



Tropical Cyclone Rafael (AAL182024)

Wind and Storm Surge

Final Event Briefing

Jamaica Cayman Islands

16 November 2024

1 SUMMARY

Tropical Cyclone Rafael is the eighteenth named cyclone and the eleventh hurricane of the 2024 Atlantic Hurricane Season. On 5 November, tropical storm Rafael passed about 70 mi (115 km) SW of Montego Bay, Jamaica, spreading tropical-storm-force winds over western Jamaica from 1200UTC to 1800UTC. It continued to move northwestward and along its track the storm strengthened steadily, with the maximum sustained winds gradually increasing to hurricane force. On 6 November at 0000UTC, Rafael passed just south of Little Cayman, the Cayman Islands, as it became a Category 1 hurricane. Despite the proximity to the country, hurricane-force winds were not experienced over the Cayman Islands, as they primarily developed over the northern sector of the hurricane, thus far north of the Cayman Islands. Tropical-storm-force winds affected Little Cayman and Cayman Brac from 5 November at 1800UTC to 6 November at 0600UTC. At the time of writing this report the hurricane is crossing the southeastern Gulf of Mexico as a Category 2 hurricane, after crossing western Cuba.

The final runs of the CCRIF tropical cyclone loss model for wind and storm surge have produced government losses for Jamaica, the Cayman Islands and for the Cayman Turtle Conservation and Education Centre Ltd. (CTCEC), with CCRIF designating Tropical Cyclone Rafael as a Loss Event¹. The government losses for Jamaica, the Cayman Islands and the CTCEC are below the Attachment Point of their Tropical Cyclone policies and therefore no payout under these policies is due.

The Aggregated Deductible Cover (ADC)² feature has not been activated for the Tropical Cyclone policy for Jamaica or the Cayman Islands because the Modelled Losses are below 30% of the Attachment Point of the countries' Tropical Cyclone policies. Therefore, no payout under the ADC feature is due for the Governments of Jamaica or the Cayman Islands. The ADC feature is not applicable for CTCEC.

The Localized Damage Index (LDI) component of the TC SPHERA model did not identify this event as a localized event³ for Jamaica. Therefore, no payout is due under the LDI endorsement of the Tropical Cyclone policy for Jamaica. The Localized Damage Index component is not available for Cayman Islands and CTCEC.

This event briefing is designed to review the modelled losses due to wind and storm surge calculated by CCRIF's tropical cyclone model for affected CCRIF member countries, to be analyzed with respect to members' Tropical Cyclone policies. At the time of writing this report,

¹ Any Tropical Cyclone event which produces a modelled loss greater than zero but lower than the policy Attachment Point (AP) in one or more policyholder countries.

² The ADC is activated if the modelled loss value is between 30% and 50% of a country's policy Attachment Point and a Disaster Alert is issued by ReliefWeb within 7 days after the event. The ADC can also be activated if the modelled loss value is between 50% of the Attachment point and the Attachment point of the country policy.

³ The LDI policy endorsement provides coverage for intense events that do not cause very large losses at a national scale but severely affect a relatively small part of a country. It is activated based on a Localized Index (LI), which compares the mean damage ratio computed for the most damaged areas and the mean damage ratio computed in the whole country. For an event to be covered by this endorsement the following conditions must be met:

- the TC local mean damage ratio computed for the local exposure must be greater than 1%
 - the TC global mean damage ratio computed for the whole country must be greater than 0.06%.
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Jamaica and the Cayman Islands were the only CCRIF member countries for which the CCRIF loss model for wind and storm surge produced government losses due to Tropical Cyclone Rafael. Government losses were also produced for CCRIF member, the Cayman Turtle Conservation and Education Centre Ltd. A separate report on other CCRIF member countries affected by wind and storm surge, with respect to their Tropical Cyclone policies or rainfall impacts on affected CCRIF member countries will be issued if applicable.

