



OFICINA NACIONAL DE METEOROLOGIA

Establishment of a Flash Flood Guidance System for Haiti and Dominican Republic

7-9 September 2016, Santo Domingo, Dominican
Republic

Presenter:

Wagner E. Rivera
Forecaster Assistant

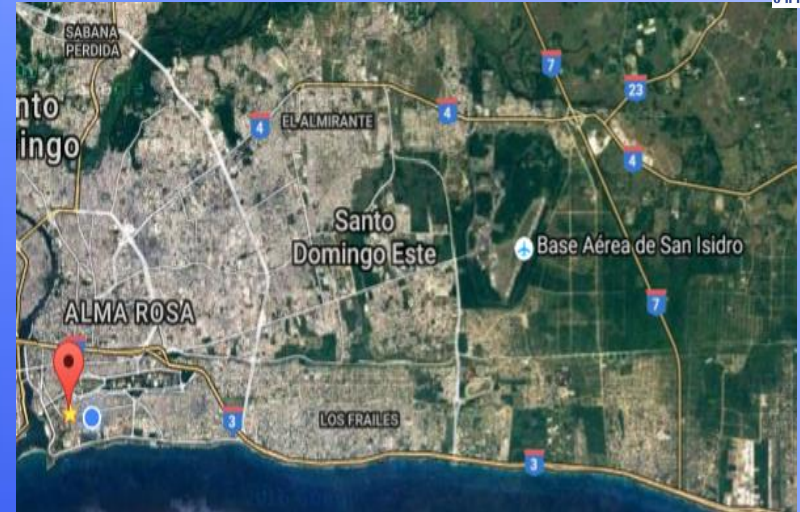
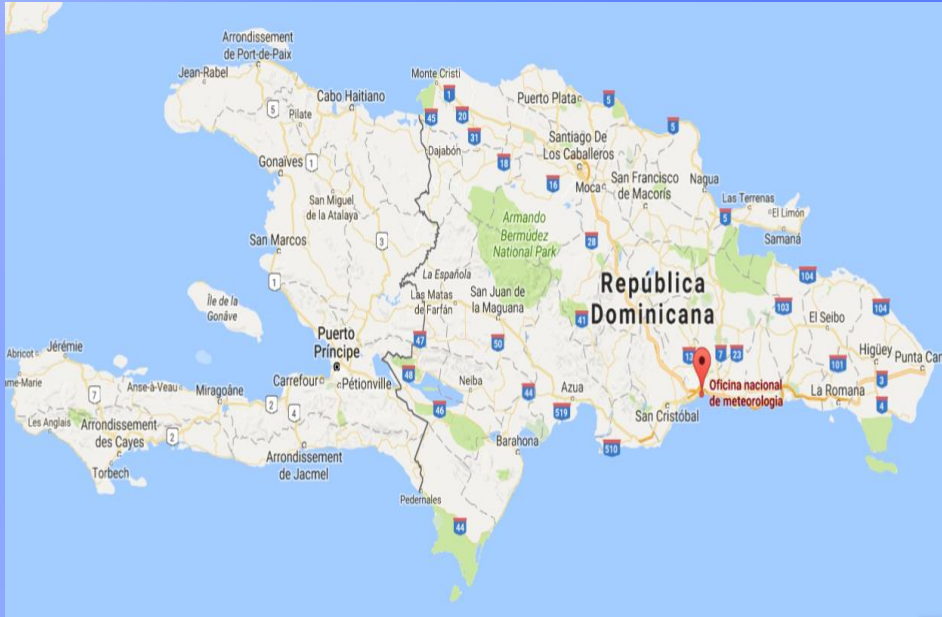


This presentation was made with the help of Ing. Miguel Campusano, the technicians Julio Ordoñez and Miriam Matos.

Introducing The Weather Service



Dominican Republic, together with Haiti, is located in the second largest island in the Greater Antilles. In the island's center we have El Pico Duarte Mountain reaching 3,175 mts of height.



