reported wind gusts above 34 kt. A wind gust of 44 kt was observed near Sao Martinho do Porto, and a gust to 43 kt was reported near Sao Bernardino.

In real-time, the subtropical storm was not shown to have formed until after 1200 UTC 18 September when it was approaching the coast of Portugal. In post-analysis, however, satellite imagery indicates that the system had adequate convective organization the previous day; although the convection waned at times it was persistent and organized enough for the low to be classified as a subtropical cyclone beginning around 0600 UTC 17 September.

Alpha is the first known subtropical or tropical cyclone to make landfall in Portugal; however, the ability to monitor such systems in this part of the Atlantic basin is limited the further one goes back in time. In 2018, Hurricane Leslie became a post-tropical cyclone before reaching the coast of Portugal, and in 2005 Tropical Depression Vince made landfall on the Iberian Peninsula but along the southwestern coast of Spain, just east of the Portugal/Spain border. There are also historical references to a hurricane striking southwestern Spain in 1842.

Rainfall and Flooding

Although there have been no official rainfall reports received from Portugal, several unofficial sites recorded storm total rainfall amounts of up to about 1.50 inches (38 mm).

Tornadoes

The Portuguese Institute for the Sea and Atmosphere reported that a squall line with wind gusts of 40–45 kt moved across the southern portion of Portugal during the morning hours of 18 September, well ahead of the center of Alpha. The squall line produced two tornadoes in Portugal, both classified as EF-1 tornadoes. One tornado occurred around 0915 UTC in the town of Palmela, located about 15 n mi south of Lisbon. There were no reports of damage associated with this tornado. A second tornado around 0950 UTC near the city of Beja, located in southeastern Portugal, uprooted numerous trees.

CASUALTY AND DAMAGE STATISTICS

There were no reports of injuries or deaths related to Alpha while it was a subtropical cyclone, but the remnants of the cyclone caused one fatality in Spain.

In Portugal, media reports indicate that high winds from Alpha caused widespread power outages and damage to numerous trees in portions of that country, but structural damage was limited. There were also some reports of localized flooding. The tornado near Beja uprooted more than 100 trees, which damaged about 30 to 40 vehicles. There was also some limited roof damage reported by local officials in that city.

The remnants of Alpha produced strong winds and heavy rainfall in Spain. The heavy rains led to a landslide near Madrid that caused a train containing 25 passengers to derail. Near the town of Calzadilla in west-central Spain, a woman died when the roof of a cattle shed collapsed. It is not known whether the roof collapse was the result of strong winds or heavy rainfall.

FORECAST AND WARNING CRITIQUE

The genesis of Alpha was poorly forecast, which is not unusual for systems over the northeastern Atlantic that transition from extratropical to subtropical. The extratropical low from

which Alpha developed was introduced into the Tropical Weather Outlook at 0600 UTC 15 September, about 48 h before the subtropical cyclone formed (Table 3). Both the 2-day and 5-day probabilities of genesis were assessed to be in the low (<40%) category. The probabilities never reached the medium (40–60%) or high (>60%) categories before genesis occurred. The poor genesis forecasts were the result of the marginally conducive atmospheric conditions and relatively cool sea-surface temperatures that the system was forecast to traverse at such a high latitude over the eastern Atlantic.

Only three NHC advisories were issued for Alpha with only one verifying 12-h forecast. For that reason, a comprehensive verification of official and guidance track and intensity forecast errors is not provided. The single verifying official forecast was issued as a Special advisory at 1630 UTC 18 September and had a 12-h forecast error of 54.2 n mi and 0.0 kt, respectively. The mean 12-h official errors for the previous 5-yr period (2015–19) are 24.2 n mi and 5.0 kt, respectively.

Although no tropical storm watches or warnings were issued for Portugal in association with Alpha, the Portuguese Institute for Sea and Atmosphere issued “Orange-level” weather warnings for wind and precipitation for the districts of Leiria and Coimbra.

