Covered Area Rainfall Event (03/07/2024)

Excess Rainfall

Event Briefing

Haiti

12 July 2024

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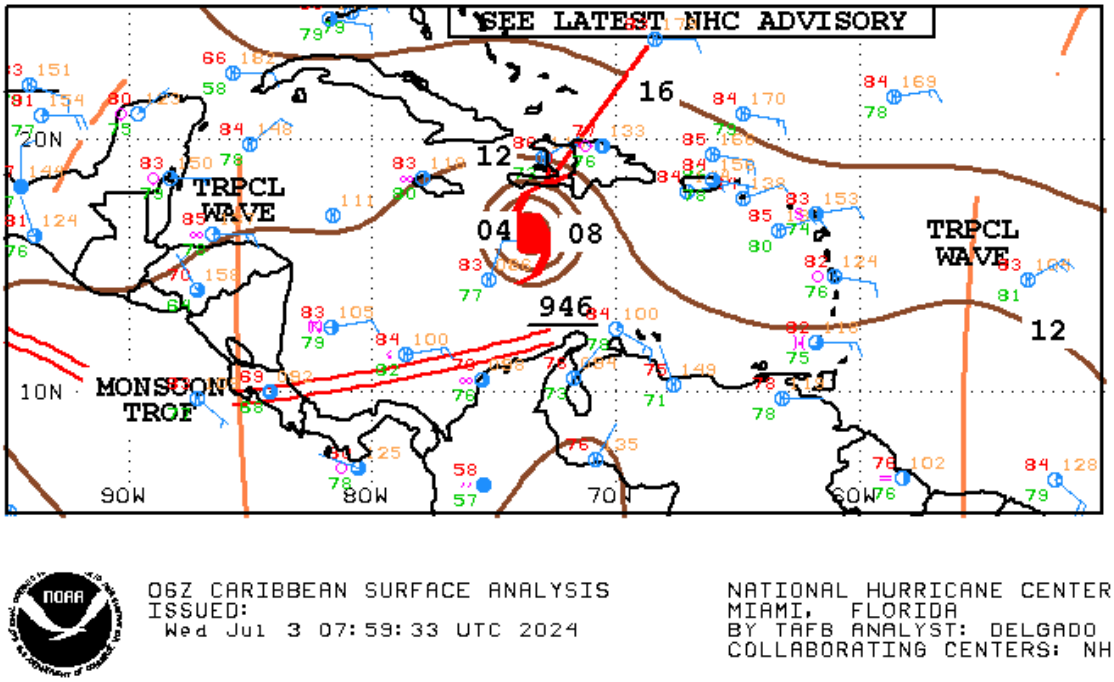
1 INTRODUCTION

This event briefing describes the impact of rainfall on Haiti, which was associated with a Covered Area Rainfall Event (CARE) on 3 July 2024. The Rainfall Index Loss (RIL) for the Covered Area Rainfall Event was below the attachment point of Haiti's Excess Rainfall policy, and therefore no payout is due to the Government of Haiti.

2 EVENT DESCRIPTION

On 30 June at 1530UTC, the US National Hurricane Center (NHC) reported that Tropical Cyclone Beryl evolved into a Category 4 hurricane. At this time, Beryl was getting closer to the Windward Islands, as its centre was sited near latitude 10.8° North, longitude 54.9° West, about 350 mi (565 km) ESE of Barbados. On the next day, 1 July, Hurricane Beryl passed over the southern Lesser Antilles, affecting them with tropical-storm conditions.Grenada experienced hurricane-conditions for some hours, before and after the hurricane making landfall on Carriacou (Grenada). Hurricane Beryl then moved away from the Windward Islands, heading west-northwestwards at 20 mph (31 km/h) along the southwestern periphery of a strong subtropical ridge oriented ESE-to-WNW sited over the North Atlantic Ocean. On 2 July, Beryl intensified to a Category 5 hurricane, but during the final hours of the day it weakened again to a Category 4 hurricane, due to the presence of a westerly wind shear over the central Caribbean Sea and the entrainment of dry air in the cyclone circulation.