The weather service's main office is located in Santo Domingo, on the southern part of the island.



We have four sub forecast center divided by regions: Santiago, El Catey, Punta Cana and Barahona. they make their own regional forecasts.



In 1954, with the international air flights, the weather service was introduced in the Dominican Republic and the first professional group was trained.

The Tools Of The Weather Service



Mapa Modificado

**RED ESTACIONES
AUTOMATICAS
ONAMET**

**DEPARTAMENTO DE CLIMATOLOGIA
División de Cómputos**

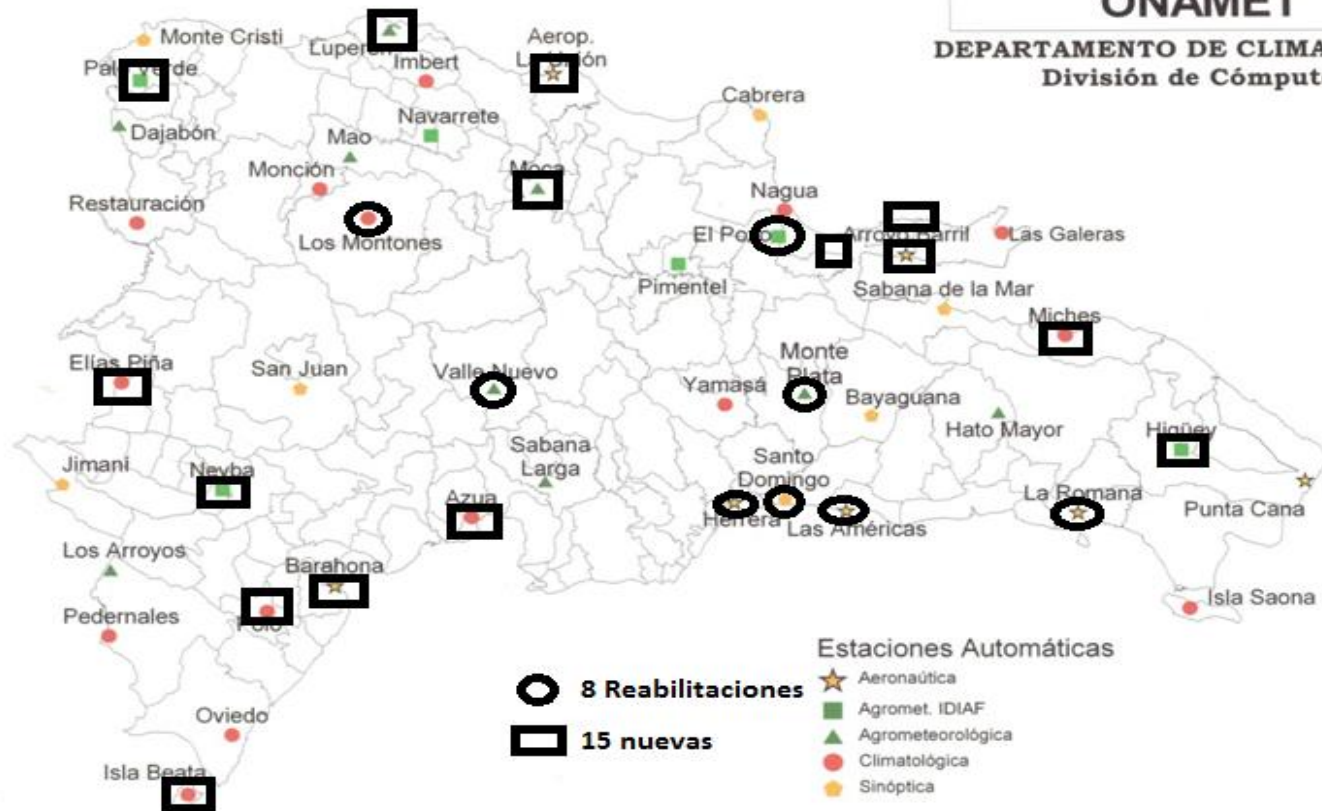


Fig.1.- Mapa de la red de Estaciones Meteorológicas Automáticas

Map marking the location of automatic stations.



