Covered Area Rainfall Events (21/10/2023)

Excess Rainfall

Event Briefing
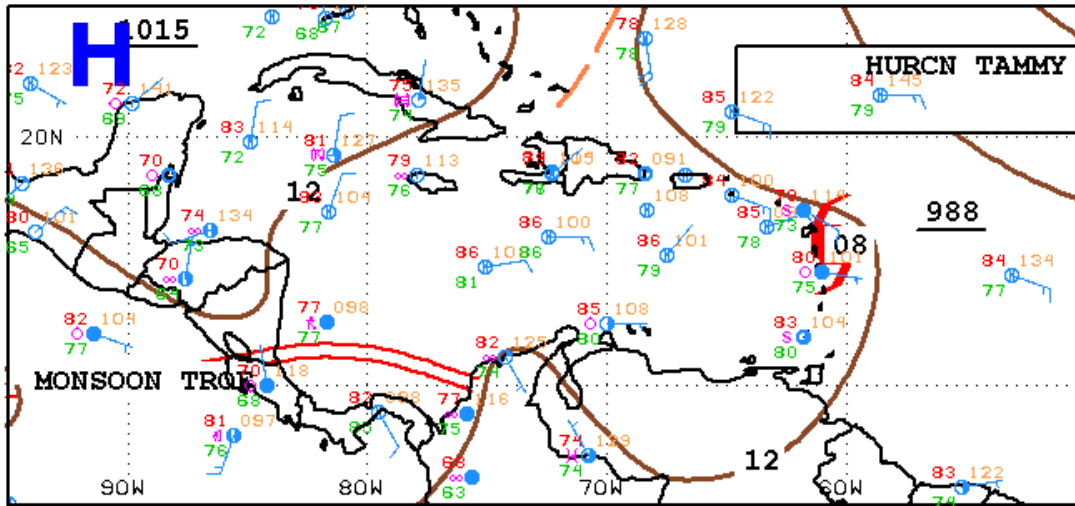
Panama

3 November 2023

---

1   INTRODUCTION

This event briefing describes the impact of rainfall on Panama, which was associated with a Covered Area Rainfall Event (CARE), on October 21, 2023. The Rainfall Index Loss (RIL) for the Covered Area Rainfall Event was below the attachment point of the Excess Rainfall policy of Panama, and therefore no payout is due to the Government of Panama.

2   EVENT DESCRIPTION

On 19 October, the eastern end of the East Pacific monsoon trough extended along latitude 10° North, from longitude 75°West, through Costa Rica, into the Pacific Ocean. Additionally, a low pressure system embedded within the monsoon trough meandered from longitudes 75° West to 78° West, just north of Panama. The combination of the trough and the low pressure system enhanced the development of scattered showers and isolated thunderstorms over a large area from latitudes 1° to 9° North and from longitudes 77° to 88° West, across the southwestern Caribbean Sea and near the northwestern Colombia coast (Figure 1a). The associated precipitation was generally moderate but was intense in certain areas and affected particularly the southern countries of Central America, particularly Panama and Costa Rica, and the surrounding waters.

a)19 October at 1200UTC

b) 20 October at 1200UTC

c) 21 October at 1200UTC

Figure 1 Surface analysis over Central America and Caribbean Sea from 19 to 21 October 2023 at 1200 UTC, as indicated in the labels. Source: US National Hurricane Center[1]

1   National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, available on 19-21 October 2023 at: *https://www.nhc.noaa.gov/tafb/CAR_12Z.gif*

During the following day, 20 October, the meteorological configuration remained unvaried. The eastern Pacific monsoon trough remained stable from Costa Rica at latitude 11°North, longitude 83°West to latitude 11°North, longitude 75°West near the Colombia coast (Figure 1b) and the low pressure system within the trough also remained stable to the north of Panama. The associated convection activity produced heavy showers and thunderstorms from latitudes 2° to 9° North between longitudes 77° and 91° West, mainly offshore from Colombia and Panama.

On 21 October, the monsoon trough moved southward, closer to Panama's northern coast, along latitude 10° North, while the low pressure system dissipated (Figure 1c). Strong thunderstorms with heavy rainfall persisted to the south of the trough, across the offshore areas of Colombia, Panama, and Costa Rica, over the region from latitudes 1° to 10° North between longitudes 77° and 81° West.