2 INTRODUCTION

On 4 November 2024 at 2100UTC, the National Hurricane Center (NHC) reported that a tropical storm formed over the central Caribbean Sea, and it was named Rafael. Its centre was located near latitude 15.5° North and longitude 76.7° West, about 175 mi (280 km) S of Jamaica. The initial minimum central pressure was estimated at 997 mb and the maximum sustained winds at 45 mph (75 km/h). Rafael was situated in an atmospheric and oceanic environment quite favourable for strengthening, with high oceanic heat content, low vertical wind shear and generally high low- to mid-tropospheric humidity. However, the intrusion of dry air into the system centre in the initial hours after its development hindered quick intensification. The system moved north at 9 mph (15 km/h) under the influence of a ridge built to the northeast of Rafael over the southwestern Atlantic Ocean and northeastern Caribbean Sea (Figure 1).

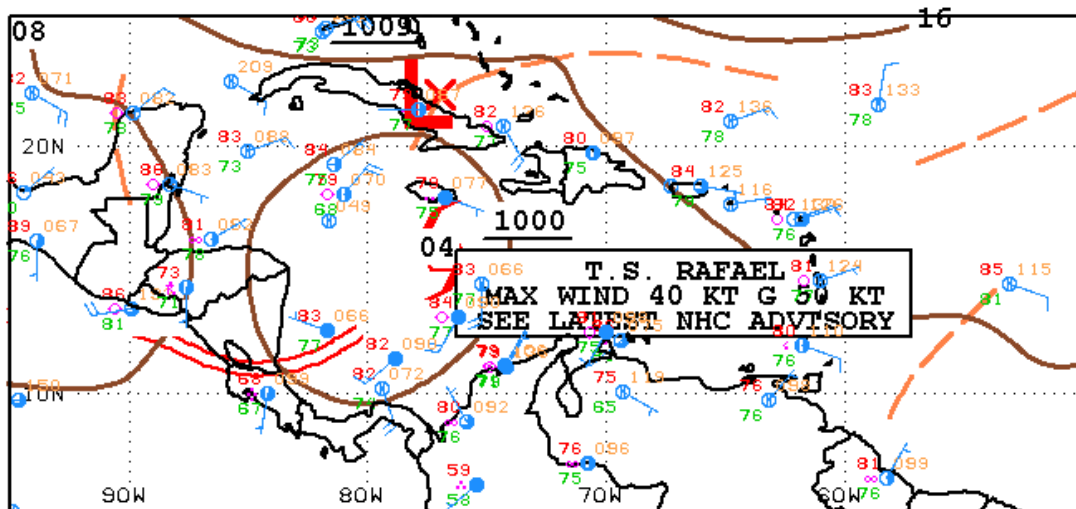
On 5 November, the tropical storm steered northwestward with faster forward motion (13 mph, 20 km/h), towards Jamaica and the Cayman Islands. At 1200UTC, the centre of Tropical Storm Rafael was sited near latitude 17.4° North and longitude 78.4° West, about 80 mi (130 km) SSW of Montego Bay, Jamaica. The satellite imagery showed several convective banding features around the system centre, more prominent over the eastern semicircle, indicative of improved organization of the tropical storm (Figure 2a). At this time, the maximum sustained winds were estimated at 60 mph (95 km/h). Tropical-storm-force winds extended outward up to 105 miles (165 km) from the centre, primarily over the northeastern sector, and started to affect the western part of Jamaica (Figure 3a).

Six hours later, at 1800UTC, the centre of Tropical Storm Rafael was at its minimum distance from Jamaica, sited near latitude 18.6° North and longitude 79.1° West, about 70 mi (115 km) SW of Montego Bay, Jamaica. Topical-storm-force winds persisted over western Jamaica, but ceased in the next 1 - 2 hours, as Rafael progressed northwestward (Figure 3b).

