CCRIF SPC
The Caribbean Catastrophe Risk Insurance Facility

On behalf of
Caribbean XSR SP

Covered Area Rainfall Event (15-19 May 2017)

Excess Rainfall

Event Briefing

26 May 2017

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1 INTRODUCTION

In mid-May 2017, the Meteorological Service of Jamaica indicated that a trough west of Jamaica would be influencing weather conditions across the island. Satellite imagery and radar reports projected light, moderate and intense rains in sections of all parishes, especially in the south. Therefore, flash floods were possible in low-lying and flood prone areas such as St. Mary, Portland, St. Thomas, Kingston, St. Andrew, St. Catherine, Clarendon, Manchester, St. Elizabeth and Westmoreland [(jamaicaobserver.com)](jamaicaobserver.com).

The Caribbean Rainfall Model indicated that a Covered Area Rainfall Event (CARE) was generated in Jamaica, starting on 15 May and ending on 19 May 2017.

2 EVENT DESCRIPTION

A surface trough developed at approximately 18UTC on 14 May in the western Caribbean, with the axis extending from the coastal waters of northern Nicaragua to the west of Jamaica (at approximately 20N80W, Figure 1).

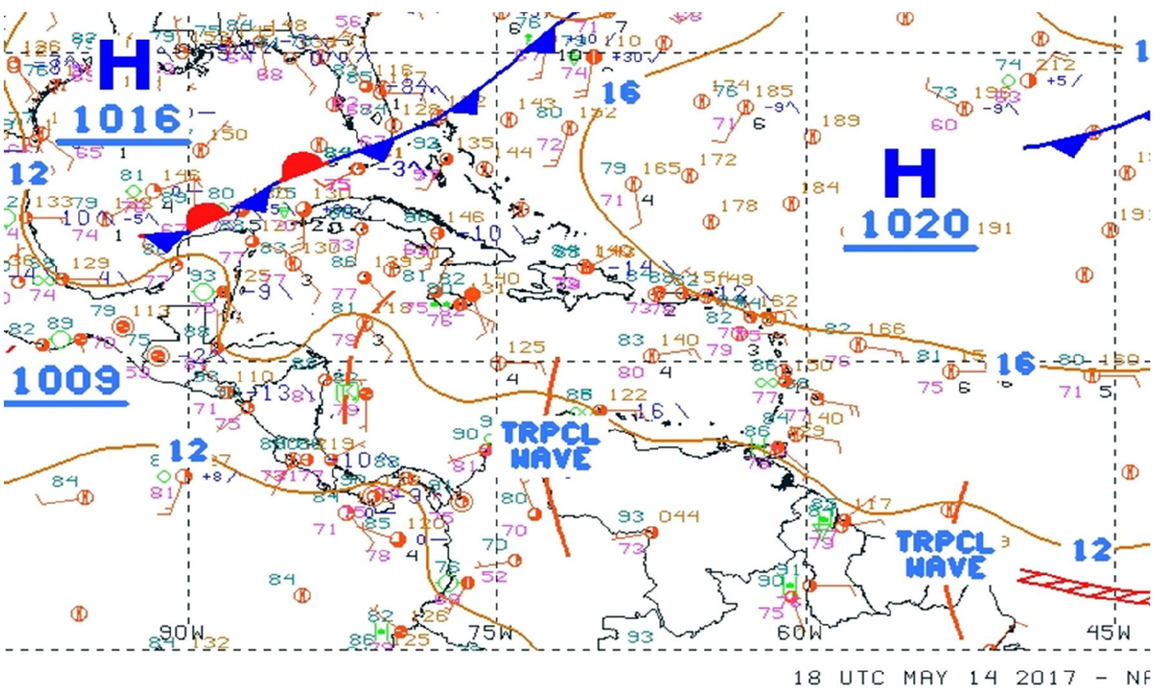
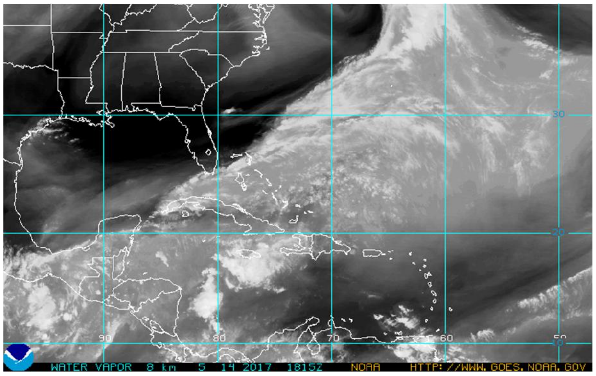


