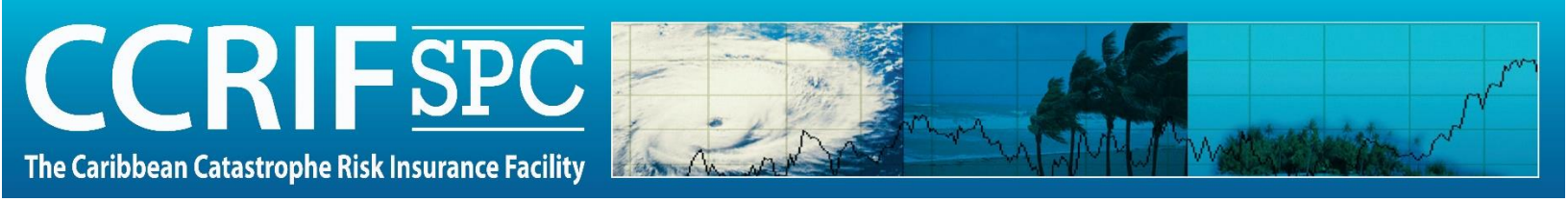

Covered Area Rainfall Event (20/05/2020 to 02/06/2020)

Excess Rainfall

Event Briefing

Nicaragua

10 June 2020

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1 INTRODUCTION

Tropical waves and low pressure systems occurred over the Central America region from 19 May to 2 June. During this time, adverse weather prevailed over Nicaragua that generated showers and thunderstorms.

This event briefing describes the impact of rainfall on Nicaragua, which is associated with a Covered Area Rainfall Event (CARE), starting on 20 May and ending on 2 June 2020. The Rainfall Index Loss (RIL) was below the attachment point of Nicaragua's Excess Rainfall policy and therefore no payout is due to the Government of the Republic of Nicaragua.

2 EVENT DESCRIPTION

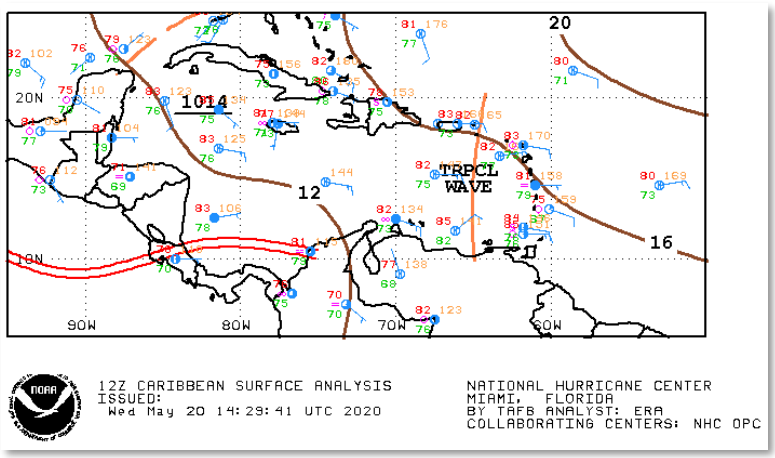
From 19 May to 2 June over Central America and particularly Nicaragua, there were persistent conditions of perturbed weather due to the high amount of moisture in the upper atmosphere and the transition of several factors of atmospheric instability. During this period, every day from 1800UTC to 0600UTC (1200 to 0000 local time), showers and thunderstorms with a scattered pattern and moderate intensity occurred over Nicaragua. The most significant rainfall events that affected Nicaragua are described below.

On 19 May, an upper level trough extended from the NW part of the Caribbean Sea to Nicaragua. The associated instability caused the development of a large thunderstorm, which affected with heavy rainfall the north Nicaragua from 19 May at 1800UTC to 20 May at 0300UTC.

