

= Hurricane Rafael =

Hurricane Rafael produced minor damage in the northeastern Caribbean Sea in mid @-@ October 2012 . The seventeenth named storm and ninth hurricane of the annual hurricane season , Rafael originated from a tropical wave roughly 230 mi ( 370 km ) south @-@ southeast of Saint Croix on October 12 ; because the system already contained tropical storm @-@ force winds , it skipped tropical depression status . Though initially disorganized due to moderate wind shear , a subsequent decrease allowed for shower and thunderstorm activity to develop in earnest by October 14 . While moving north @-@ northwestward the following morning , Rafael intensified into a Category 1 hurricane . A cold front off the East Coast of the United States caused the system to turn northward and eventually northeastward by October 16 , at which time Rafael attained its peak intensity with maximum sustained winds of 90 mph ( 150 km / h ) . As the cyclone entered a more stable atmosphere and tracked across increasingly cooler sea surface temperatures , it began extratropical transition , a process the system completed by the following afternoon .

As a disorganized tropical cyclone in the northeastern Caribbean , Rafael produced major flooding across the region . As much as a foot of rain fell across portions of the Lesser Antilles , causing mudslides , landslides , and river flooding . In addition , the heavy rains led to significant crop loss . Sustained winds near hurricane force were recorded on Saint Martin , while tropical storm @-@ force gusts occurred widespread . Lightning activity as a result of heavy thunderstorms caused many fires and power outages . One fatality occurred when a woman in Guadeloupe unsuccessfully attempted to drive her car across a flooded roadway . As Rafael passed just to the east of Bermuda as a hurricane , light rainfall was recorded . Gusts over 50 mph ( 85 km / h ) left hundreds of houses without electricity . Large swells from the system caused significant damage to the coastline of Nova Scotia , while many roads were washed away or obscured with debris , but overall , damage was minimal .

= = Meteorological history = =

The formation of Hurricane Rafael is attributed to a low @-@ latitude tropical wave that emerged off the western coast of Africa on October 5 . The wave remained disorganized until roughly midway between the Cape Verde Islands and Lesser Antilles , at which time a broad area of low pressure developed and convection began to consolidate around it . As a result , the disturbance was introduced into the National Hurricane Center ( NHC ) ' s 48 @-@ hour Tropical Weather Outlook with a low chance of tropical development . These chances were subsequently raised as further development occurred , with the system receiving a medium chance of development early on October 10 , and a high chance of development as it approached the southern Leeward Islands late the following evening . As the wave crossed into the eastern Caribbean Sea and slowed down , the previously broad and open surface low consolidated and became stacked with the mid @-@ level center . The disturbance was already producing tropical storm @-@ force winds , and as a result , skipped tropical depression status to become Tropical Storm Rafael at 1800 UTC on October 12 . At this time , the cyclone was located roughly 200 mi ( 320 km ) south @-@ southeast of St. Croix .

Despite being named , Rafael remained disorganized initially ; this was the result of the interaction between an upper @-@ level trough and the cyclone itself . Moderate to strong wind shear dislocated the center of Rafael and the deepest shower and thunderstorm activity . Over the course of the next few days , however , the upper @-@ level trough gradually weakened and backed westward , allowing for the development of an anticyclone atop the tropical storm . Wind shear lessened , allowing the center to become obscured from view and outflow to develop in association with the system . As it began to execute a turn towards the north under the influence of an upper @-@ level trough to its west , a central dense overcast was noted on satellite imagery . Following a series of intensity estimates , Rafael was upgraded to a hurricane around 0600 UTC on October 15 , while positioned about 650 mi ( 1045 km ) south of Bermuda , although this intensity was speculated upon until later that afternoon following a hurricane hunters flight into the system .

As Rafael moved northward , it continued to intensify rapidly in spite of moderate wind shear . An

eye became visible on microwave imagery during the morning hours of October 16 , during which time the cyclone attained its peak intensity as a Category 1 hurricane with maximum sustained winds of 90 mph ( 150 km / h ) and a minimum barometric pressure of 969 mb ( hPa ; 28 @. @ 61 inHg ) . By the afternoon hours of that same day , data from an Air Force Reserve reconnaissance aircraft indicated that Rafael was on the verge of a weakening trend , attributed to decreasing sea surface temperatures and higher wind shear . Though the system retained hurricane @-@ force winds , it began to transition into an extratropical cyclone on October 17 , a process it completed by 1800 UTC that same day after interacting with a cold front ; at the time of the transition , Rafael was positioned well southwest of Nova Scotia . The remnants of the cyclone looped around a larger extratropical low over the north @-@ central Atlantic Ocean for several days prior to dissipating over Portugal by 1800 UTC on October 26 .