Table 1. Best track for Subtropical Storm Alpha, 17–19 September 2020.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
14 / 1200	47.2	22.0	1002	40	extratropical
14 / 1800	47.2	22.2	996	50	"
15 / 0000	47.0	22.4	992	60	"
15 / 0600	46.0	22.5	994	60	"
15 / 1200	45.0	22.1	996	50	"
15 / 1800	43.9	21.4	998	45	"
16 / 0000	42.9	20.5	1000	40	"
16 / 0600	41.9	19.8	1000	40	"
16 / 1200	40.9	19.5	1000	40	"
16 / 1800	39.9	19.3	1000	40	"
17 / 0000	38.9	18.9	1002	35	"
17 / 0600	38.3	18.1	1002	35	subtropical storm
17 / 1200	37.7	17.3	1002	35	"
17 / 1800	36.7	15.6	999	40	"
18 / 0000	36.7	13.1	996	45	"
18 / 0600	37.9	11.4	996	45	"
18 / 1200	38.9	10.3	996	45	"
18 / 1800	39.9	9.1	996	45	"
18 / 1840	40.0	8.9	996	45	"
19 / 0000	40.6	7.6	1004	30	subtropical depression
19 / 0600					dissipated
18 / 0000	36.7	13.1	996	45	maximum wind and minimum pressure
18 / 1840	40.0	8.9	996	45	landfall about 10 n mi south of Figueira da Foz, Portugal

Table 2. Selected surface observations for Subtropical Storm Alpha, 17–19 September 2020.

Location	Minimum Sea Level Pressure		Maximum Surface Wind Speed			Total rain (in)
	Date/ time (UTC)	Press. (mb)	Date/ time (UTC)[a]	Sustained (kt)	Gust (kt)	
Portugal						
Sao Pedro de Moel				39 (10 min)	55	
Monte Real (LPMR)	18/1800	999.0	18/1800	31 (10 min)	48	
Olhão			18/0950		42	
Tavira			18/1010		39	
Weather Underground (unofficial)						
Sao Martinho do Porto	18/1730	1001.4	18/1745		44	
Sao Bernardino			18/1630		43	
Boavista			18/1515		36	
Figuerira da Foz			18/1920		38	

[a] Date/time is for sustained wind when both sustained and gust are listed.

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%)	48	48
Medium (40%–60%)	-	-
High (>60%)	-	-