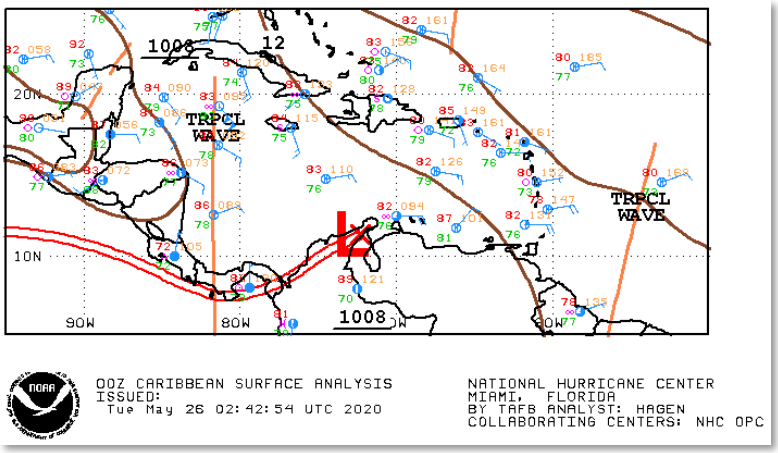
On 20 and 21 May, the monsoon trough moved northward from its previous position over Panama and it was located over Costa Rica in the vicinity of the border with Nicaragua (Figure 1a). As a consequence, several thunderstorms associated with heavy rainfalls developed in the nocturnal hours (from 1800UTC to 0600UTC) on both 20 and 21 May. Afterwards, the monsoon trough retired southwards.

On 25 and 26 May, the southward extension of a broad area of low pressure to Nicaragua and the presence of a tropical wave (Figure 1b), led to the intensification of the thunderstorm activity during the nocturnal hours. Isolated thunderstorms affected with intense precipitation most of Nicaragua and particularly the western portion (Figure 2b).

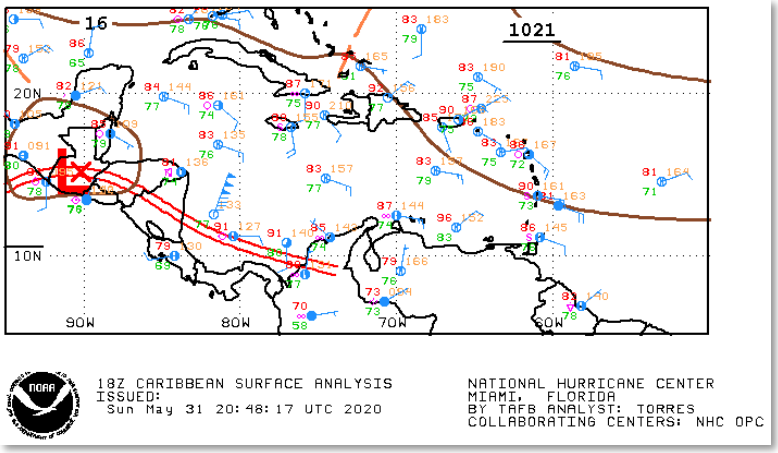
On 28 May, a second approach of the monsoon trough from the south led to the development of a strong thunderstorms over the east coast of Nicaragua. (Figure 2c). In the next hours the convective system moved across the entire Nicaragua, affecting it with heavy precipitation from 1800UTC to 29 May at 0500UTC. In the next two days, the monsoon trough retired southward. However, afterwards it shifted towards north a third time and it persisted over Nicaragua (with axis from 13N, 84W to 15N, 86W, Figure 1c) from 31 May to 2 June. As a consequence, several thunderstorms of scattered moderate to isolated strong intensity developed during this period in the nocturnal hours. Heavy rainfall affected Nicaragua in different regions: onshore the Atlantic coast on the night 31 May-01 June, onshore the Pacific coast on the night 01-02 June and over the western portion of Nicaragua on the night 02-03 June.