During the next six hours, the tropical storm approached the Cayman Islands and continued to strengthen steadily, becoming a Category 1 hurricane on 6 October just after 0000UTC. At this time, the centre of Rafael crossed the waters in the vicinity of the Cayman Islands, and was at its minimum distance from the Cayman Islands, about 20 mi (35 km) SE of Little Cayman. The maximum sustained winds were estimated at 80 mph (130 km/h) and the minimum central pressure was at 985 mb. The satellite imagery reported that the hurricane had an improved structure, with very deep convection near the centre, primarily over the northern semicircle, rotating around the centre (Figure 2b). Moreover, the inner core was almost closed with a 11-17 mi (18-28 km) diameter eyewall, despite being occasionally open on the southwest side (Figure 3c). The most intense winds blew over the northern semicircle (Figure 3c), over the sector with the most active

convection. The Cayman Islands, and particularly Little Cayman and Cayman Brac, had been affected by tropical-storm-force winds six hours earlier, on 5 October just after 1800UTC (Figure 3b), then the wind intensity almost ceased for a short period around 6 October at 0000UTC, when the inner core of the tropical storm passed very close to these islands (Figure 3c). When the system was upgraded to a hurricane after 0000UTC, the wind pattern improved in organization and intensity. At 0300UTC, the Hurricane eyewall closed. Over the southwestern sector, hurricane winds extended outward up to 15 mi (30 km) from the centre, primarily over the northern quadrant, and tropical-storm-force winds extended outward up to 115 mi (185 km), Figure 3d. After a short interval with low winds, tropical-storm-force winds spread again over Little Cayman and Cayman Brac and persisted until 0600UTC (Figure 3d). Despite the proximity to the hurricane centre, the Cayman Islands did not experience hurricane-force winds, as they developed after the passage of the system centre over the country and mostly over the northern sector of the hurricane, thus far north of the Cayman Islands.