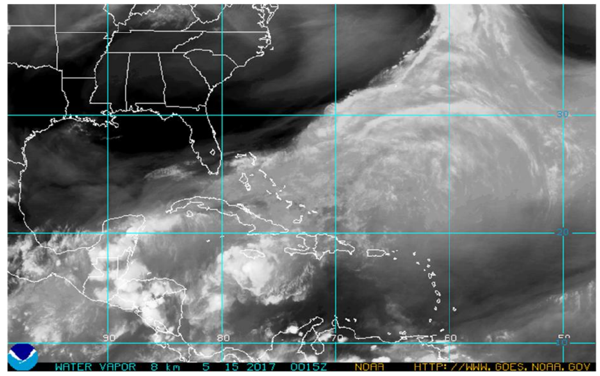
Figure 1 Surface analysis valid at 18UTC on 14 May. *Source: http://www.opc.ncep.noaa.gov/Loops/*

The disturbance remained embedded within an area of deep layer moisture as depicted in the water vapour satellite imagery (Figure 2a).

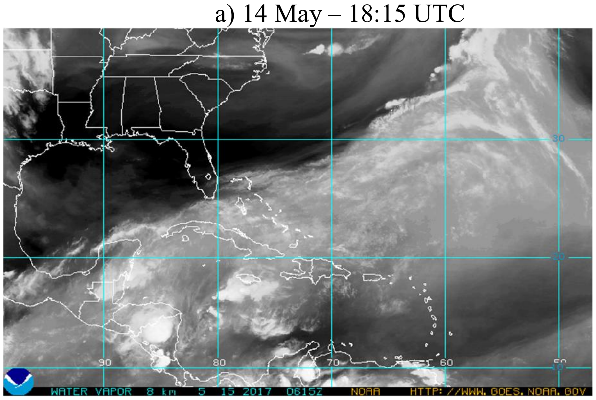
Scattered to moderate convection was observed over Jamaica starting from 18UTC on 14 May up to 6UTC on 15 May. In the following 12 hours, convective precipitation affected mostly the marine region on the southwest of Jamaica (Figure 2).



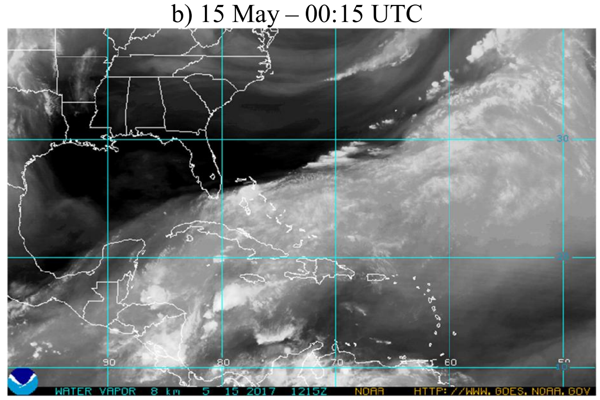
a) 14 May – 18:15 UTC



b) 15 May – 00:15 UTC



c) 15 May – 06:15 UTC



d) 15 May – 12:15 UTC

Figure 2 Water vapour images collected by the NOAA's Geostationary Operational Environmental Satellites (GOES) at 8 km of resolution at different hours, as indicated by the labels. *Source:* http://www.goes.noaa.gov/

Starting from 00UTC on 16 May up to about 12UTC of the same day, Jamaica was affected by heavy showers and scattered thunderstorms associated with the southwesterly movement of a large region of deep convection. This region of deep convection was caused by an intensification of the mentioned surface trough, which at 12UTC on 16 May extended from southern Cuba to the coastal waters of southern Nicaragua, and which developed a 1010 mb low pressure on the coastal waters south of Cuba (Figure 3).