a) 20 May at 1200UTC



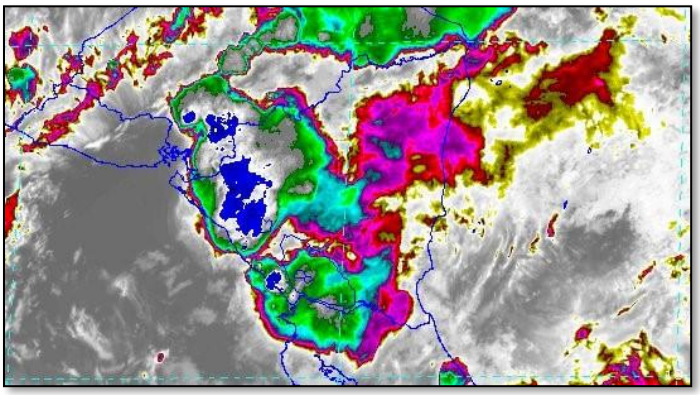
b) 26 May at 0000UTC



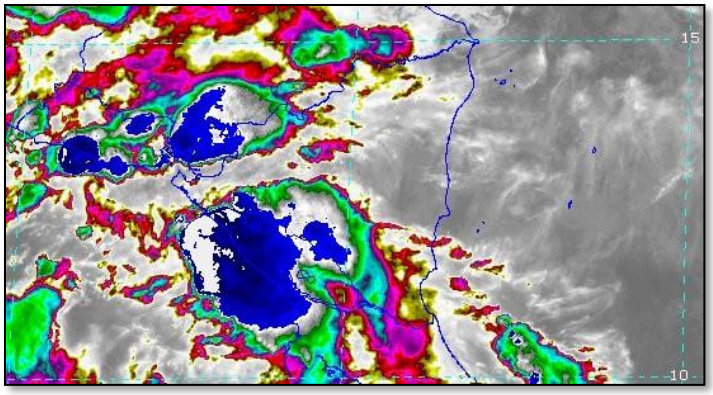
c) 01 June at 1800UTC

Figure 1 Surface analysis over Central America at different times as indicated in the caption.
Source: US National Hurricane Center[1]

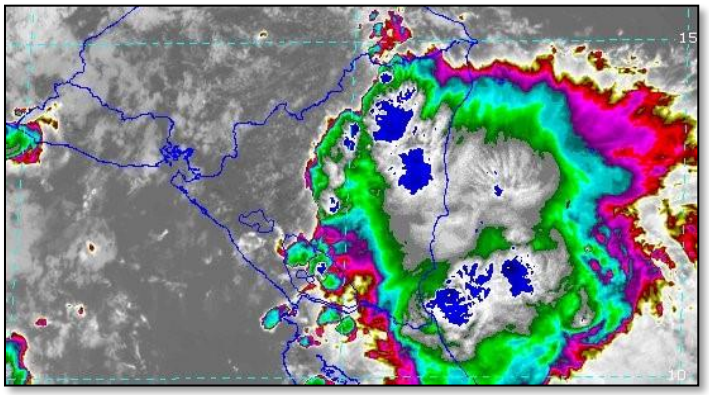
[1] National Oceanic and Atmospheric Administration - FTP, National Hurricane Center, review dates: from 20 May to 02 June 2020, available at: *https://www.nhc.noaa.gov/tafb/CAR_00Z.gif*



a) 20 May at 0000UTC



b) 27 May at 0600UTC



c) 28 May at 1800UTC

Figure 2 Satellite imagery at different times as indicated by the captions from thermal infrared channel enhanced with colour. Violet to green colours represent high altitude clouds (top cloud temperature between -50°C and -70°C), while the white/blue colours represent very high altitude clouds (top cloud lower than -70°C). High altitude clouds indicate strong convection associated with intense precipitation.
Source: NOAA Satellite and Information Service[2]

[2] RAMSDIS Online Archive, NOAA Satellite and Information Service, review dates: from 20 May to 02 June 2020, available at: *http://rammb.cira.colostate.edu/ramsdis/online/archive.asp?data_folder=tropical/tropical_ge_14km_wv&width=640&height=480*

3 IMPACTS

The Vice-President of Nicaragua, Rosario Murillo reported damage to houses and increased levels of rivers in different municipalities, but there were no casualties due to this adverse weather.