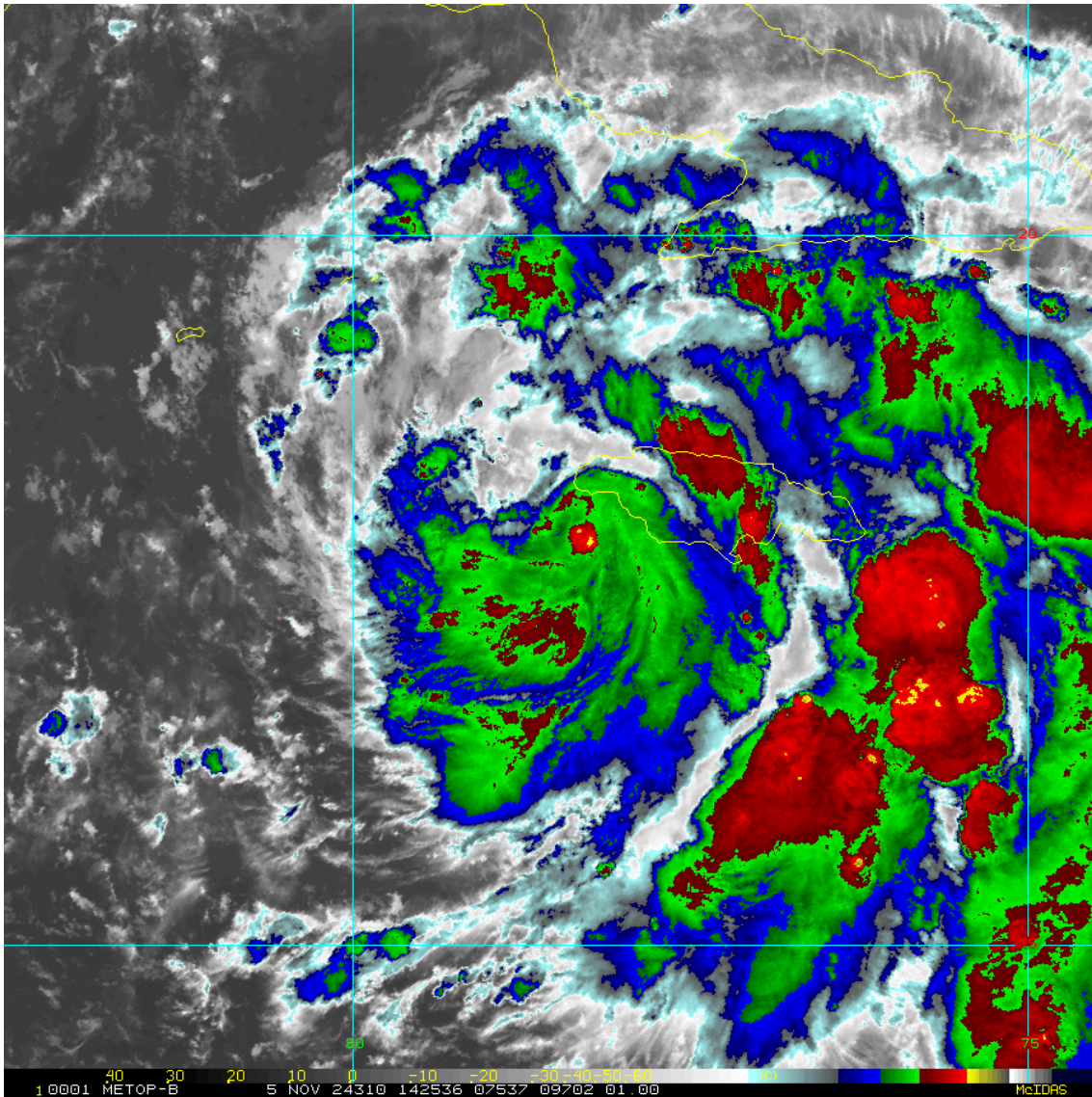
During the following hours of 6 October, Rafael rapidly intensified, becoming a Category 3 hurricane at 1800UTC, when it approached the south coast of western Cuba. After landfall in Cuba, at 2115UTC, the hurricane weakened to a Category 2 hurricane. At the time of writing this report, Rafael has just emerged off the northern coast of Cuba and is moving over the southeastern Gulf of Mexico with unvaried intensity.



