Covered Area Rainfall Event (04/11/2023 to 05/11/2023)

Excess Rainfall

Event Briefing

Trinidad and Tobago - Tobago

14 November 2023

1   INTRODUCTION

This event briefing describes the impact of rainfall on Tobago, which was associated with a Covered Area Rainfall Event (CARE), from November 04, 2023, to November 05, 2023. The Rainfall Index Loss (RIL) for the Covered Area Rainfall Event was below the attachment point of Trinidad and Tobago's Excess Rainfall policy for Tobago, and therefore no payout is due to the Government of Trinidad and Tobago. In the case of Trinidad, no CARE event was identified.

2   EVENT DESCRIPTION

On 2 and 3 November, an upper-level trough extended northeastward from an upper low-pressure system near the ABC Islands[1] (located approximately at latitude 15°North, longitude 64°West) to beyond the northern Leeward Islands (Figure 1). Divergent winds south of these features triggered scattered showers and isolated thunderstorms over the south-central and southeastern Caribbean Basin, including the Windward Islands and the Atlantic waters just to the east. The satellite imagery showed more active convection over this region between 1800 UTC and 0000UTC, corresponding to the afternoon hours in local time, on both 2 and 3 November (Figure 2a and 2b). Particularly over Tobago, thunderstorms were active on 3 November at 0000UTC and on 4 November at 0000UTC (Figure 2a and 2b).
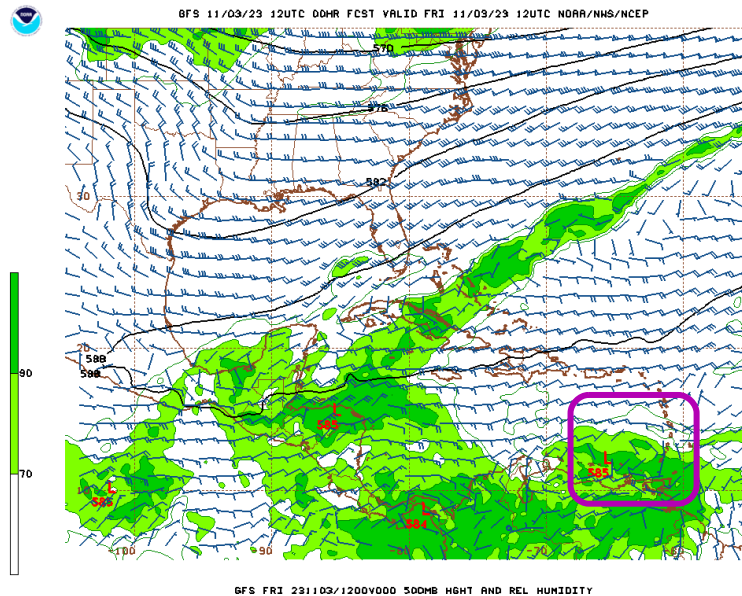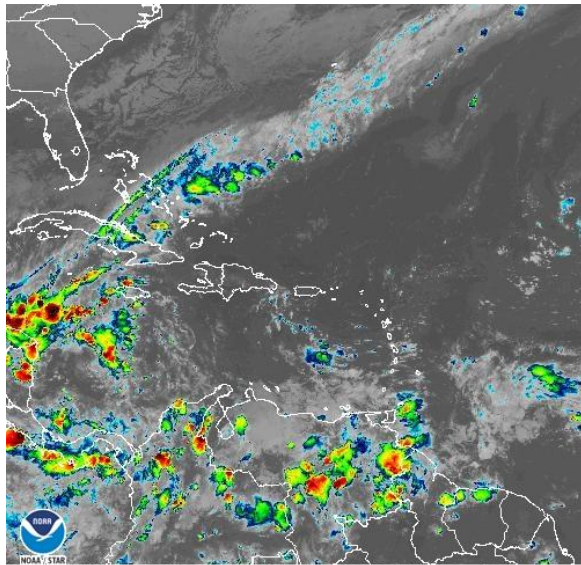

3 November at 1200UTC

Figure 1 Analysis at 500hPa of geopotential height, relative humidity and horizontal wind components produced by the GFS model over the Caribbean area on November 3, 2023 at 1200UTC. Source: US National Hurricane Center[2]. The violet square indicates the upper low pressure system and the region with upper divergent flow.