3   IMPACTS

At the time of writing this report, the information available on excess rainfall impacts in Panama is limited. The National Civil Defense System (SINAPROC – in Spanish) deployed specialists nationwide to attend to approximately 34 homes that were affected in several provinces due to the heavy rains that occurred during the weekend of October 20-22. The National Operations Center (COEN – in Spanish) reported flooding in some sectors of Chiriqui, where water damage was reported in some homes.[2]

Figure 1 - SINAPROC Response Team providing support to families affected by flooding.

---

[2] SINAPROC: Equipos de Respuesta del SINAPROC brindan apoyo a familias afectadas por inundaciones del fin de semana - Sinaproc

4   RAINFALL MODEL OUTPUTS

All data sources used by the XSR 3.0 model, CMORPH, IMERG, WRF5, WRF7, WRF11 and WRF15[3], detected the occurrence of precipitation over Panama and the surrounding waters during the period 19 to 21 October 2023. However, each data source reported a specific distribution and accumulation of rainfall, as discussed below and shown in Figure 4. The CARE for Panama was activated on 21 October and lasted for one day. The CARE was activated due to the use of the 12-hour and the 48-hour aggregation intervals for precipitation[4] and thus the period considered by the XSR 3.0 model for the loss estimate based on the accumulated precipitation in Panama was 19 – 21 October.

CMORPH reported total accumulated values of precipitation higher than 80 mm over some areas in the western side of Panama (mainly in the Provinces of Chiriquì and Veraguas) and in the vicinity of Panama City, with maximum values between 160 mm and 200 mm in Chiriquì Province. The values of accumulated precipitation were reported to be lower than 80 mm over the remainder of the country.

IMERG reported total accumulated values of precipitation with a geographic distribution similar to that of CMORPH, but with higher intensity. Values higher than 120 mm were shown over most of Chiriquì and Veraguas Provinces and Ngöbe-Buglé comarca and in the vicinity of Panama City, with maximum values between 280 mm and 320 mm along the Pacific coast in Chiriquì Province. The values of accumulated precipitation were reported to be lower than 120 mm over the remainder of the country.

WRF5 showed total accumulated values of precipitation higher than 160 mm in some regions along the Pacific coast in the Veraguas, Panama and Darien Provinces, with maximum values between 360 mm and 400 mm in Veraguas Province. Moreover, total accumulated values of rainfall higher than 120 mm, with local maximum reaching 240 mm, were shown over localized areas in the cordillera of Talamanca. The accumulated values of precipitation were reported to be lower than 120 mm over the remainder of the country.

WRF7 showed total accumulated values of rainfall higher than 120 mm in some localized

---

[3]   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.

[4] 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.

regions over the Cordillera of Talamanca, with maximum values between 320 mm and 360 mm. Total accumulated values higher than 120 mm were reported in Panama Province, with maximum values reaching 320 mm along the Pacific coast, and in isolated areas in Veraguas and Darien Provinces.