00Z CARIBBEAN SURFACE ANALYSIS
ISSUED:
Tue Nov 5 02:52:40 UTC 2024

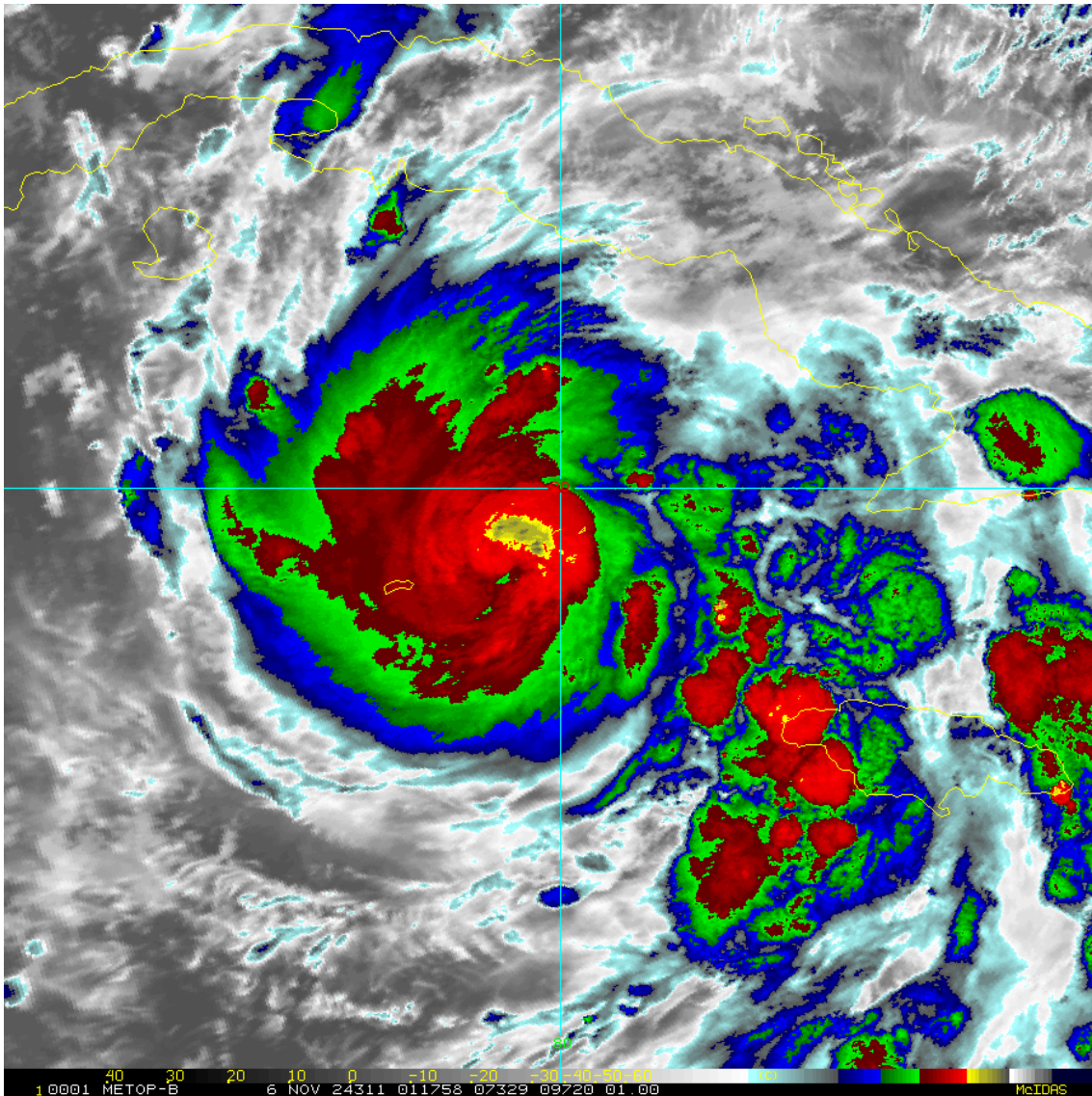
NATIONAL HURRICANE CENTER
MIAMI, FLORIDA
BY TAFB ANALYST: KRV
COLLABORATING CENTERS: NHC OPC

Figure 1 Surface analysis over the Caribbean area on 5 November 2024 at 0000 UTC. Source: US National Hurricane Center⁴



a) 5 November at 1425UTC

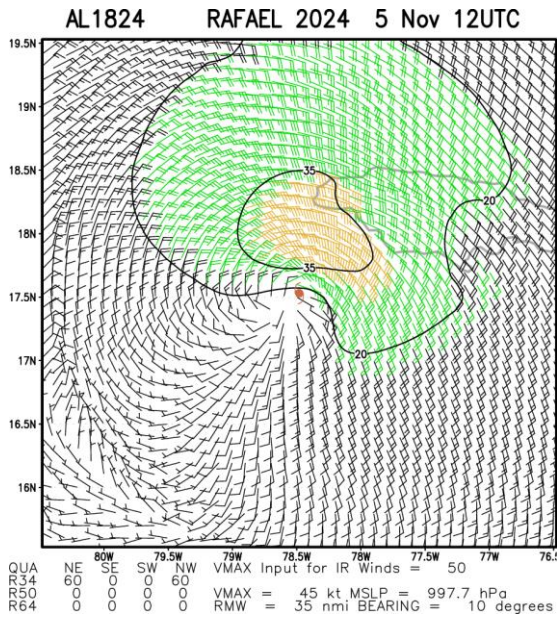
⁴ National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review date: 5 November 2024, available at: https://www.nhc.noaa.gov/tafb/CAR_00_Z.gif