We have two Radars. One Doppler in Punta Cana, with a range of around 300 km. The other one is on the capital city, Santo Domingo, but is out of order since 1990. Therefore there is not total coverage of the west part. Efforts are being in process to install one on the North West, to be able to provide support to Haiti.

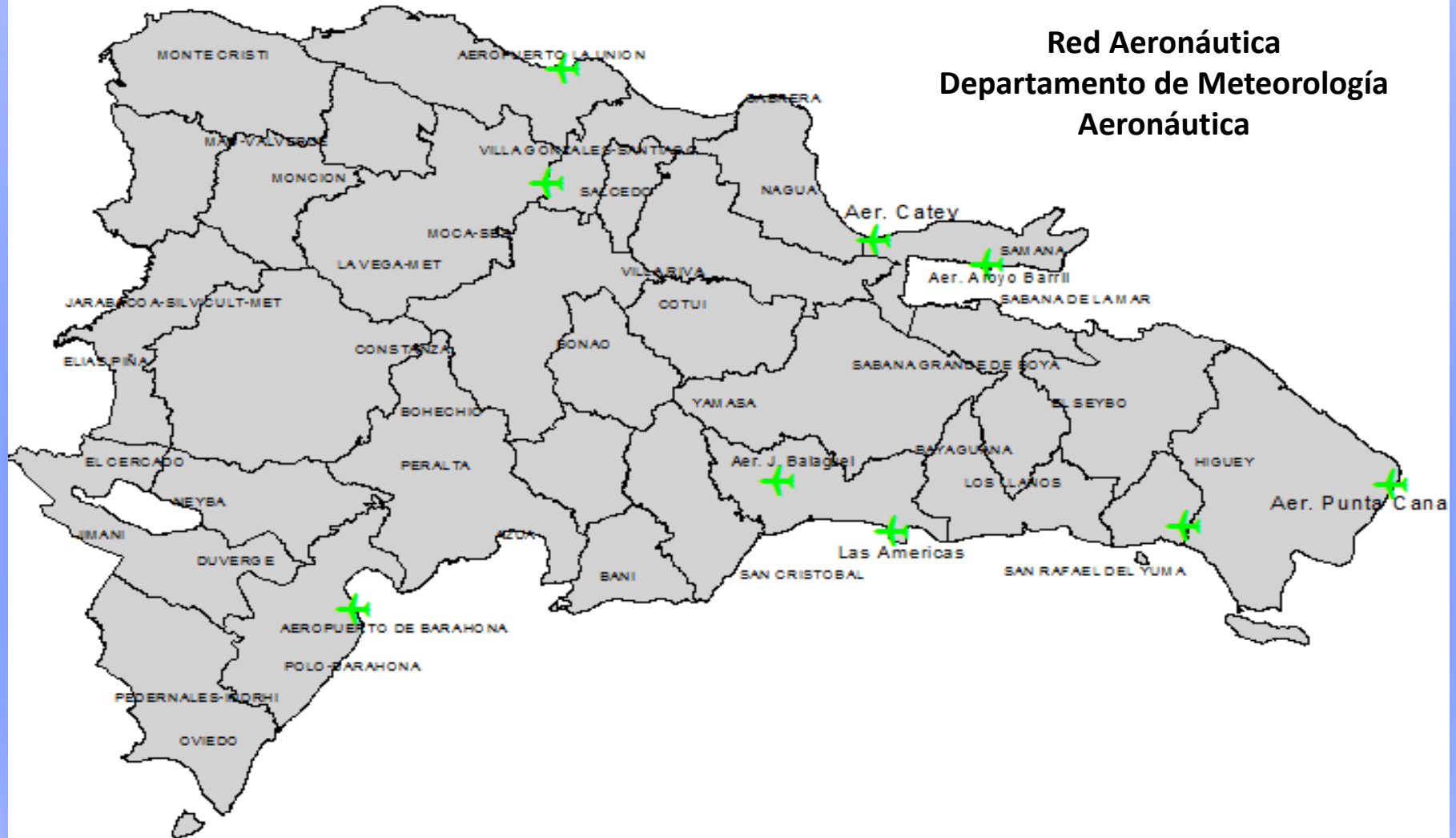