According to information published in the local news[3] [4] an increase in river levels, damaged roads and flooded houses were reported in municipalities in northern Nicaragua. Soil saturation and damage to farmland were also reported. The affected communities include Estelí, El Jícaro and Jalapa.

Figure 4 shows some of the flood damage caused by this adverse weather in Nicaragua.

Figure 4 Flood damage caused by this adverse weather period in Nicaragua – 20 May to 2 June 2020
Sources: *100% Noticias* and *Radio ABC Stereo*

4 RAINFALL MODEL OUTPUTS

All three data sources used by the XSR 2.5 model, CMORPH[5], WRF5 and WRF7[6], simulated the occurrence of precipitation over Nicaragua during the period 19 May – 2 June 2020.

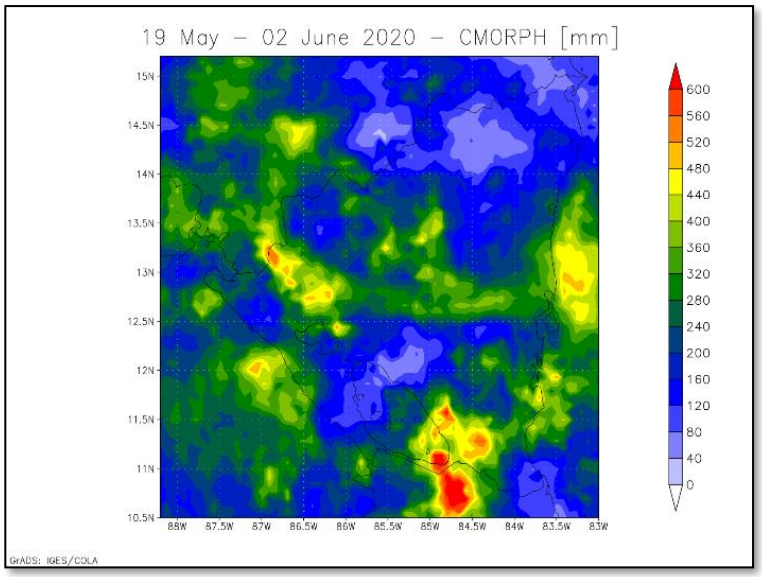
CMORPH reported total accumulated amounts of precipitation higher than 120mm in most of Nicaragua, with maximum values between 440 mm and 640 mm over southern Nicaragua and between 440 mm and 560 mm over the north central highlands.

WRF5 simulated similar values of total accumulated rainfall but with a different spatial pattern compared with CMORPH. Values were greater than 120 mm over the entire country and the

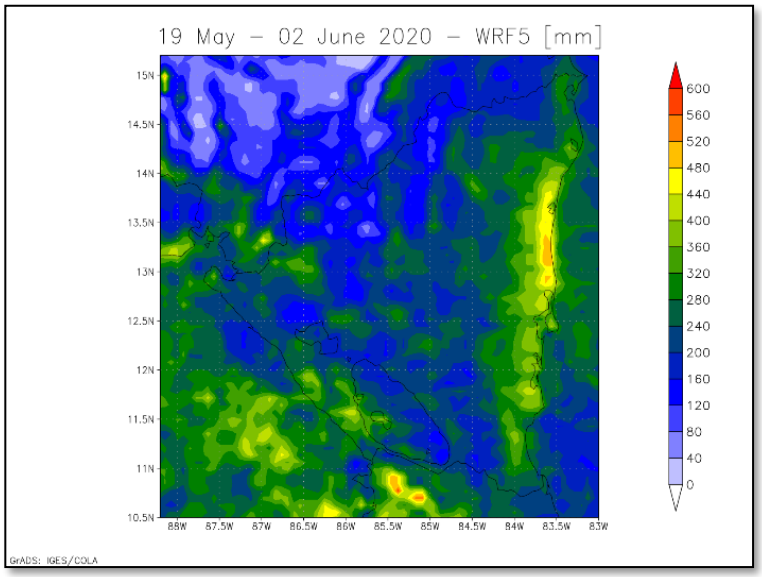
[3] *100% Noticias*, available at: *https://100noticias.com.ni/*
[4] *Radio ABC Stereo*, available at: *http://www.radioabcstereo.com/*
[5] CMORPH Model: the satellite-based rainfall precipitation estimates provided by the NOAA Climate Prediction Center (CPC) using the so-called Morphing Technique *http://www.cpc.ncep.noaa.gov/products/janowiak/cmorph_description.html*. Further details in the Definitions section of this report.
[6] WRF5 and WRF7 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 in the Delfinitions section of this report.