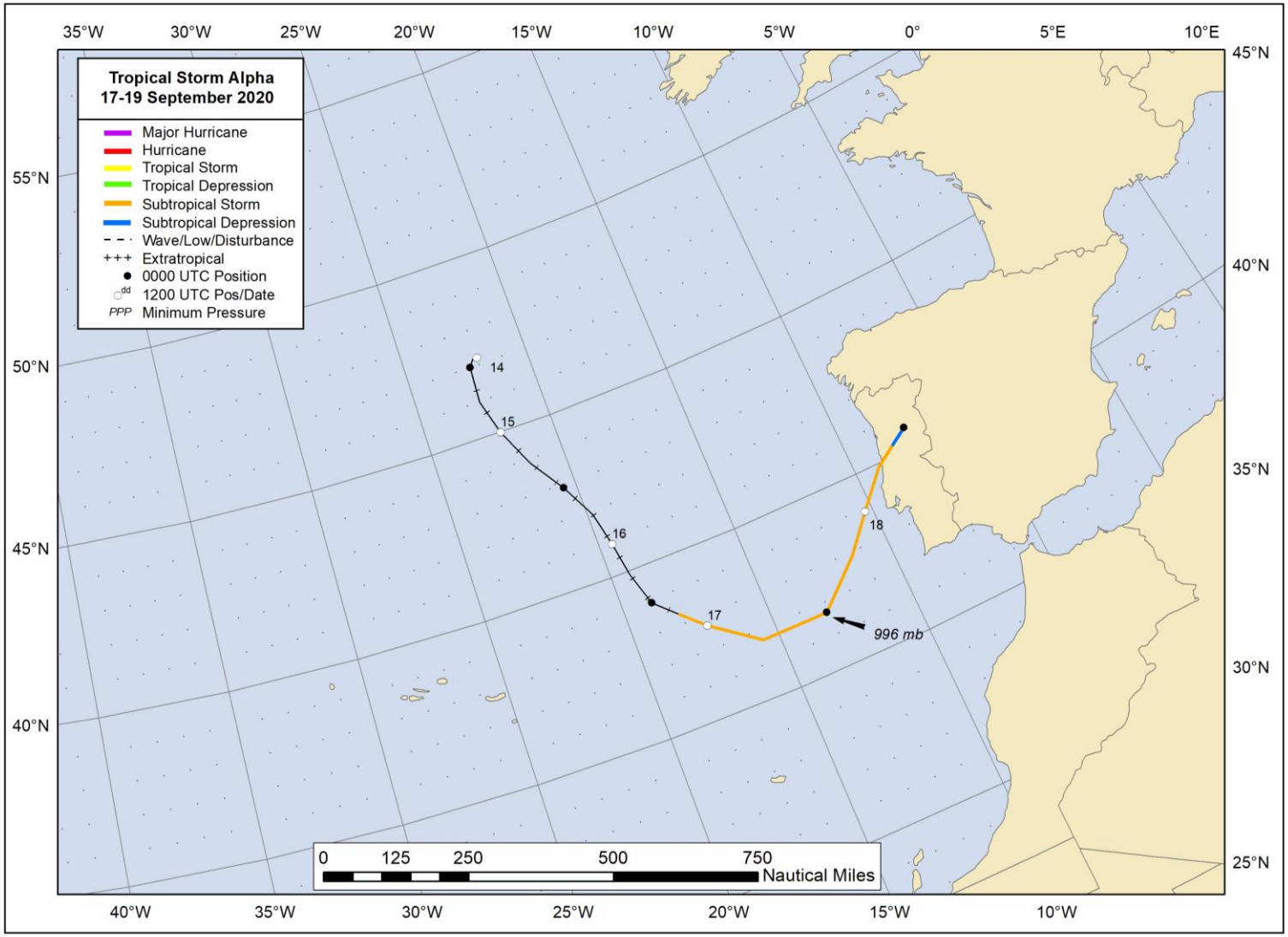

Figure 1. Best track positions for Subtropical Storm Alpha, 17–19 September 2020. The track during the extratropical stage is partially based on analyses from the NOAA Ocean Prediction Center.

