= Tropical Storm Grace (2009) =

Tropical Storm Grace holds the record for being the farthest northeast forming tropical cyclone in the Atlantic basin . The seventh named storm of the slightly below average 2009 Atlantic hurricane season , Grace formed from an extratropical cyclone over the Azores on October 4 . It strengthened to attain peak sustained winds of 65 mph (100 km / h) and developed an eye @-@ like feature , although cold sea surface temperatures inhibited the development of thunderstorm activity near the center . The storm lost its tropical characteristics on October 6 , though the remnants merged with a separate system near the British Isles .

Grace had only minor effects on land , although while it was passing through the Azores , islands close to the storm 's center recorded winds of up to 44 mph (71 km / h) and moderate rainfall . Although not solely related to the cyclone , heavy rainfall in Portugal led to some street flooding . The remnants also impacted parts of Ireland and the United Kingdom , where rainfall approaching 2 in (51 mm) and tropical storm @-@ force winds were recorded . However , no damage occurred .

= = Meteorological history = =

Tropical Storm Grace originated from a large extratropical cyclone that formed along a cold front on September 27 , roughly 470 mi (755 km) east of Cape Race , Newfoundland . Initially attached to an occluded front , the low detached from the system and gradually acquired tropical characteristics . By October 1 , shower and thunderstorm activity began to develop near the center of the system as it tracked through the central Azores . However , the following day , convection began to decrease with the system , and the National Hurricane Center (NHC) ceased monitoring it . Over the following two days , the system executed a counter @-@ clockwise loop near the Azores . During the afternoon of October 4 , convection redeveloped around the center of the low and was classified as a tropical storm near São Miguel Island . Although the storm was tropical at this time , the NHC did not issue advisories for several hours .

The first advisory from the NHC was issued at 11 : 00 AST on October 4 ; at this time , the system was officially named Grace , the seventh named storm of the 2009 Atlantic hurricane season . The storm featured relatively deep convection around an eye @-@ like feature . Although Grace was over waters normally not warm enough for tropical cyclone development , low wind shear allowed the convection to persist . A steady northeastward track was taken by the storm in response to a southerly flow over the northwestern Atlantic . The storm intensified slightly as it moved over decreasing sea surface temperatures , with winds estimated at 65 mph (100 km / h) early on October 5 .

A large extratropical cyclone near Grace caused the storm to deteriorate in organization , with convection weakening and becoming asymmetric . By this time , the storm was over 18 ° C (64 ° F) waters , likely inhibiting convective development . Shower and thunderstorm activity continued to diminish throughout the day on October 5 ; however , Grace maintained tropical characteristics , namely a deep , warm core . Early on October 6 , the NHC issued their final advisory on Grace as it merged with a frontal system over the northeastern Atlantic . Just prior to merging , the lowest pressure in relation to the storm was recorded at 986 mbar (hPa ; 29 @.@ 12 inHg) . The extratropical remnants of Grace persisted for roughly 18 hours before dissipating over the Celtic Sea early on October 7 . However , the United States Naval Research Laboratory continued to monitor the system for several more hours until it moved over the North Sea .

Although officially designated a tropical cyclone by the NHC , Météo @-@ France , the French meteorological service , stated in their annual report to the World Meteorological Organization that Grace should not have been classified a tropical system . In their report , they argued that although the storm presented deep convection , an eye @-@ like feature , and winds above 60 mph (95 km / h) , the overall development of Grace was more similar to that of a mid @-@ latitude non @-@ tropical cyclone . However , operationally , Météo @-@ France considered Grace to be a subtropical cyclone . They also criticized the NHC of warning upon this system based on recent trends of the link between global warming and increased hurricane activity .

= = Impact and records = =

Upon being classified a tropical cyclone within the Azores , a few islands received minor rainfall and high winds . Gusts up to 44 mph (71 km / h) were recorded on Ponta Delgada . While merging with the frontal system on October 6 , the storm 's outer bands produced heavy rains and strong winds over parts of Portugal , resulting in some street flooding . In higher elevations , wind gusts were estimated to have exceeded 80 km / h (50 mph) .

Due to the storm 's relatively rapid forward movement by the time it reached the United Kingdom , rainfall was limited . In Ireland , 1 @.@ 18 in (30 mm) of precipitation fell in the city of Cork . Sustained winds in the city were recorded up to 23 mph (37 km / h) . Rainfall in the country peaked at 48 mm (1 @.@ 9 in) in Wexford . Near the coastline of Wales , a buoy recorded sustained winds up to 41 mph (66 km / h) , equivalent to a minimal tropical storm . Late on October 6 , the remnants of Grace moved inland over Wales , bringing heavy rains and high winds to the region . Maximum rainfall in the United Kingdom reached 1 @.@ 92 in (49 mm) in Capel Curig . One ship , the Cap Castillo (call sign A8PI5) , recorded sustained winds of 45 mph (72 km / h) on October 5 , while located about 110 mi (180 km) south of the storm 's center . Moisture from the storm 's remnants fueled another , more powerful cyclone that caused flooding in parts of Belgium after producing upwards of 2 @.@ 4 in (61 mm) of rain .

Operationally , Grace was not classified a tropical storm until it reached latitude 41 @.@ 2 ° N. This marked the second northernmost formation of a tropical storm in the Atlantic on record ; only Tropical Storm Alberto of 1988 had formed farther north . However , a post @-@ storm analysis concluded that Grace had actually become a tropical storm 12 hours earlier than initially estimated , placing its location of development further south , at 38 @.@ 5 ° N. The storm still marked the farthest northeast a tropical cyclone formed in the Atlantic basin , breaking the record set by Hurricane Vince in 2005 .

In its Tropical Cyclone Report on Grace , the National Hurricane Center reported that the formation of Grace was poorly forecast . The first mention of the precursor low on October 1 predicted that it would not develop into a tropical or subtropical cyclone . Over the following three days , the system was not mentioned in the NHC 's tropical weather outlooks until just prior to Grace 's classification . The lack of preceding outlooks was attributed to the storm 's unusual location and the sparsity of data for storms in the region .