largest values were reported along the Caribbean coast (between 320 mm and 520 mm) and along the southern sector of the Pacific coast (between 280 mm and 400 mm).

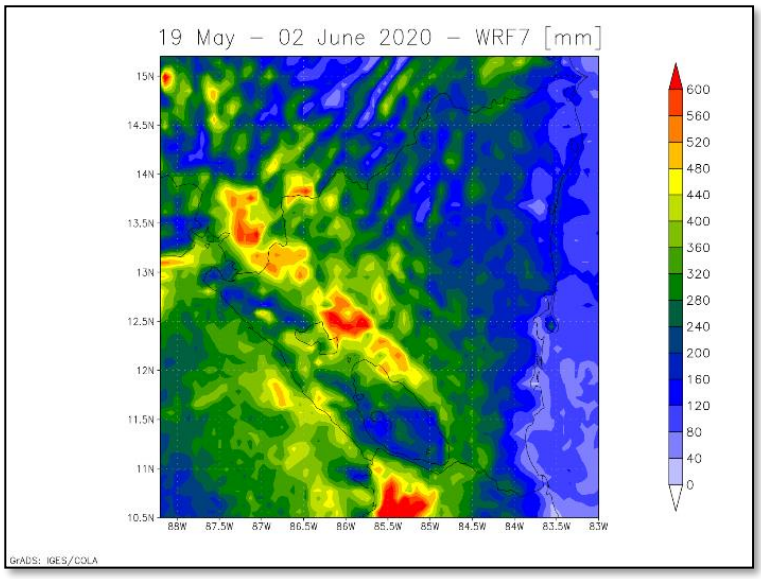
WRF7 showed greater total accumulated precipitation than WRF5 and CMORPH on average over the country (values larger than 200 mm over most of Nicaragua). Also, the maximum precipitation affected more extended areas, and amounts greater than 320 mm and locally reaching 640 mm were reported over the internal highlands.



a) CMORPH



b) WRF5



c) WRF7

Figure 5 Total accumulated precipitation during the period 19 May – 02 June 2020 over Nicaragua estimated by CMORPH (a), WRF5 (b) and WRF7 (c). Source: CCRIF SPC

Daily rainfall maps by CMORPH, WRF5 and WRF7 over the exposure map of XSR 2.5 are not included here; 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/NIC/CARE_7_2019/daily_prec_short.mp4

https://wemap.ccrif.org/OUTPUT/CCRIF/XSR/Events/NIC/CARE_7_2019/daily_prec_long.mp4

The Rainfall Index Loss (RIL) was above the loss threshold for Nicaragua for all of the three data sources used by XSR2.5: CMORPH, WRF5 and WRF7. The RIL was higher for WRF7 due to the large amounts of accumulated precipitation presented by WRF7 over the Pacific lowlands, an area characterized by high exposure.

The final RIL (RIL_{FINAL}) was calculated as the average of the RILs from the three data sources . 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 Nicaragua's Excess Rainfall policy and thus did not trigger a policy payout.

5 TRIGGER POTENTIAL

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

CCRIF expresses empathy with the Government and people of Nicaragua for the impacts on communities caused by this adverse weather.

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.