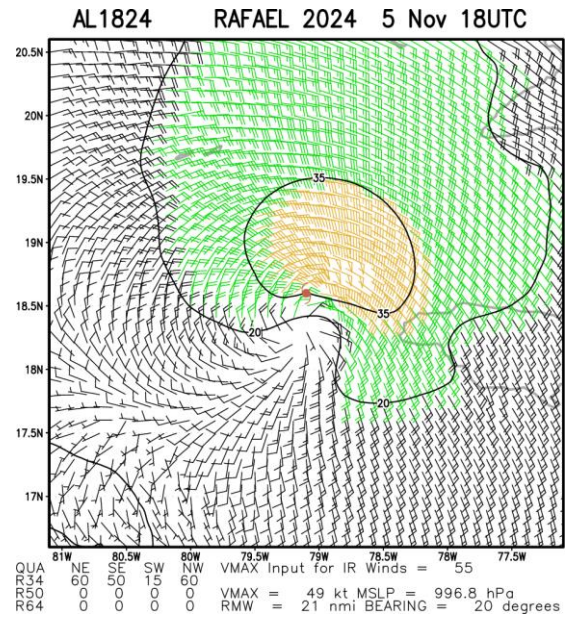
b) 6 November at 0117UTC

Figure 2 Satellite imagery on 5 and 6 November at different times as indicated in the labels from the thermal infrared channel enhanced with colour. Blue/green colours represent high altitude clouds (top cloud temperature between -50°C and -70°C), while the red/yellow colours represent very high altitude clouds (top cloud lower than -70°C). High altitude clouds indicate strong convection associated with intense precipitation. Source: NOAA, National Environmental Satellite, Data and Information Service⁵.

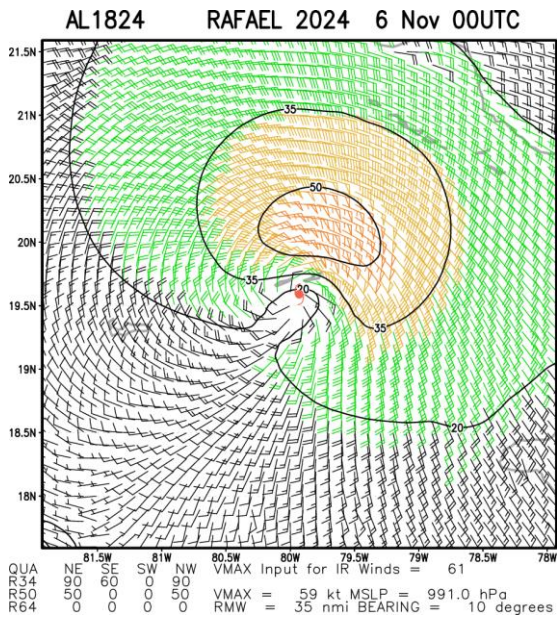
⁵ RAMSDIS Online Archive, NOAA Satellite and Information Service, available at: https://rammb-data.cira.colostate.edu/tc_realtime/storm.asp?storm_identifer=all82024