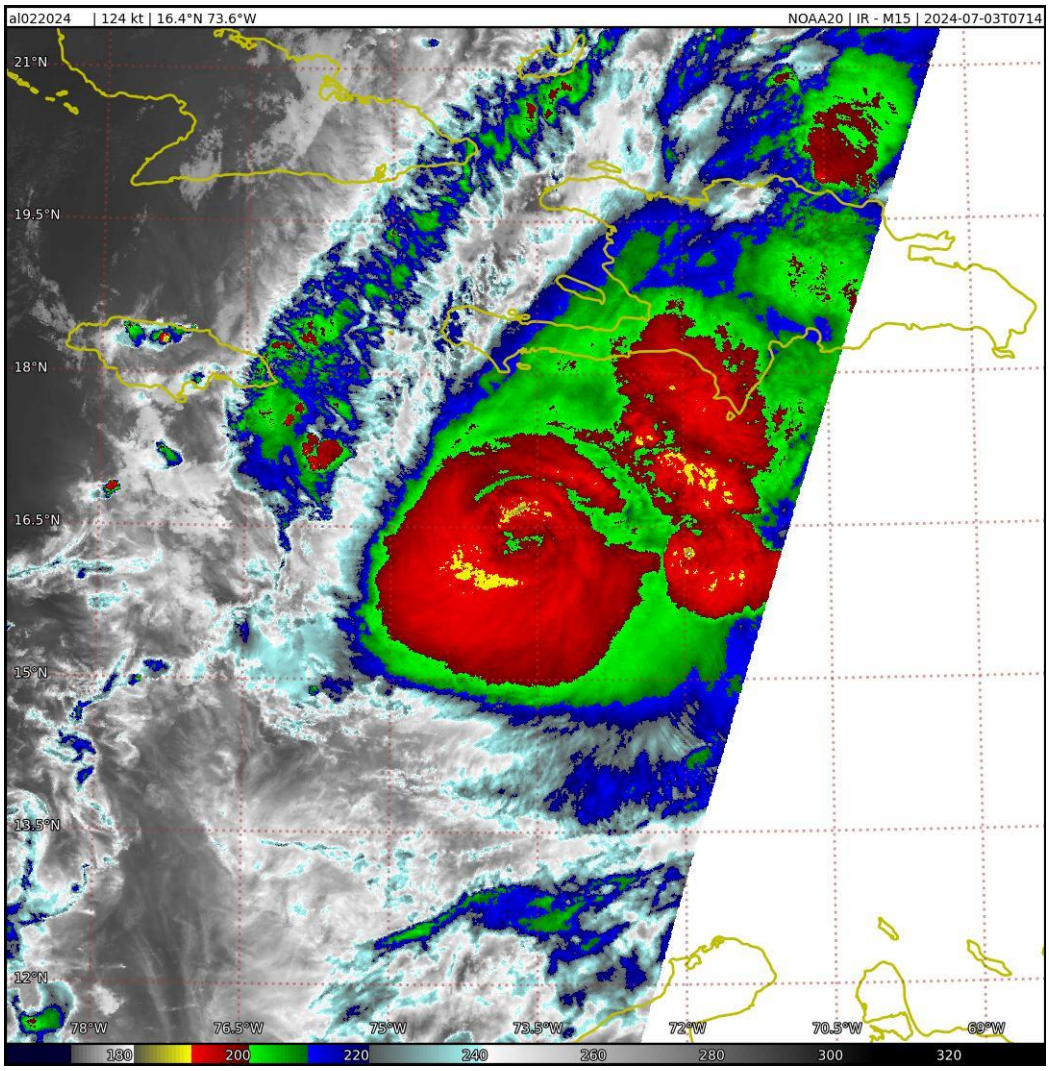
On 3 July at 0300UTC, Hurricane Beryl was at its minimum distance from Port-au-Prince , as its centre was sited near latitude 16.1° North, longitude 72.4° West, about 170 mi (273 km) SSW of the capital of Haiti (Figure 1). The minimum central pressure was 946 mb and the maximum sustained winds were estimated at 145 mph (230 km/h). From the satellite images, the hurricane appeared to be experiencing the effects of a moderate northwesterly wind shear. The eye had become cloud-filled, and the hurricane's cloud pattern was elongated northeast to southwest. Very deep convection was present in the eyewall and over the outer rainband to the northeast of the centre (i.e. in the northeastern quadrant), and the core of the hurricane remained intact (Figure 2). While the precipitation associated with the hurricane core remained off the coast of Haiti, the northeastern outer rainband of Beryl affected the country with moderate to locally intense precipitation, mainly on its southern side and along the southern coast (Figure 2). The rainfall associated with the outer rainband started over Haiti on 0300UTC and persisted for most of the day, until 2200UTC, while the hurricane was passing south of Haiti, proceeding towards Jamaica.



03 July at 0600UTC

Figure 1 Surface analysis over the Caribbean area on 3 July 2024 at 0600UTC. Source: US National Hurricane Center[1]

1 National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review date: 3 July 2024, available at: *https://www.nhc.noaa.gov/tafb/CAR_06Z.gif*



03 July at 0714UTC

Figure 2 Satellite imagery on 3 July, 2024 at 0714UTC 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 Service[2].