WRF11 showed total accumulated values of precipitation higher than 120 mm in localized areas along the Cordillera of Talamanca, over Colon and Panama Provinces and over the southern portions of Veraguas and Darien Provinces. The maximum values, between 400 mm and 440 mm, were shown over areas in Chiriquì and Veraguas Provinces.
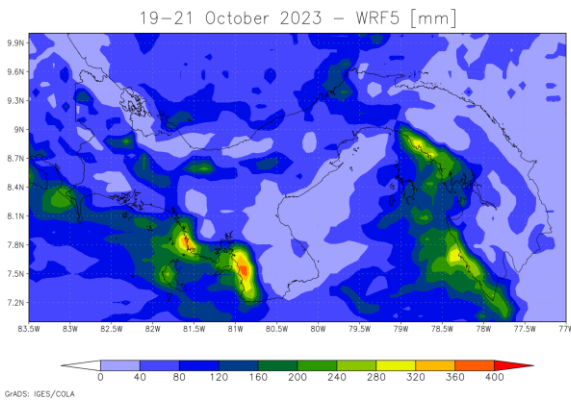
WRF15 showed total accumulated values of precipitation with a geographic distribution similar to that of WRF11, but with the higher values over smaller areas. The maximum values, between 400 mm and 440 mm, were shown over areas in Chiriquì and Veraguas Provinces.
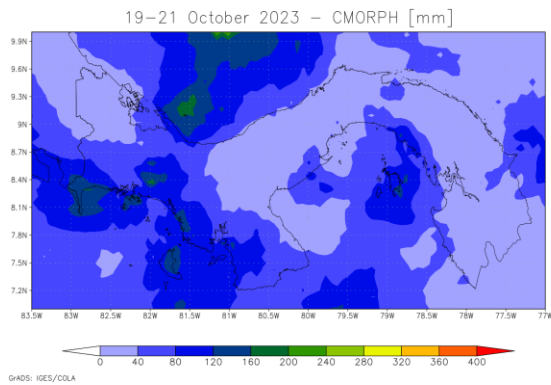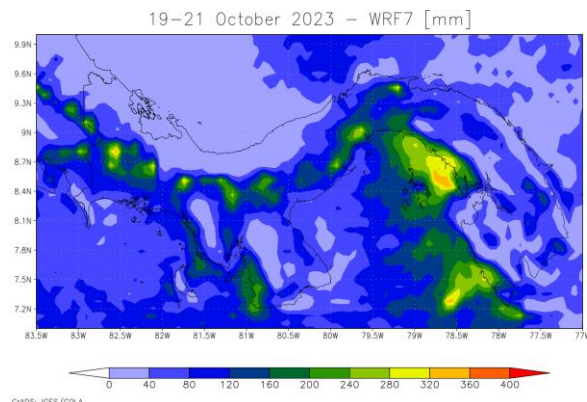
a) CMORPH
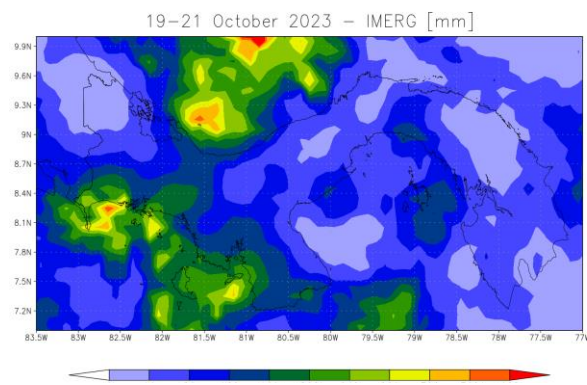
a) IMERG

c) WRF5

d) WRF7

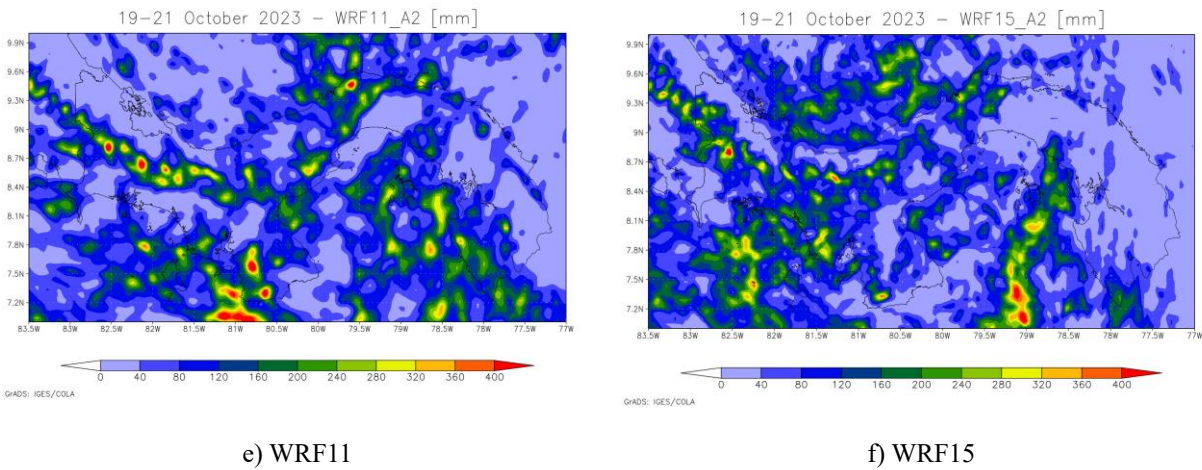e) WRF11   f) WRF15

Figure 4 Total accumulated precipitation during the period 19-21 October, 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/PAN/CARE_5_2023/daily_prec_short.mp4

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

The Rainfall Index Loss (RIL) was above the loss threshold for Panama for three data sources used by XSR3.0: IMERG, WRF7 and WRF11. The RIL was the highest for IMERG.

The final RIL (RIL_{FINAL}) was calculated as the average of the three RILs from IMERG, WRF7, and WRF11. 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 Excess Rainfall policy for Panama and therefore the policy was not triggered.

5 TRIGGER POTENTIAL

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

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

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.