

Subtropical Storm Olga WFO San Juan, PR

Summary

On December 10, 2007, an area of low pressure just north St Thomas, U.S. Virgin Islands, rapidly developed into Subtropical storm Olga. Olga was the 10th tropical cyclone to develop during the month of December in roughly 150 years of records. Additionally, it is only the 4th December tropical storm on record to hit land. Due to the rapid intensification of this system in close proximity to major population centers, decision making was critical in the hours leading up to the event. In the 48-hour period in which Olga affected the island of Puerto Rico, radar estimates showed over 15” inches of rain had fallen across some of the higher elevations of the islands, while observations showed approximately 10” had fallen. Generally, island-wide totals ranged from 4-8”. One death indirectly related to the storm’s impact was blamed on a landslide caused by heavy rainfall, which occurred in the densely populated San Juan suburb of Bayamon. Additionally, several rivers reached “major flood stage” through densely populated areas. Subtropical Storm Olga eventually intensified into Tropical Storm Olga as it hit the Dominican Republic one day later causing 33 deaths, displacing 61,000 people, and causing several millions of dollars of major flood damage.

Events leading to Olga’s formation

In the days leading up to the formation of Subtropical Storm Olga, a low level trough began to develop along the eastern periphery of an upper level low over the tropical Atlantic Ocean near 50 degrees West Latitude. Waters in the region were still marginally warm enough to assist in subtropical development, near 28 degrees Celsius. Initially, the system was inhibited by strong southwesterly wind shear, which confined convection to the northern side of the storm. Model guidance was reluctant to develop the system, likely due to the shear effects, but a few models were depicting a low level trough or a weak closed low pressure system forming just southeast of Puerto Rico in the day 3-5 period. As the system continued to move west, it showed signs of better organization, but southwesterly shear was strong enough to prevent a closed low level circulation to develop. WFO San Juan and the National Hurricane Center began communicating about the system and its potential threats during the day on Sunday, December 9.

The morning of Monday, December 10, the low pressure system was beginning to show initial signs of low level rotation on satellite as it continued to move west towards the Leeward Islands. Deep convection was still mainly limited to the northern side of the system, and judging by model guidance and initial movement, it had appeared as though Puerto Rico would be spared from the brunt of the rains. Deciding to err on the side of caution, WFO San Juan issued a Flood Watch for the entire Island and U.S. Virgin Islands of St. Thomas and St. John, as well as a wind advisory, which had already been in effect for over a day before the storm brushed the coast.

Olga Rapidly Intensifies into a Subtropical Storm the night of Monday December 10, 2007

Subtropical characteristics began to rapidly take shape as the low pressure system showed better signs of formation during the afternoon of Monday, December 10. The center of the system was just north of St. Thomas by the evening hours, moving over slightly warmer and shallower waters. This aligned it just under an Upper Level col of low pressure between two lobes of vorticity in high layers of the atmosphere. This was a critical step in Olga’s intensification process. By reducing the wind shear, it allowed the storm to close off its low level circulation and begin wrapping convection around its newly formed center. Communications increased between the WFO San Juan and the National Hurricane Center (NHC), whose hurricane specialists had been watching the storm closely around the clock and who had already issued a Special Tropical Disturbance Statement. The hurricane specialist had noticed tropical storm force sustained winds (35 knots, or 40 mph) at NOAA buoy 41403 located approximately 150 miles north of St. Thomas and winds at Cyril E. King Airport in St. Thomas were beginning to gust over to over 30 knots. At this time, convection was beginning to explode northwest of St. Thomas as cloud tops reaching 55-60 thousand feet were occurring nearing the rapidly deepening low center. As convection intensified, the low pressure center became significantly stronger as northwesterly flow on the northwest side of the system increased, allowing convection to push south towards the northern coast of Puerto Rico.

Noticing the rapidly changing situation, the NHC and WFO San Juan again communicated about how they would designate the system. At 11 p.m. AST on Monday, December 10, the NHC named Subtropical Storm Olga as the

season's 15th tropical cyclone, and issued its first public advisory. The island of Puerto Rico was not included in the Tropical Storm Warning, but rather only the coastal Atlantic Waters north of the island.

Impacts in Puerto Rico

During the early morning hours of Tuesday, December 11, the northern coast of Puerto Rico began to experience heavy rains and measured winds of 30 mph, with gusts of 37 mph. Several residents estimated winds near 50 mph along exposed northern coasts. During the day on Tuesday, the center of Subtropical Storm Olga moved over the waters along the northern coast of Puerto Rico and just north of the Mona Passage between Puerto Rico and the Dominican Republic. By this time, the storm had intensified substantially. Olga eventually lost her cold core characteristics and transitioned into Tropical Storm Olga, while producing winds near 50 knots (58 mph) in its core over water immediately before making landfall along the eastern coast of the Dominican Republic. The low level circulation with a pressure of 1004 mb became impressive, allowing convection to fully wrap around the center. Even the southern half of Puerto Rico received substantial amounts of precipitation. Radar estimates showed very impressive rainfall amounts rapidly covering the entire island. Reports of damaged homes, flooded rivers, mudslides, and landslides began coming in as the rain continued through the day and evening.

Reports that were received by the NWS San Juan after the storm included one indirect fatality caused by a mud and rockslide that hit a car carrying two occupants on Wednesday, December 12 at 1:30 a.m. on PR 167 between Bayamon and Naranjito, according to the newspaper, El Nueva Dia. The passenger was killed, but the driver survived. Additionally, many roads were closed to traffic all across PR due to fallen trees, flash flooding, and ponding of water on the road surfaces.

Impacts to structures and services across PR were common. Two occupants of a home in Aguada, PR were injured when a tree fell on their home at 4:10 a.m. Tuesday, December 11, according to police. Additionally, impacts were felt on the power and water grid across the island. It was reported that over 20,000 people were without power and more than 35,000 people were without water during some point in the storm.

Impacts across the U.S. Virgin Islands were less severe, with Saint Thomas only receiving 0.97" of precipitation at the airport with this system but other impacts were certainly noteworthy. Several minor power outages were reported throughout St. Thomas and St. Croix, caused by tree limbs brushing against power lines, according to report received by the Virgin Island Daily News. Some local businesses, including the charter flight company, Seaborne Airlines, were disrupted during the height of the storm, but resumed normal activities as the weather improved.

Forecasters at the San Juan office were busy issuing several flash flood and flood warnings for most major rivers in Puerto Rico. All together, over 30 flood warning products were issued during this event. The rainfall associated with tropical storm Olga was so intense and widespread that after the storm passed, the muddied water from local rivers was clearly visible in satellite imagery for several days.

Conclusion

Olga's rapid intensification near Puerto Rico presented forecasters with a complex situation involving critical rapid decision-making and intra-agency coordination. As the case in Tropical Storm (later to be hurricane) Noel, low pressure formed very close to Puerto Rico and intensified posing more difficulties to the island of Hispaniola. The San Juan Forecast Office served a critical role providing local expertise, observations, and customer service during a somewhat rare, but not unusual, late-season tropical cyclone.