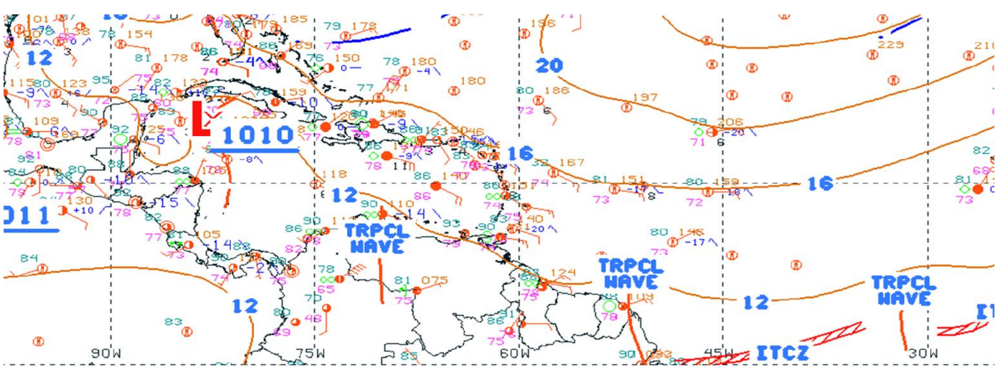
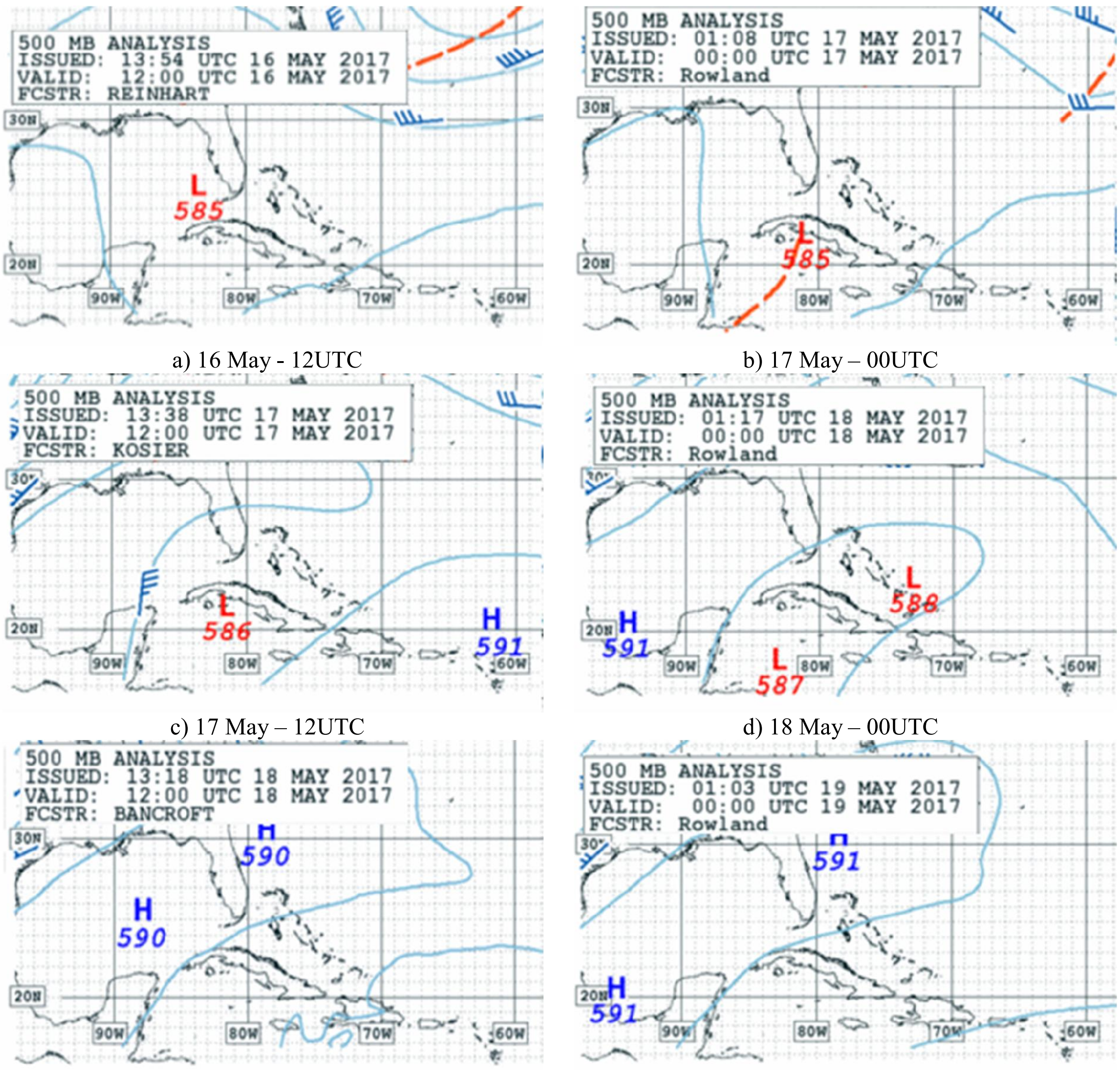