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1   Aruba, Bonaire, and Curaçao, the three westernmost islands of the Leeward Antilles in the Caribbean Sea.
2   National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review date: 3 November, 2023 available at: *https://mag.ncep.noaa.gov/data/gfs/12/west-atl/500_rh_ht/gfs_west-atl_000_500_rh_ht.gif*

On 4 November, the upper low-pressure system sited near the ABC Islands dissipated. However, the left instability and the high moisture availability supported scattered showers over the eastern Caribbean Basin. Minor convective activity was visible from the satellite imagery over Tobago.
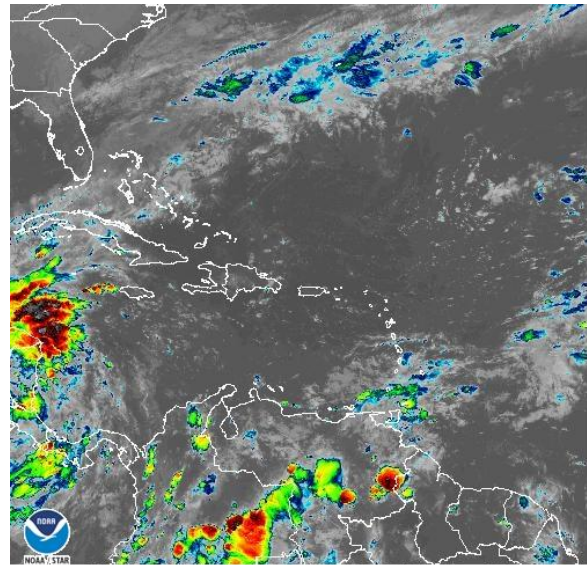
| a) 3 November at 0000UTC | b) 4 November at 0000UTC |

Figure 2 Satellite imagery on 3 and 4 November, 2023 at 0000UTC 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, GOES Image View[3]. The violet square indicates Trinidad and Tobago and the surrounding waters.

3   IMPACTS

At the time of writing this event brief, no information was available related to damage or loss in Tobago due to this Covered Area Rainfall Event during the indicated period. However, on November 7 the Trinidad and Tobago Meteorological Service (TTMS) issued a localized flood alert due to continue rainfall activity over Trinidad and Tobago. [4]

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3   NESDIS Online Archive, NOAA National Environmental Satellite, GOES Image View, available at: https://www.star.nesdis.noaa.gov/GOES/sector.php?sat=G16&sector=cam
4   Loop News: Met Office warns of flooding, landslides as more rains expected | Loop Trinidad & Tobago (loopnews.com)

4   RAINFALL MODEL OUTPUTS

All data sources used by the XSR 3.0 model, CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15[5], detected the occurrence of precipitation over Trinidad and Tobago and the surrounding waters during the period 2 to 5 November 2023. However, each data source reported a specific distribution and accumulation of rainfall, as discussed below and shown in Figure 4. A CARE for Tobago was activated on 4 November and lasted until 5 November. The CARE was activated due to the use of the 12-hour and the 48-hour aggregation intervals for precipitation[6] and thus the period considered by the XSR 3.0 model for the loss estimate based on the accumulated precipitation in Tobago was 2-5 November.

CMORPH reported total accumulated values of precipitation higher than 90 mm over most of Tobago, with maximum values, between 120 mm and 150 mm, over the northeastern edge of the island. Lower values, between 30 mm and 90 mm, were shown over the southwestern portion of Tobago.

IMERG reported total accumulated values of precipitation between 30 mm and 60 mm over most of Tobago. Higher values, between 60 mm and 90 mm, were shown over a small portion of the northeastern coast.

WRF5 showed total accumulated values of precipitation higher than 60 mm over most of Tobago. The maximum values, between 90 mm and 150 mm, were reported over the northeastern portion of the island.

WRF7 showed total accumulated values of precipitation lower than 30 mm over the entire island of Tobago.