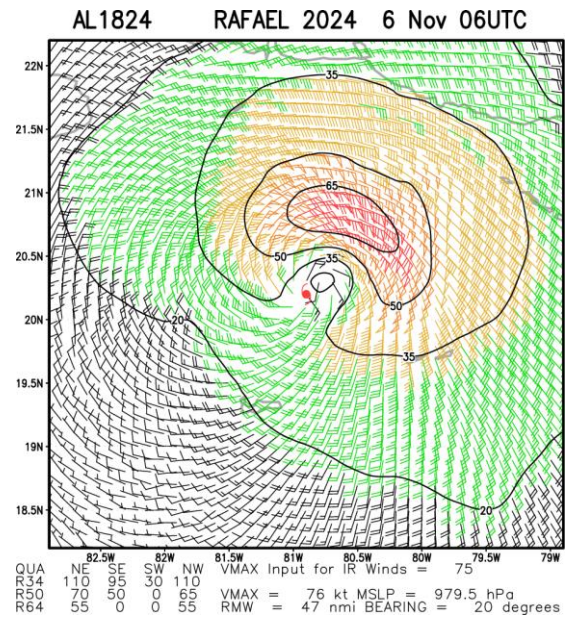
a) 5 November at 1200UTC



b) 5 November at 1800UTC



c) 6 November at 0000UTC



d) 6 November at 0600UTC

Figure 3 Multi-platform satellite based tropical cyclone surface wind analysis estimated on 5 and 6 November, 2024 at different times as indicated by the labels. Contouring indicates wind intensity at 20 kn (23 mph, 37 km/h), at 35 kn (40 mph, 65 km/h), 50 kn (57mph, 93 km/h) and 65 kn (74mph, 120 km/h). Source: NOAA, National Environmental Satellite, Data and Information Service⁶

⁶ RAMSDIS Online Archive, NOAA Satellite and Information Service, available at: https://rammb-data.cira.colostate.edu/tc_realtime/storm.asp?storm_identifier=al182024

3 CCRIF SPC MODEL OUTPUTS

Under CCRIF’s loss calculation protocol, a CCRIF System for Probabilistic Hazard Evaluation and Risk Assessment (SPHERA) report is required for any tropical cyclone affecting at least one member country with winds greater than 39 mph (62.7 km/h). Jamaica and the Cayman Islands – including CCRIF member, the Cayman Turtle Conservation and Education Centre, were affected by Tropical Cyclone Rafael, which was designated by CCRIF as a Loss Event⁷.

The wind footprint is one of the outputs from CCRIF’s SPHERA model for tropical cyclones. Figure 4 shows the wind footprint for the areas affected by Tropical Cyclone Rafael.

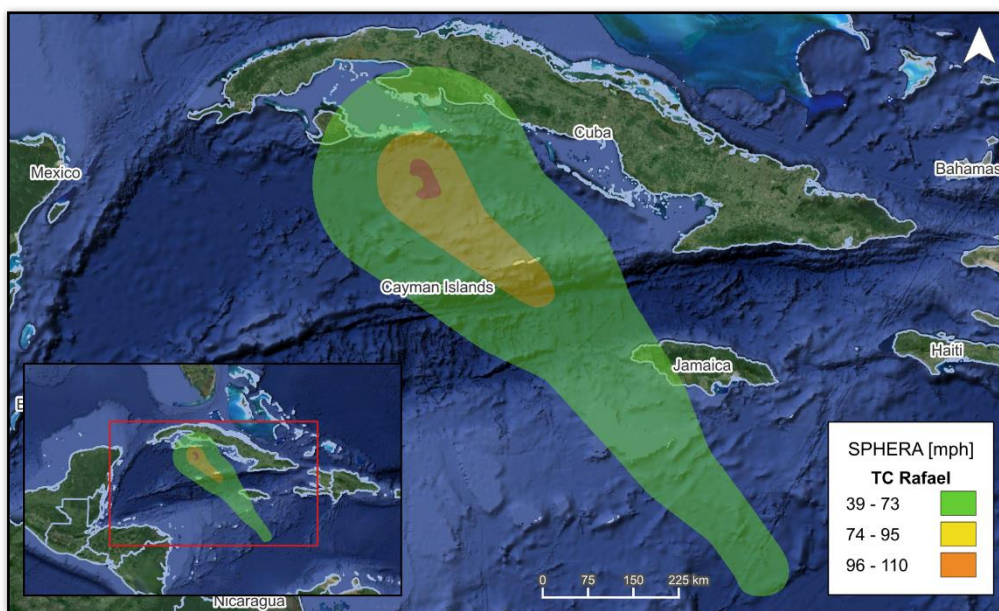


Figure 4 Map showing the wind field associated with Tropical Cyclone Rafael over Jamaica and Cayman Islands.
Source: NHC & CCRIF/SPHERA

4 REPORTED IMPACTS

At the time of writing this report, the available information on damage in the Caribbean due to Tropical Storm Rafael is shown below.