Radar dome of Punta Cana in the eastern corner of the country... Operated by the weather service, but have more than 5 years out of services .



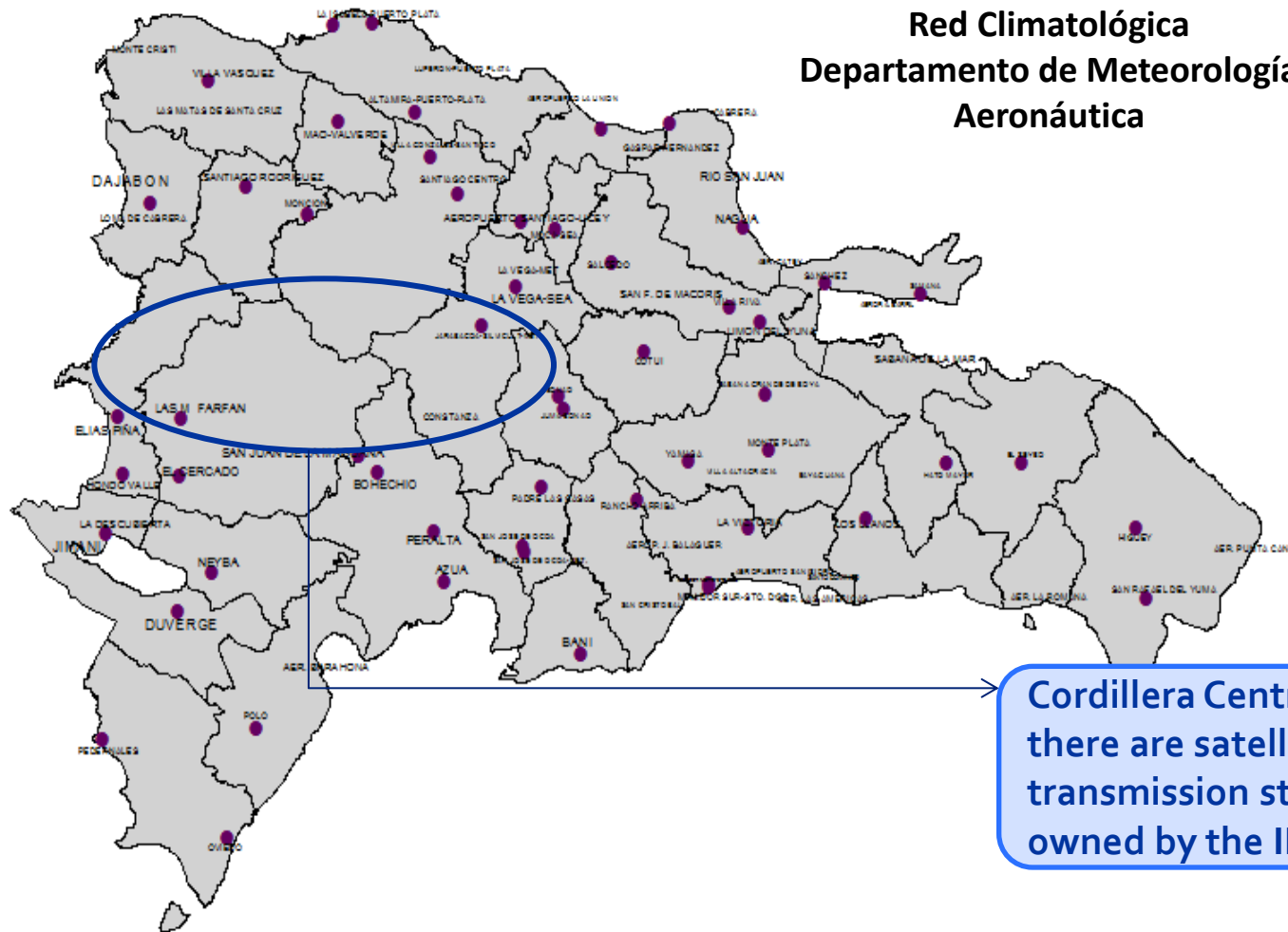
There is an atmosphere sounding station with daily launches. During the hurricane season there are two, one in the morning and other at night.