WRF11 showed total accumulated values of precipitation higher than 60 mm over the central part of Tobago, in particular in the districts of Saint John, Saint Mary and Saint Paul. The maximum values, between 120 mm and 150 mm, were reported over a small area in the Saint John district. Lower values were shown over the remainder of Tobago.

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5   CMORPH Model: the satellite-based rainfall precipitation estimates provided by the NOAA Climate Prediction Center (CPC) using the so-called Morphing Technique *http://www.cpc.ncep.noaa.gov/products/janowiak/cmorph_description.html*. Further details are provided in the Definitions section of this report

        IMERG Model: The satellite-based rainfall estimation model developed by NASA, expressed in mm, derived by aggregating the IMERG 30-minute Rainfall Data at 10km spatial resolution and available at *https://jsimpsonhttps.pps.eosdis.nasa.gov/imerg/late*. Further details in the Definitions section of this reportWRF5,

        WRF7, WRF11 and WRF15 Models: the Weather Research and Forecasting Model weather model-based Configuration #1 and #2 data *https://www.mmm.ucar.edu/weather-research-and-forecasting-model*. These data are initialised by the NCEP FNL dataset. (NCEP FNL Operational Model Global Tropospheric Analyses [*http://rda.ucar.edu/datasets/ds083.2/*]). Further details are provided in the Definitions section of this report.

6   The two aggregation periods correspond to the Rainfall Aggregation Period #1 and Rainfall Aggregation Period #2, as indicated in the Schedule. Further details in the Definitions section of this report.

WRF15 showed total accumulated values of precipitation between 30 mm and 60 mm over most of the country, in particular over the southern and extreme northern portions of the island. Higher values, between 60 mm and 90 mm, were reported in two small regions, along the southern coast and over the northern edge of Tobago, respectively, while lower values were shown over the remainder of the island.
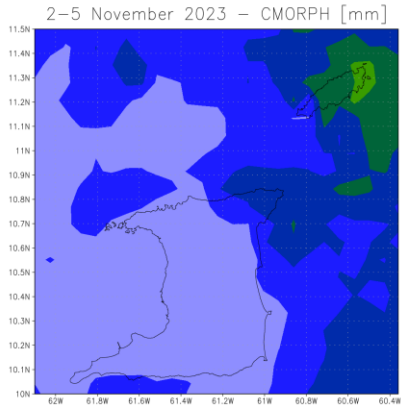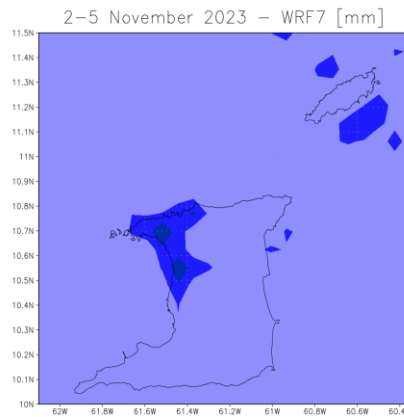