3 REPORTED IMPACTS

At the time of writing this report, there is limited information reporting damages or losses in Haiti due to this Covered Area Rainfall Event during the indicated period.

2 RAMSDIS Online Archive, NOAA Satellite and Information Service, available at: https://rammb-data.cira.colostate.edu/tc_realtime/storm.asp?storm_identifier=al022024

Several municipalities in the southeastern area of the country reported coastal floods. [3]

Figure 4 Street flooded in Haiti. / Agenzia Fides [4]

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 Haiti and the surrounding waters during the period 1 to 3 July 2024. Each data source reported a specific distribution and accumulation of rainfall, as discussed below and shown in Figure 3. A CARE for Haiti was activated on 3 July and closed the same day. 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 Haiti was 1 to 3 July.

CMORPH reported total accumulated values of precipitation between 20 mm and 80 mm on the southern side of Haiti. Lower values were reported over the central and northern areas of

3 SWI: El huracán Beryl causa "muy pocos daños" en Haití, según afirman autoridades - SWI swissinfo.ch
4 Agenzia Fides: AMERICA/HAITI - Camillians after Hurricane Beryl
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.

the country.

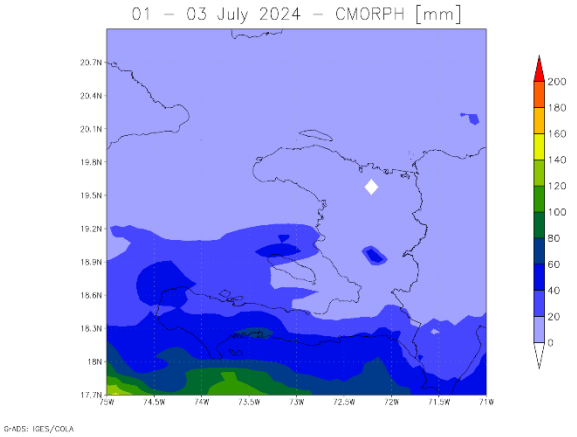
IMERG reported total accumulated values of precipitation higher than 60 mm over most of the southern part of Haiti, with maximum values between 120 mm and 160 mm. Lower values were reported over the central and northern areas of the country.

WRF5 showed total accumulated values of precipitation lower than 20 mm over all of Haiti, except for a few isolated and restricted areas in the northern and southwestern areas of the country.

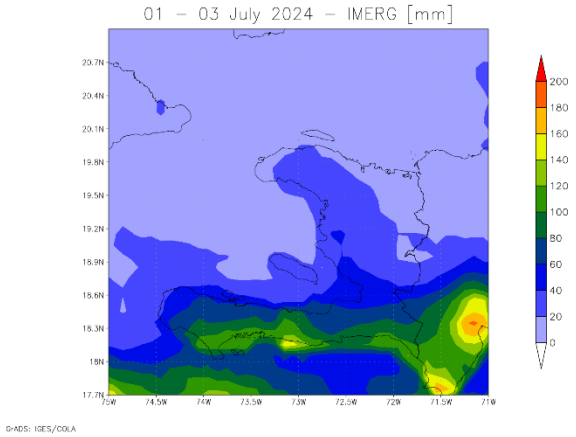
WRF7 reported total accumulated values of precipitation with a similar geographic distribution and intensity to that of WRF5, with values lower than 20 mm over most of the country and localized maximum values between 40 mm and 80 mm on the northern part of Haiti.

WRF11 showed total accumulated values of precipitation lower than 20 mm over most of the country, except for the southwestern edge, where values higher than 200 mm were reported.

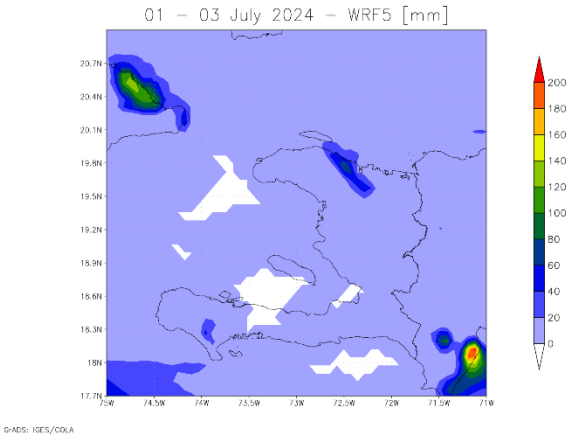
WRF15 reported total accumulated values of precipitation lower than 20 mm over most of the country, except for small areas with rainfall values in the range of 20 and 60 mm.