Red Aeronáutica Departamento de Meteorología Aeronáutica



We have nine Airports: They do Aeronautical observation every hour and synoptically every three.

Red Climatológica Departamento de Meteorología Aeronáutica



**Cordillera Central,
there are satellite
transmission stations
owned by the INDRHI**

Basic network of Synoptic, aeronautic, Agrometeorologic and Climatologic observations, automatic stations and volunteer observers. There are also agreements with various private institutions that make observations.

OTHER TOOLS

Smart Met: Is a tool for viewing and editing meteorological data

Numerical Prediction Models at global and limited scale: GFS, NGM, MM5, WINDGRIDDS and UKMET.

Daily reports of Civil Defense volunteers via Radio.

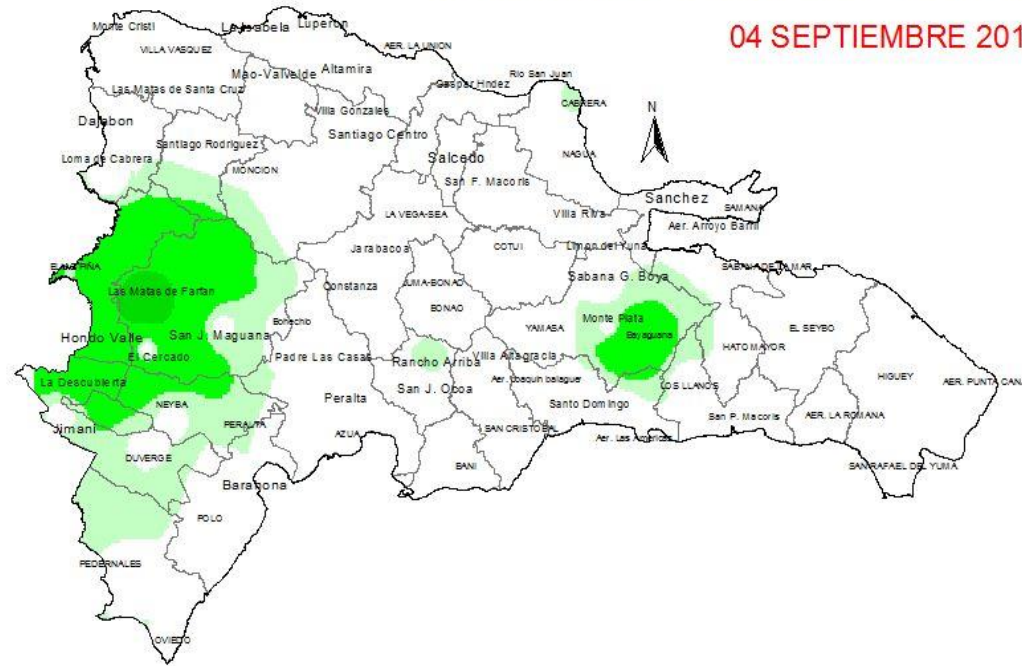
Some Products Of The Weather Service

OFICINA NACIONAL DE METEOROLOGIA
 Departamento de Meteorología Operativa
 División de Hidrometeorología



LLUVIAS ACUMULADAS EN MILIMETROS (24 Horas)

04 SEPTIEMBRE 2016



Hydrometeorological division prepares a daily rainfall accumulated. Eases the issue of alert for warnings, floods and landslides.