= = Preparations and impact = =

= = Caribbean islands = =

Shortly after the development of Rafael , a tropical storm watch was issued for the island of Puerto Rico ; tropical storm warnings were issued for surrounding locations , including the British and U.S. Virgin Islands . By the morning hours of October 13 , the warnings were discontinued for Saint Lucia and Martinique , but issued for Culebra and Vieques . The warnings were discontinued for Guadeloupe and Saint Martin by the pre @-@ dawn hours of the following morning as Rafael pulled away , and expired for the remaining northeastern Caribbean Islands several hours later . In preparation for the system , the Virgin Islands Territorial Management Agency ( VITEMA ) activated several emergency operation centers across the region , and requested assistance from the Federal Emergency Management Agency ( FEMA ) , who deployed a team of workers to cover the aftermath of Rafael . The departments of public works and power authority placed emergency crews on standby , while all ports out of the U.S. Virgin Islands were open to outbound vessel traffic only ; the Coast Guard advised mariners to prepare for impending severe weather .

As a tropical storm , Rafael hit Guadeloupe with large amounts of rain , causing significant damage to homes and especially crops . According to Météo @-@ France , up to 5 @. @ 9 inches ( 150 mm ) fell in 3 hours in the prefecture of Basse @-@ Terre , and up to 12 inches ( 300 mm ) in 48 hours between October 13 and 14 ; an estimated 7 @. @ 9 inches ( 200 mm ) fell during that same timeframe in Grande @-@ Terre . Flooding and mudslides as a result of the heavy rain damaged 60 to 80 % of the vegetable crops in Grande @-@ Terre , and lightning as a result of strong storms sparked fires and led to power outages . Sustained winds of 24 mph ( 39 km / h ) and gusts reaching 42 mph ( 68 km / h ) occurred in Raizet ; gusts reached 64 mph ( 103 km / h ) in La Désirade . A woman was killed in Matouba , part of Saint @-@ Claude , after attempting to drive her car across a flooded roadway ; she was swept away . Heavy rains in St. Kitts , amounting to 11 @. @ 87 in ( 301 mm ) in a 30 ? hour span , caused significant flooding and mudslides , especially around Basseterre . Traffic across the area was paralyzed as roads became impassable , and most businesses were closed for the duration of the storm . Many residents lost power and water supply as well . A few people attempted to drive through flooded roads and required rescue . Numerous weather stations in the French islands of Saint Barthélemy and Saint Martin recorded gusts of 63 mph ( 101 km / h ) and 67 mph ( 108 km / h ) , respectively . Although several boats were grounded , overall damage remained fairly minor in the French territories . Road 2 between Manati , Puerto Rico and Vega Baja , Puerto Rico was flooded ; several houses were also flooded at Toa Alta High .

= = Bermuda = =

As Rafael exited the northeastern Caribbean Sea , a tropical storm watch was issued for Bermuda on October 14 . This watch was subsequently upgraded to a tropical storm warning the following

morning , but was dropped by early on October 17 as the system passed northeast of the island . In advance of the system , residents were urged to take their typical precautionary measures ; in addition , the main two airlines on Bermuda ? WestJet and United Airlines ? cancelled hundreds of flights on October 16 . Officials warned of minor storm surge along low @-@ lying coasts , while the Bermuda Weather Service ( BWS ) warned of two to four inches of rainfall . Winds , while stronger than locals expected , did not cause significant damage . The BWS noted that sustained winds of 34 mph ( 55 km / h ) , and gusts reaching 51 mph ( 82 km / h ) , occurred at the L.F. Wade International Airport as the storm made its closest approach ; these winds left about 600 houses without electricity according to the Bermuda Electric Light Company . Rainfall was less than originally feared , peaking at 1 @.@ 71 inches ( 43 mm ) .

= = = Newfoundland = = =

Though tropical cyclone watches and warnings were not issued , city officials in St. John 's recommended all residents in Newfoundland to prepare for Rafael . Large swells and storm surge produced by the post @-@ tropical cyclone caused extensive damage along the Avalon Peninsula . According to locals , the waves were more intense than during Hurricane Igor , a cyclone which devastated the region during the 2010 Atlantic hurricane season . Large sections of roads were washed out or covered in debris left behind by the waves . Near Trepassey , the local breakwater was destroyed in three sections , allowing waves to wash inland . As a result , a 9 @.@ 1 m ( 30 ft ) wide and 1 @.@ 5 m ( 5 ft ) deep gap in one of the main roads was left behind . In an area known as the Lower Coast , 50 people were cut off from the surrounding area . Overall damage in the area was estimated at C \$ 1 ? 2 million . Rainfall associated with the storm was light , amounting to 6 mm ( 0 @.@ 24 in ) in Cape Race .