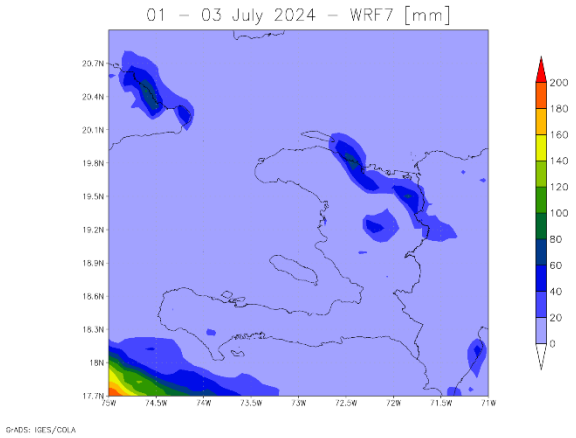


a) CMORPH

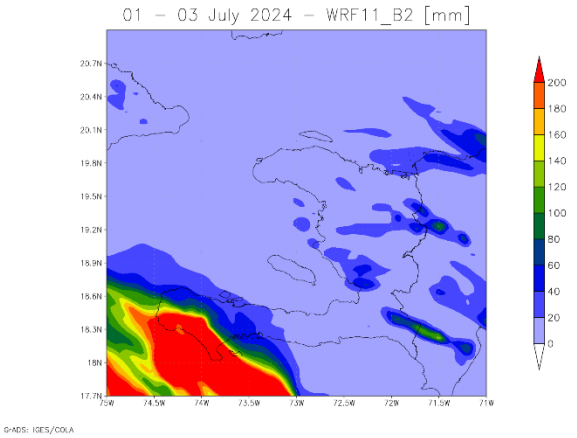


b) IMERG

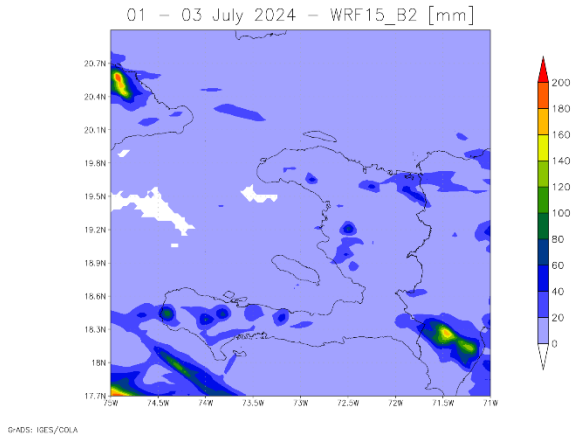




c) WRF5



d) WRF7



e) WRF11

f) WRF15

Figure 4 Total accumulated precipitation during the period 01 and 03 July, 2024
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/HTI/CARE_1_2024/daily_prec_short.mp4
https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/HTI/CARE_1_2024/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for Haiti's Excess Rainfall policy for one of the data sources used by XSR3.0: WRF11. A Disaster Alert declaration with code 52063 was issued by ReliefWeb for Haiti related to Hurricane Beryl. The final RIL (RIL_{FINAL}) was calculated using the only RIL above the loss threshold.

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 Haiti's Excess Rainfall policy, and thus the policy was not triggered. Therefore, no payout is due under the Excess Rainfall policy to the Government of Haiti.

The Wet Season Trigger (WST) endorsement 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 endorsement of Haiti's Excess Rainfall policy.

7 The WST endorsement is designed to provide a predetermined payout for rainfall events occurring amidst already saturated soil conditions, effectively capturing the heightened risk of flooding and landslides. It is activated based on two factors: the Wet Index (the average 1-month Standardized Precipitation Index for all grid cells in the country) and

The Localized Event Trigger (LET) component of the XSR3.0 model did not identify this CARE as a localized event[8]. Therefore no payout is due under the Local Event Trigger endorsement of Haiti's Excess Rainfall policy.

5 TRIGGER POTENTIAL

The Rainfall Index Loss calculated for the Covered Area Rainfall Event (CARE) for Haiti was below the attachment point of its Excess Rainfall policy, 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

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 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.
Wet event (WE) is any period of consecutive days, during which the Wet Index (WI) is equal or greater than 1
8 The LET is designed to cover rainfall events that affect only a small portion of the island. To determine a qualifying localized event, two conditions must be met: the average precipitation in the 10% of the area with highest precipitation – known as the "Local Exposure" - from (i) either of the satellite datasets (CMORPH or IMERG) and (ii) at least three of the six WRF models must be greater than the local precipitation threshold (LPT).

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.