Figure 3 Surface analysis valid at 12UTC on 16 May. *Source:* http://www.opc.ncep.noaa.gov/Loops/

An upper level low pressure area located on the west of Florida (Figure 4a) supported the ascending movement of the moist air transported from the Caribbean Sea.

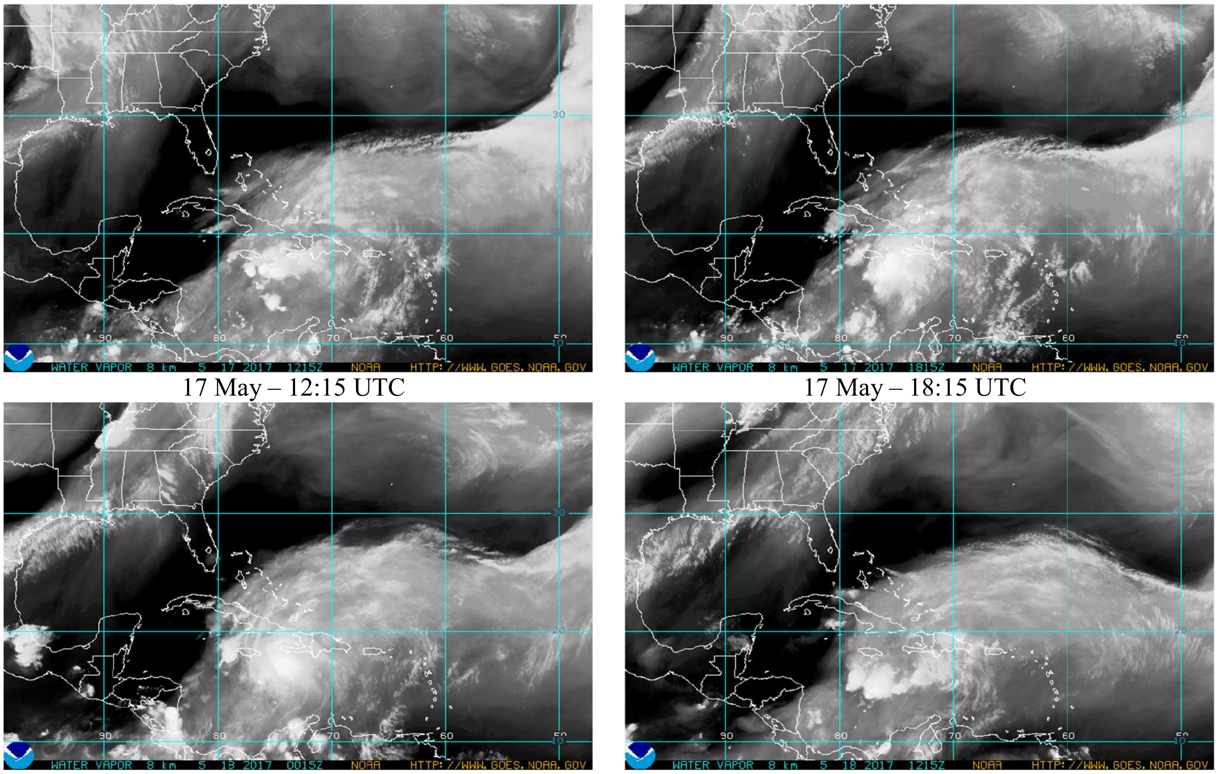
This upper level feature, which supported the convection and diverging flow aloft, moved slowly towards the SE in the second part of 16 May, and afterwards remained almost stationary over Cuba during the next two days (Figure 4). This led to the continuation of showers for the north-central Caribbean.