a) CMORPH
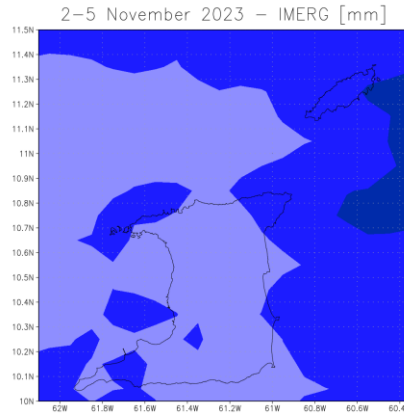
a) IMERG

c) WRF5

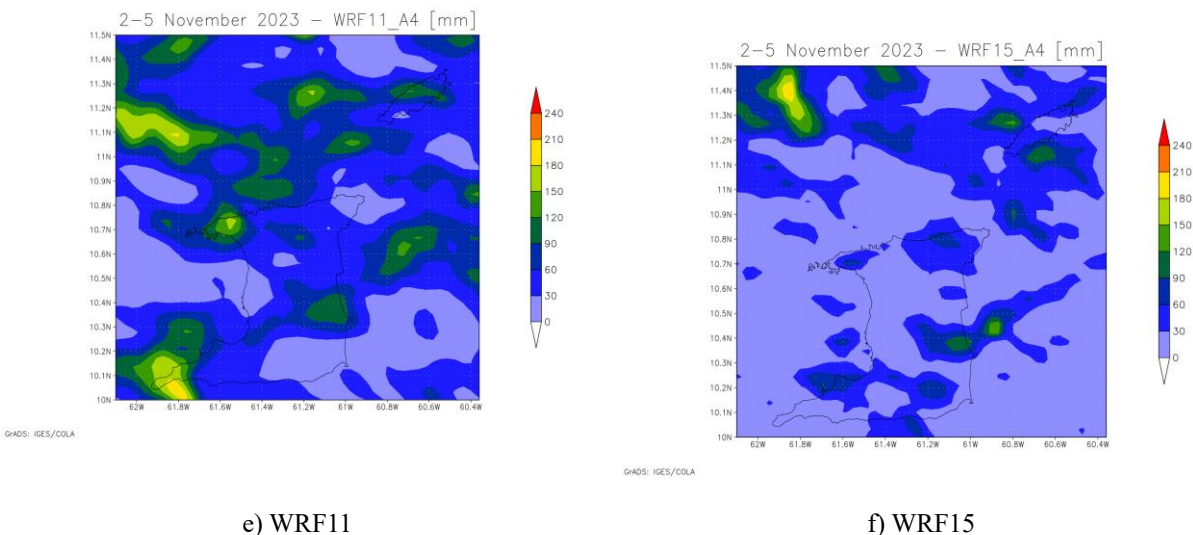d) WRF7

e) WRF11   f) WRF15
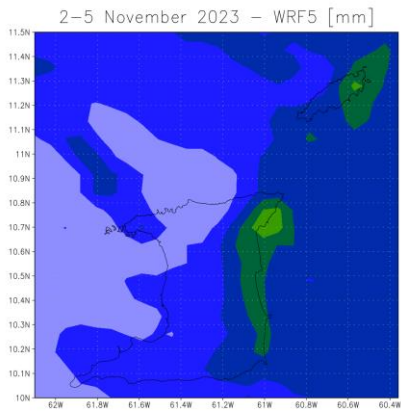
Figure 4 Total accumulated precipitation during the period 2-5 November, 2023
estimated by CMORPH (a), IMERG (b), WRF5 (c), WRF7 (d), WRF11 (e), WRF15 (f). Source: CCRIF SPC

Daily rainfall maps by CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15 over the exposure map of XSR 3.0 are not included here and they can be downloaded at the following links for 12-hour aggregation and 48-hour aggregation respectively:

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/TTO/TTO_TOB/CARE_5_2023/daily_prec_short.mp4

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/TTO/TTO_TOB/CARE_5_2023/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for Tobago for four data sources used by XSR3.0: CMORPH, WRF5, WRF11 and WRF15. The RIL was the highest for CMORPH.

The final RIL (RIL_{FINAL}) was calculated as the average of the four RILs from CMORPH, WRF5, WRF11 and WRF15. The RIL_{FINAL} was greater than zero and therefore this CARE qualified as a loss event. However, the RIL_{FINAL} was below the attachment point of the Trinidad and Tobago's Excess Rainfall policy for Tobago, and therefore the policy was not triggered. Therefore, no payout is due under this Excess Rainfall policy to the Government of Trinidad and Tobago.

The Wet Season Trigger (WST) component of the XSR3.0 model did not identify this CARE as a "Wet Season" event[7]. Therefore, no payout is due under the Wet Season Trigger

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7   The WST endorsement provides a fixed payout for rainfall events that happen when the soil is already saturated and has limited absorption ability. The WST endorsement is activated based on two factors: the Wet Index (the average 1-month Standardized Precipitation Index for all grid cells in the country) and Wet Periods (the period of time where the Wet Index exceeds 1, which indicates that the soil is wetter than its long-term average and serves as an indicator of soil saturation). The WST policy endorsement provides a payment when one or more CAREs with

endorsement of Excess Rainfall policy of Tobago.