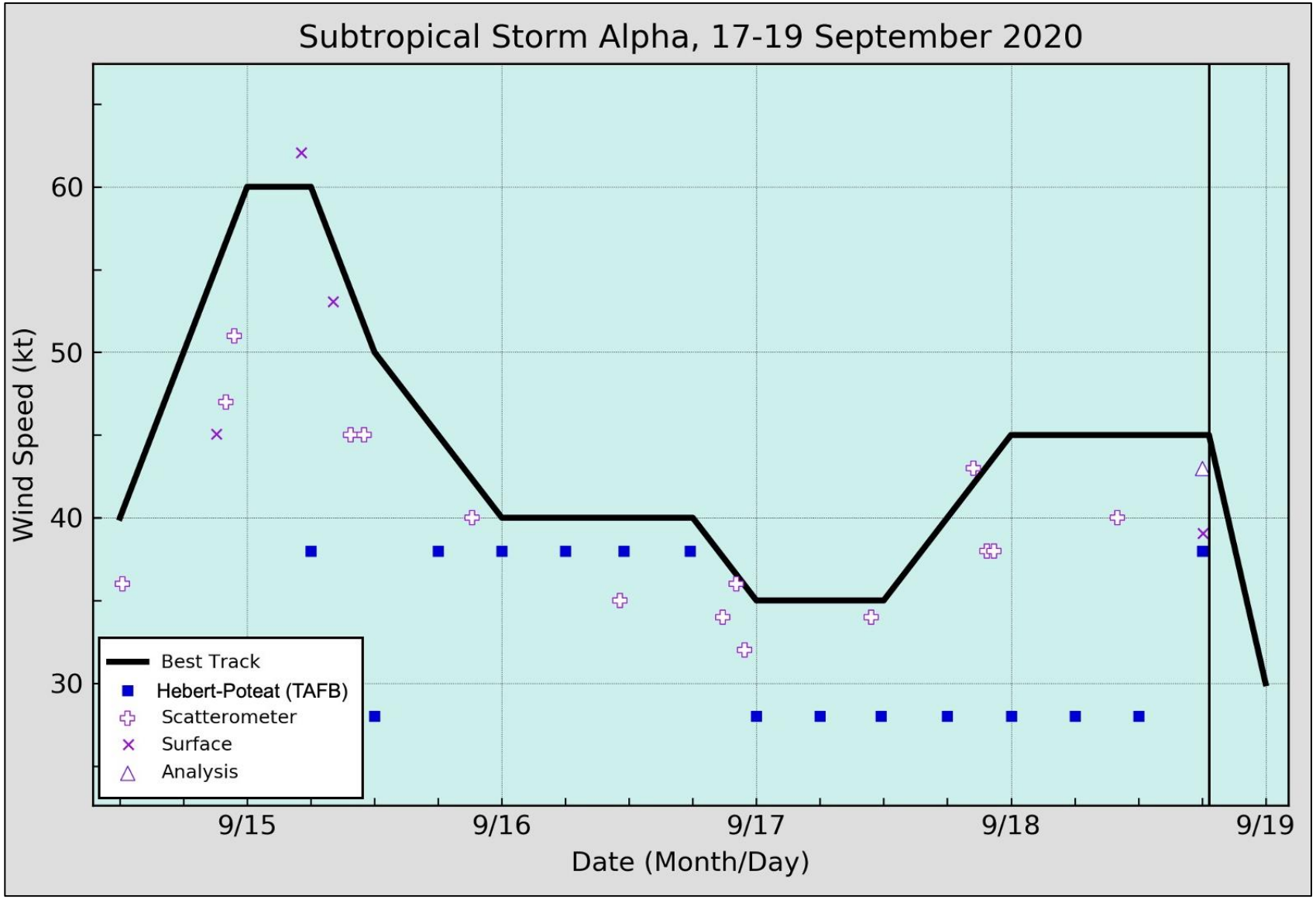

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Subtropical Storm Alpha, 17–19 September 2020. Dashed vertical lines correspond to 0000 UTC, and solid vertical line corresponds to landfall.

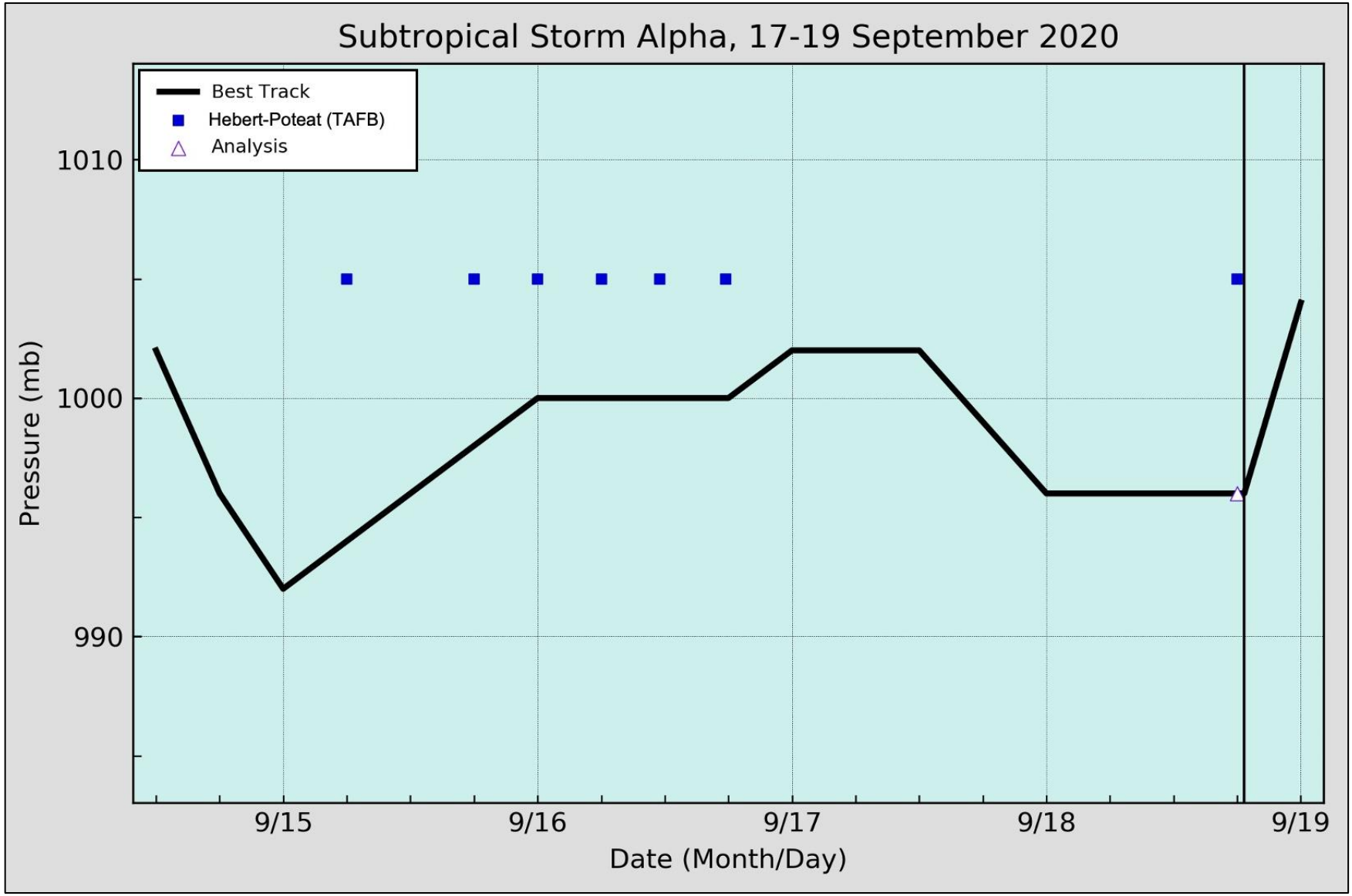

Figure 3. Selected pressure observations and best track minimum central pressure curve for Subtropical Storm Alpha, 17–19 September 2020. Dashed vertical lines correspond to 0000 UTC, and solid vertical line corresponds to landfall.