OFICINA NACIONAL DE METEOROLOGIA
DEPARTAMENTO DE METEOROLOGIA GENERAL
División de Meteorología Sinóptica y Pronósticos
INFORME DEL TIEMPO



Miércoles 24 de agosto de 2016 a las 6:00 a.m. válido hasta el viernes 26 de agosto de 2016 a las 6:00 a. m.

AGUACEROS, TORMENTAS ELECTRICAS Y RAFAGAS DE VIENTO POR EFECTO DE LA ONDA TROPICAL

El área del Caribe oriental amanece siendo afectada por una activa onda tropical asociada a una baja presión, la misma está generando aguaceros, tormentas eléctricas y ráfagas de viento, dicho evento hidrometeorológico se mueve hacia el oeste manteniendo un potencial de 50% probabilidad de convertirse en ciclón tropical durante las próximas 48 horas.

La actividad lluviosa asociada a esta onda tropical comenzará a afectar el país desde esta tarde, debido a la incursión de campos nubosos que irán penetrando el territorio por la zona este y propagándose de forma gradual a otros puntos del país, dejando a su paso aguaceros con tormentas eléctricas y ráfagas de viento. Esta actividad continuará ocurriendo durante la noche.

Para el jueves, se espera que la onda tropical mantenga su centro de baja presión en agua del Atlántico Norte muy próximo al territorio nacional, sin embargo, los campos nubosos asociados a la misma seguirán originando aguaceros de moderados a fuerte con tormentas eléctricas, ráfagas de viento sobre las regiones noreste, este, cordillera Central y la línea noroeste, así como también en algunos puntos del valle del Cibao Central. Para el viernes la onda habrá salido del territorio pero quedará una vaguada asociada al evento que continuará generando aguaceros al combinarse con los efectos locales.

Debido al incremento de las lluvias que se esperan la Oficina Nacional de Meteorología (ONAMET), mantiene un alerta meteorológica de inundaciones repentinas y deslizamiento de tierra hacia las provincias: La Altagracia, Hato Mayor, El Seibo, Duarte, María Trinidad Sánchez, Puerto Plata, Monte Plata, también emite un alerta meteorológico contra inundaciones urbanas para San Cristóbal y gran Santo Domingo. Por otro lado, se restringe la navegación a las frágiles, pequeñas y medianas embarcaciones en toda la costa norte y el Canal de la Mona debido a oleaje peligroso.

National Weather Service performs three weather reports daily at 6:00 am , at 1:00 pm and the last at 6:00 pm. when a weather system expected to produce significant cumulative rainfall , we include a special paragraph with a meteorological alert against flash floods on vulnerable areas .

OFICINA NACIONAL DE METEOROLOGÍA
DEPARTAMENTO DE METEOROLOGIA GENERAL
División de Meteorología Sinóptica y Pronósticos

BOLETÍN ESPECIAL PARA EL COE

MIÉRCOLES 24 DE AGOSTO DE 2016..... A LAS 11:00 A.M.

SITUACION ACTUAL:

Las condiciones del tiempo sobre el país, estarán dominadas por un aumento significativo de la nubosidad acompañados de aguaceros y tronadas así como ráfagas de viento principalmente en horas de la tarde y la noche, especialmente hacia las provincias: La Altagracia, San Pedro de Macorís, Hato Mayor, La Romana, Sánchez Ramírez, Monte Plata, Monseñor Nouel, La Vega, San Juan, Santiago, Puerto Plata, Elías Piña y el gran Santo Domingo. Estas precipitaciones serán causadas por el acercamiento de la activa onda tropical.