a) 16 May - 12UTC b) 17 May – 00UTC
c) 17 May – 12UTC d) 18 May – 00UTC
e) 18 May – 12UTC f) 19 May – 00UTC

Figure 4 Analysis of the Geopotential Height at 500 mb valid at different hours.
Source: http://www.opc.ncep.noaa.gov/

Scattered to numerous showers and thunderstorms were observed on the western side of Haiti, from 16 May to about 6UTC on 17 May. In the following hours the nucleus of deep convective precipitation shifted towards the SW, yielding to heavy showers over Jamaica and surrounding coastal waters (Figure 5).



17 May – 12:15 UTC | 17 May – 18:15 UTC

18 May – 00:15 UTC | 18 May – 12:15 UTC

Figure 5 Water vapour images collected by the NOAA's Geostationary Operational Environmental Satellites (GOES) at 8 km of resolution at different hours, as indicated by the labels. *Source:* http://www.goes.noaa.gov/

Late on 18 May, the persistent upper level trough (Figure 5) responsible for the deep convective precipitation started to fracture, with the southern part of the trough drifting westward. The deep convective precipitation that affected Haiti started to weaken and dissipate.

During 19 May this dissipating system interacted with a tropical wave, which moved westward through the Caribbean Sea and which was associated with scattered moderate convection. The interaction of these two features produced scattered showers and a few thunderstorms affecting portions of Cuba, the Cayman Islands and Jamaica, as well as portions of Nicaragua, Costa Rica and Panama (Figure 6).