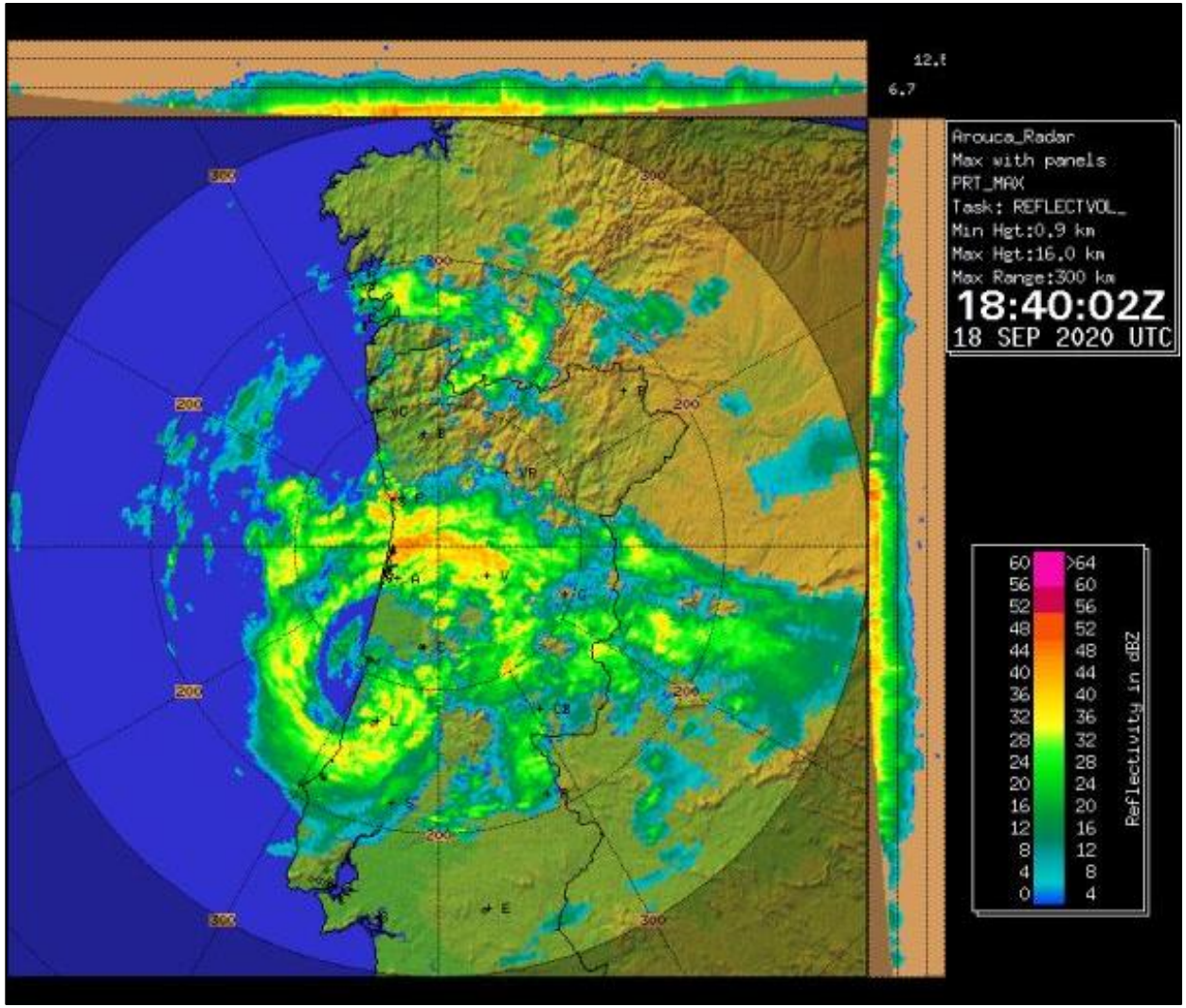

Figure 4. Radar image of Subtropical Storm Alpha at 1840 UTC 18 September at the time of landfall in Portugal. Image courtesy of the Portuguese Institute for Sea and Atmosphere.