Debido a las lluvias que se esperan a partir de la tarde de hoy y el jueves, **La Oficina Nacional de Meteorología (ONAMET)**, mantiene el **ALERTA METEOROLOGICA** por inundaciones repentinas y deslizamientos de tierra así como ráfagas de viento hacia las provincias: La Altagracia, Hato Mayor, La Romana, San Pedro de Macorís, El Seibó, Duarte, María Trinidad Sánchez, Puerto Plata, Monte Plata, también mantiene un alerta meteorológica por inundaciones urbanas para San Cristóbal y el gran Santo Domingo.

PRONOSTICO PARA LAS PRÓXIMAS 24 A 48 HORAS:

A partir de esta tarde, continuarán las precipitaciones con tormentas eléctricas y ráfagas de viento en ocasiones, debido a la activa onda tropical asociada a un sistema de baja presión, que está entrando en aguas del mar Caribe, concentrándose las lluvias más intensas hacia las regiones sureste, noreste, norte, noroeste y la cordillera Central y extendiéndose gradualmente al resto del territorio.

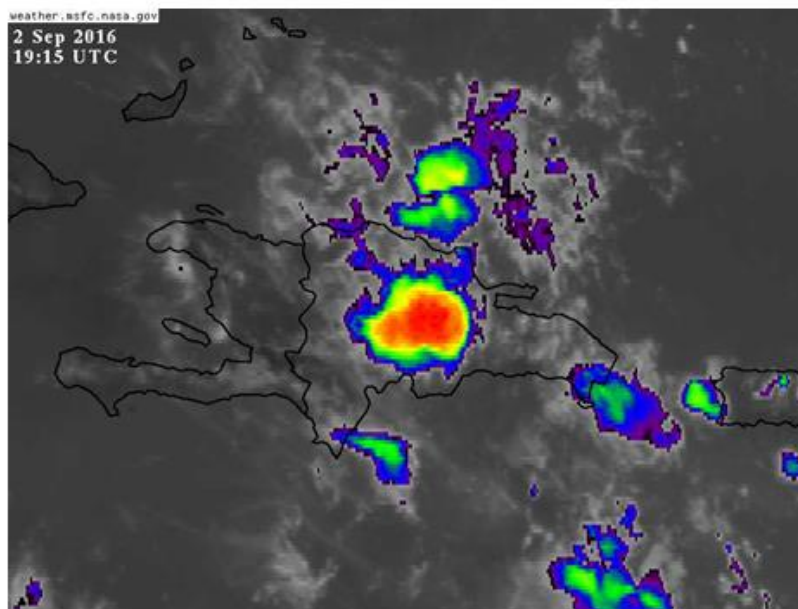
Análisis de pronósticos de lluvias acumuladas en 24 horas presentan valores entre 10 y 70 milímetros pudiendo ser superiores en puntos aislados.

PRONOSTICO EXTENDIDO ENTRE 72 A 120 HORAS:

La activa onda tropical estará incidiendo sobre el país y continuara provocando aguaceros con tormentas

The national Forecast center do a Special newsletter for Emergency Operation Center (COE). Two bulletins are issued daily, the first at eleven a.m and the second at four p.m. These bulletins describes the forecasts between the next 24 to 48 hours, and finally the expected between 72 and 120 hours. In those periods of time includes the expected amount of precipitation based on use of numerical models

BOLETIN INFORMATIVO DE MUY CORTO PLAZO
02 DE SEPTIEMBRE DE 2016
VALIDEZ DESDE LAS 3:20 P.M. HASTA LAS 06:20 P.M.
PRONOSTICO DE MUY CORTO PLAZO NO. 1