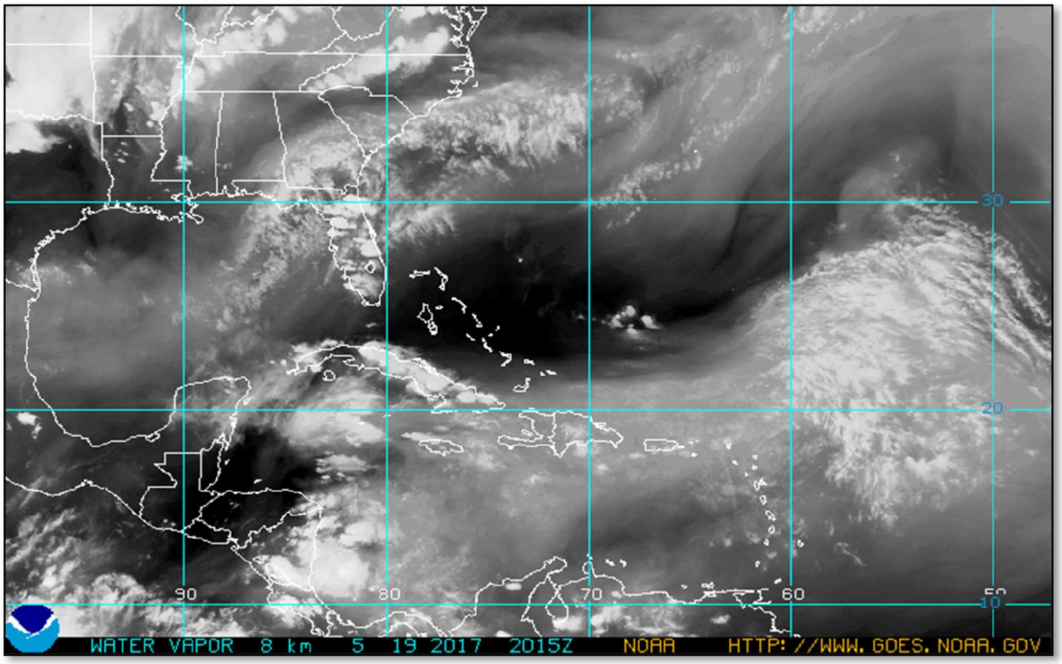


Figure 6 Water vapour image collected by the NOAA's Geostationary Operational Environmental Satellites (GOES) at 8 km of resolution on 19 May – 20:15 UTC. *Source:* http://www.goes.noaa.gov/

3 IMPACTS

According to Major Clive C. Davis, Director General of the Office of Disaster Preparedness and Emergency Management (ODPEM), damages had not been quantified at the time of this report.

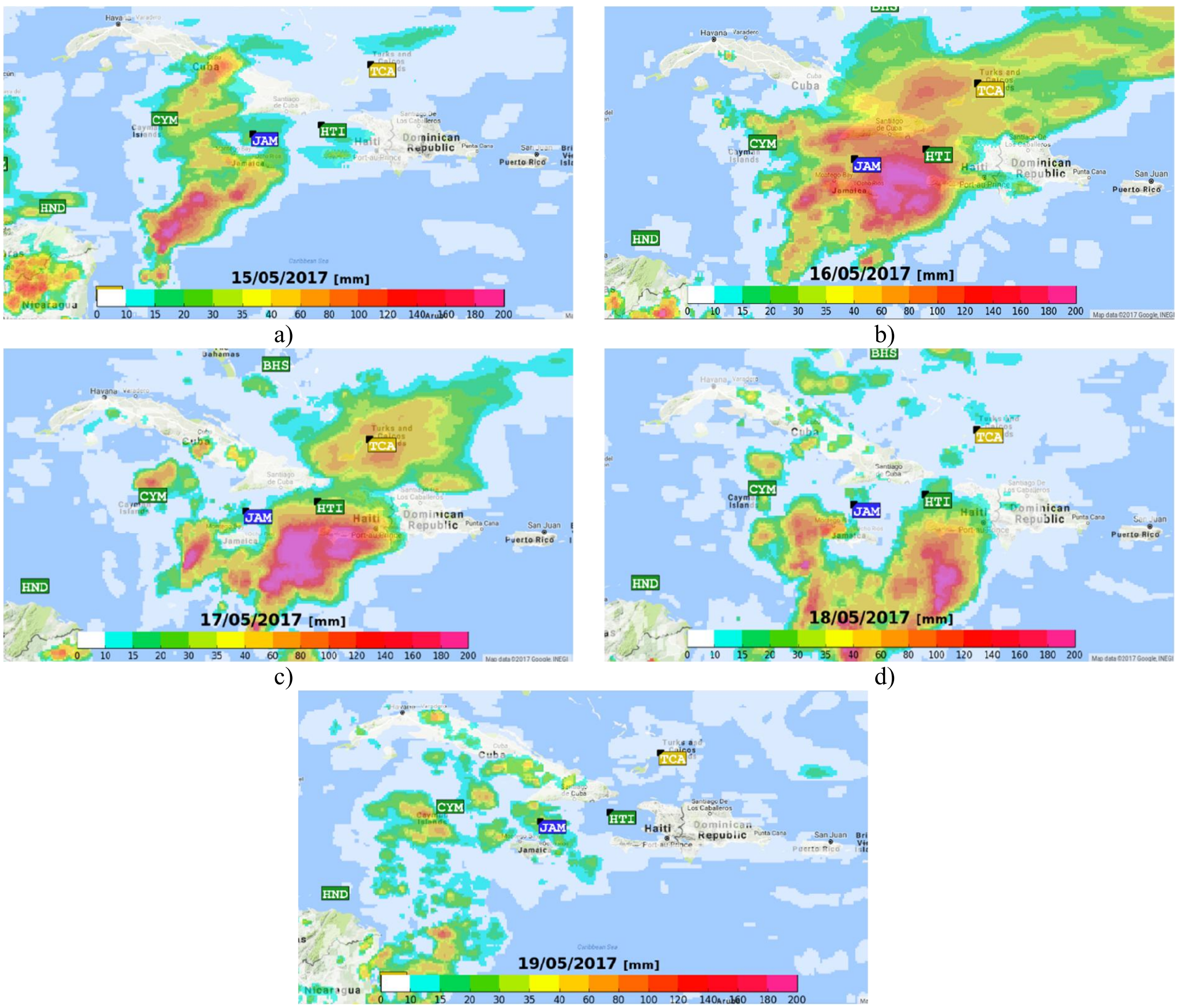
As of the date of this report, the following information had been published in the local news (jamaicaobserver.com):