5   TRIGGER POTENTIAL

The Rainfall Index Loss calculated for the Covered Area Rainfall Event (CARE) for Tobago, was below the attachment point of Trinidad and Tobago's Excess Rainfall policy for Tobago, and therefore no payout is due. This CARE did not activate the Wet Season Trigger endorsement of the Excess Rainfall policy and therefore no payout under this endorsement is due.

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

a modelled loss greater than zero occur within a Wet Period and the corresponding value of the Wet Index during the Wet Period exceeds a predetermined threshold.

DEFINITIONS

Active Exposure Cell Percentage Threshold	The percentage of the total number of XSR Exposure Grid Cells within the Covered Area of the Insured, that must be exceeded to trigger a Covered Area Rainfall Event.
Active Exposure Grid Cells	The XSR Exposure Grid Cells for which in the same single day the Aggregate Rainfall #1 value computed using the CMORPH-based Rainfall Estimate equals or exceeds the Rainfall Event Threshold #1 or the Aggregate Rainfall #2 value computed using the CMORPH-based Rainfall Estimate equals or exceeds the Rainfall Event Threshold #2.
Aggregate Rainfall #1	The rainfall amount accumulated over the Rainfall Aggregation Period #1 (as defined in the Schedule) measured in millimeters (mm) in any of the XSR Exposure Grid Cells in the Covered Area of the Insured. For a given day and a Rainfall Aggregation Period #1 of n hours, the Aggregate Rainfall #1 is the maximum amount of rainfall accumulated over any of the n-hour windows that intersect the day itself considering a time interval of 3 hours.
Aggregate Rainfall #2	The rainfall amount accumulated over the Rainfall Aggregation Period #2 (as defined in the Schedule) measured in millimeters (mm) in any of the XSR Exposure Grid Cells in the Covered Area of the Insured. For a given day and a Rainfall Aggregation Period #2 of n hours, the Aggregate Rainfall #2 is the maximum amount of rainfall accumulated over any of the n-hour windows that intersect the day itself considering a time interval of 3 hours.
Calculation Agent	Entity charged with undertaking the primary calculation of the Rainfall Index Loss.
CMORPH-based Maximum Aggregate Rainfall #1	The maximum value during the Covered Area Rainfall Event of the Aggregate Rainfall #1 computed using the CMORPH-based Rainfall Estimates in any given XSR Exposure Grid Cell over the Covered Area of the Insured.
CMORPH-based Maximum Aggregate Rainfall #2	The maximum value during the Covered Area Rainfall Event of the Aggregate Rainfall #2 computed using the CMORPH-based 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 Rainfall Estimates using the XSR Rainfall Model. Parameters are drawn from XSR Exposure Grid Cells within the Covered Area of the Insured, 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 (CARE) event will not be considered. The Disaster Alert description issued by ReliefWeb and/or its attached documentation must include specific reference to the CARE dates with a tolerance period of 2 calendar days.
Maximum Aggregate Rainfall #1	The highest value during a Covered Area Rainfall Event of the Aggregate Rainfall #1 amount in any of the XSR Exposure Grid Cells in the Covered Area of the Insured computed.
Maximum Aggregate Rainfall #2	The highest value during a Covered Area Rainfall Event of the Aggregate Rainfall #2 amount in any of the XSR Exposure Grid Cells in the Covered Area of the Insured computed.
Rainfall Event Threshold #1	Aggregate Rainfall #1 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.

Rainfall Event Threshold #2	Aggregate Rainfall #2 level as defined in the Schedule which should be exceeded to trigger an Active Exposure Cell.
Rainfall Aggregation Period #1	The number of hours over which the Aggregate Rainfall #1 is computed for all XSR Exposure Grid Cells during a Covered Area Rainfall Event.
Rainfall Aggregation Period #2	The number of hours over which the Aggregate Rainfall #2 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.
WRF5 Model	The weather research and forecasting rainfall model by NOAA with Configuration #5 data initialized with and assimilating the data provided 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.
WRF7 Model	The weather research and forecasting rainfall model by NOAA with Configuration #7 data initialized with and assimilating the data provided 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.
XSR Grid Cell Exposure Value	The value, used to calculate the CMORPH-based Exposure Grid Cell Loss, the WRF5-based Exposure Grid Cell Loss, and the WRF7-based Exposure Grid Cell Loss.