Jamaica

The rainfall reported in Jamaica was over 75 millimeters, primarily in section of southern parishes, causing flooding events. As the storm intensified and moved toward the Cayman Islands, there were reports of maximum sustained winds of 60 mph with higher gusts in Jamaica.⁸

⁷ Any Tropical Cyclone event which produces a modelled loss greater than zero in one or more policyholder countries.

⁸ Jamaica Loop News: [Tropical Storm Warning maintained as Rafael moves away from Jamaica | Loop Jamaica](#)

The rainfall and strong winds also impacted the electricity supply, causing power outages, as some customers of the Jamaica Public Service Co. reported.⁹



Figure 5 Scene from the passage of Tropical Storm Rafael over Jamaica – Photo: Jamaica Gleaner Youtube¹⁰

Cayman Islands

Little Cayman suffered impacts from the passage of Hurricane Rafael, resulting in sunk boats, downed power lines and trees and roads covered in sand and debris.

Flights were unable to land, power outages were reported, and schools remained closed on Wednesday November 6.

Damage assessment teams worked hard on Little Cayman and on Cayman Brac. The reports included fences and gates blown down, as well as trees and power poles. Diving companies reported boats submerged in the high seas.



⁹ Jamaica Loop News: [Tropical Storm Rafael causes power outages | Loop Jamaica](#)

¹⁰ Jamaica Gleaner Youtube: [Sights and scenes from the passage of Tropical Storm Rafael - YouTube](#)

Figure 6 Fallen fences and trees in Little Cayman Photo: Frans De Backer

The director of Hazard Management Cayman Islands reported no critical damages to the electricity sector, and there were no reports of casualties.

Fourteen hours after the eye of the storm passed over the country, the Government made the “all clear” declaration.¹¹

Cayman Turtle Conservation and Education Centre

Staff at the Cayman Turtle Centre reported minor damage from Rafael due to careful advance preparation and adherence to their disaster preparedness protocols.¹²

The Cayman Turtle Centre re-opened on Wednesday November 6, ready to welcome visitors.

5 CCRIF LOSS MODEL

The final runs of the CCRIF tropical cyclone loss model for wind and storm surge have produced government losses for Jamaica, the Cayman Islands and the Cayman Turtle Conservation and Education Centre Ltd. (CTCEC), with CCRIF designating Tropical Cyclone Rafael as a Loss Event¹³. The government losses for Jamaica, the Cayman Islands and the CTCEC are below the Attachment Point of their Tropical Cyclone policies and therefore no payout under these policies is due.

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The Localized Damage Index (LDI) component of the TC SPHERA model did not identify this event as a localized event¹⁵ for Jamaica. Therefore, no payout is due under the LDI endorsement of the Tropical Cyclone policy for Jamaica.

For additional information, please contact CCRIF SPC at: pr@ccrif.org

¹¹ Cayman Compass: [Little Cayman - Cayman Compass](#)

¹² Cayman iNews: [Cayman Turtle Centre](#)

¹³ Any Tropical Cyclone event which produces a modelled loss greater than zero but lower than the policy Attachment Point (AP) in one or more policyholder countries.

¹⁴ The ADC is activated if the modelled loss value is between 30% and 50% of a country’s policy Attachment Point and a Disaster Alert is issued by ReliefWeb within 7 days after the event. The ADC can also be activated if the modelled loss value is between 50% of the Attachment point and the Attachment point of the country policy.

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