- The National Works Agency (NWA) reported that 90 per cent of the roadways were reported obstructed.
- There was severe damage to infrastructure and in the agricultural sector.
- There were significant levels of landslides and flooding in Clarendon communities of Frankfield, Pennants, Aenon Town, Kemps Hill, Preddie and Milk River, which affected the water supply facilities.
- Heavy flood waters flowed through houses, blocked roads and destroyed crops and livestock in the south Manchester region.
- Due to heavy rains, dozens of houses in communities in the Myersville Division of south east St. Elizabeth were flooded, forcing their residents to flee.
- The parishes of Kingston and St. Andrew, St. Catherine, Clarendon, Manchester, St. Elizabeth, St. Mary, Portland and St. Ann were severely affected.

Figure 7 Damages caused by extreme rainfall in Jamaica – May 2017. Source: http://www.jamaicaobserver.com/

4 RAINFALL MODEL OUTPUTS

The trajectory of the cumulated precipitation reported by CMORPH during the period 15-19 May broadly agrees with the one inferred by the synoptic event description (see previous section) and from the GEOS imagery. On 15 May, the more intense precipitation was reported SW of Jamaica and over the Windward Passage. From 16 to 17 May the core of the convective precipitation moved from the eastern side of Cuba to the Windward passage to the western side of Haiti, and on 18 May the nucleus moved towards the SW. Finally on 19 May, scattered precipitation was reported over the coastal waters of Jamaica, Cuba and Nicaragua (Figure 8).



a) b) c) d) e)

Figure 8 CMORPH cumulated precipitation along: a) 15, b) 16, c) 17, d) 18 and e) 19 May, 2017.

Regarding the amount of accumulated precipitation, there was a reasonable agreement (slight overestimation) among CMORPH and the data recorded at:

- Kingston (Jamaica): total precipitation on 15 May: 10.92 mm, 16 May: 42.93 mm, 17 May: 1.02 mm, 18 May: 4.06 mm, 19 May: 1.02 mm (source:https://www.wunderground.com/jm/kingston)
- Four stations in the area surrounding Port-au-Prince (Haiti), reported total precipitation values ranging between 37 and 54 mm accumulated from 15 to 17 May (with no precipitation recorded on 15 May (source:http://www.weather-forecast.com/weather-stations/Port-Au-Prince-Airport)).

5 TRIGGER POTENTIAL

The Rainfall Index Loss calculated for this CARE was below the attachment point of Jamaica's Excess Rainfall policy and therefore no payout is due.

CCRIF expresses sympathy with the Government and people of Jamaica for the severe impacts on communities and infrastructure caused by this event.

For further information, please contact ERN-RED, the CCRIF SPC Risk Management Specialist.

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DEFINITIONS

Active Exposure Cell Percentage Threshold The percentage of the total number of XSR Exposure Grid Cells as defined in the Schedule, with in the covered Area of the Insured, which when exceeded triggers a Covered Area Rainfall Event.

Active Exposure Grid Cells The XSR Exposure Grid Cells for which in the same single day the Average Aggregate Rainfall value computed using the CMORPH-based Rainfall Estimate equals or exceeds the Rainfall Event Threshold.

Average Aggregate Rainfall The Average Aggregate Rainfall amount (where the number of days in the Rainfall Aggregation Period is defined in the Schedule) as measured in millimeters per day (mm/day) in any of the XSR Exposure Grid Cells in the Covered Area of the Insured. For a given number of days n, the n-day aggregation period is the average of rainfall on the day itself and on the previous n-1 days.

Calculation Agent Entity charged with undertaking the primary calculation of the Rainfall Index Loss as described in the Calculation Agency Agreement.

CMORPH-based Maximum Average Aggregate Rainfall The maximum value during the Covered Area Rainfall Event of the Average Aggregate Rainfall computed using the CMORPH-based Daily Rainfall Estimates in any given XSR Exposure Grid Cell over the Covered Area of the Insured.

CMORPH-based Covered Area Rainfall Parameters The CMORPH Model information provided on a continuous basis by the XSR Model Data Reporting Agency used by the Calculation Agent to obtain the CMORPH-based Daily Rainfall Estimates using the XSR Rainfall Model. Parameters are drawn from XSR Exposure Grid Cells within the Covered Area of the Insured as identified in the Cell Identification and Rainfall Exposure Value Table in the Schedule, by their respective latitude and longitude. Measurement units and precision of data ingested by the XSR Rainfall Model are identical to those provided by the XSR Model Data Reporting Agency and are further elaborated in the Attachment entitled ‘Calculation of Rainfall Index Loss and Policy Payment’.

CMORPH Model The satellite-based rainfall estimation model provided by NOAA CPC as described in the Rainfall Estimation Models section of the Policy.

Covered Area The territory of the Insured as represented in the XSR Rainfall Model.

Covered Area Rainfall Event Any period of days, with an interruption less than or equals to the Event Tolerance Period, during which the number of Active Exposure Grid Cells is greater than or equal to the product of (a) Active Exposure Cell Percentage Threshold multiplied by (b) the total number of XSR Exposure Grid Cells within the Covered Area.

Country Disaster Alert An official disaster alert issued by ReliefWeb (http://reliefweb.int/) for the country in question for one of the following types of events: tropical cyclone, flood, flash flood and severe local storm. Any disaster alert issued later than seven (7) days after the completion of the Covered Area Rainfall Event event will not be considered.

Maximum Average Aggregate Rainfall The highest value during a Covered Area Rainfall Event of the Average Aggregate Rainfall amount in any of the XSR Exposure Grid Cells in the Covered Area of the Insured computed.

Rainfall Event Threshold Average Aggregate Rainfall level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.

Rainfall Aggregation Period The number of days over which the Average Aggregate Rainfall is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.

Rainfall Index Loss For any Covered Area Rainfall Event affecting the Insured, the US Dollar loss calculated by the Calculation Agent using the XSR Rainfall Model, as described in the Attachment entitled 'Calculation of Rainfall Index Loss and Policy Payment'. The Rainfall Index Loss can only be calculated once the Covered Area Rainfall Event is completed.

WRF1 Model The weather research and forecasting rainfall model by NOAA with Configuration #1 data initialized by the National Center for Environmental Prediction as described in the Rainfall Estimation Models and in the Input Data to the Rainfall Estimation Models sections of the Policy.

WRF2 Model The weather research and forecasting rainfall model by NOAA with Configuration #2 data initialized by the National Center for Environmental Prediction as described in the Rainfall Estimation Models and in the Input Data to the Rainfall Estimation Models

	sections of this Attachment.
XSR Rainfall Model	The computer model used to calculate the Rainfall Index Loss, as described in the Attachment entitled ‘Calculation of Rainfall Index Loss and Policy Payment’.
XSR Exposure Grid Cells	The 30 arc-second by 30 arc-second grid of cells each of which is attributed with an XSR Grid Cell Exposure Value greater than zero, as provided in the Schedule.
XSR Grid Cell Exposure Value	The value, as shown in the Cell Identification and Rainfall Exposure Value Table in the Schedule, used to calculate the CMORPH-based Exposure Grid Cell Loss, the WRF1-based Exposure Grid Cell Loss, and the WRF2-based Exposure Grid Cell Loss.