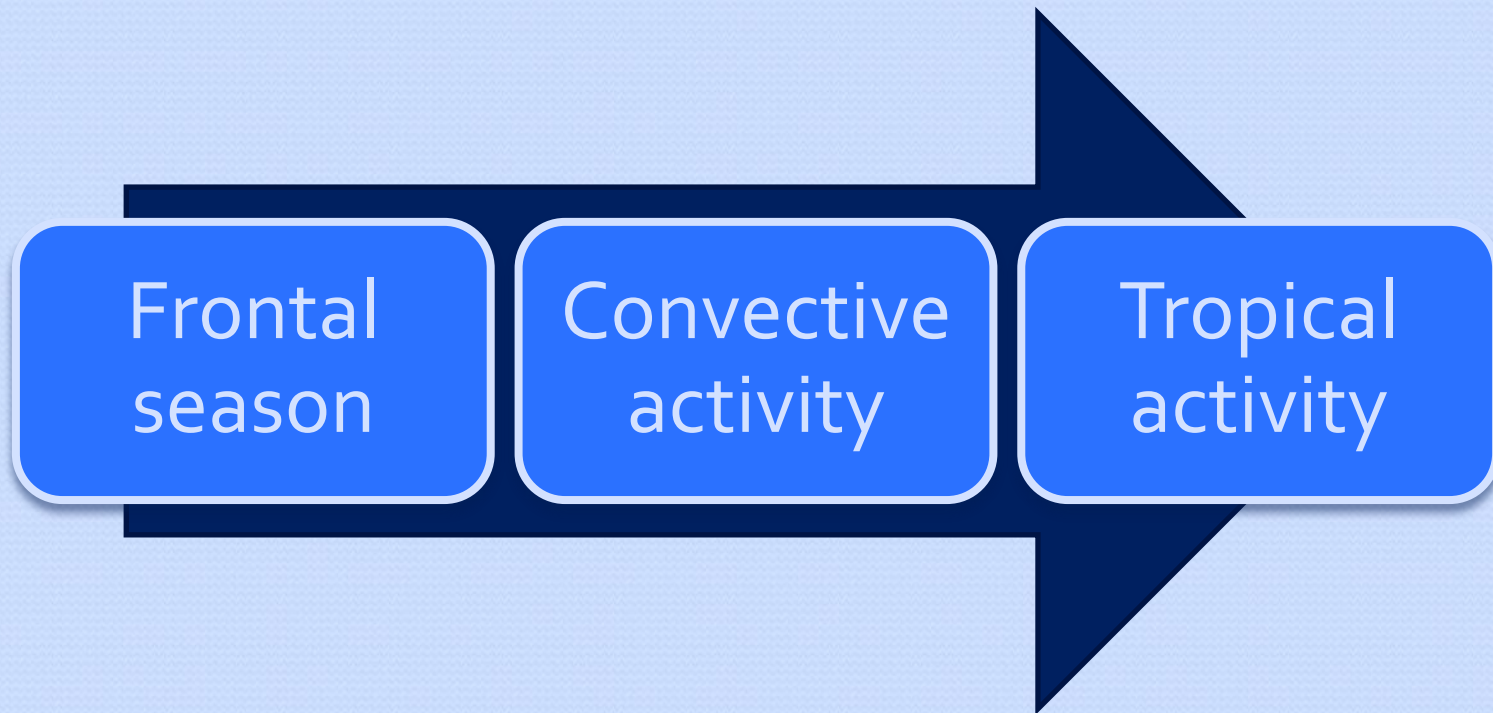
Las imágenes del satélite meteorológicos muestran incrementos nubosos, los cuales están generando aguaceros con tormentas eléctricas y posibles ráfagas de vientos, sobre las provincias Monte Plata, Monseñor Nouel, Sánchez Ramírez y La Vega. Esta actividad de aguaceros podría extenderse en el transcurso de la tarde hacia otras provincias cercanas.

Las instituciones de protección civil deben darle seguimiento a las informaciones que emite esta ONAMET.

A newsletter very short term is done when local convective conditions that have the potential to generate flash floods occur, we follow through satellite images . These bulletins are made with a validation of three hours.

Annual climate performance of the Dominican Republic

SEASONS

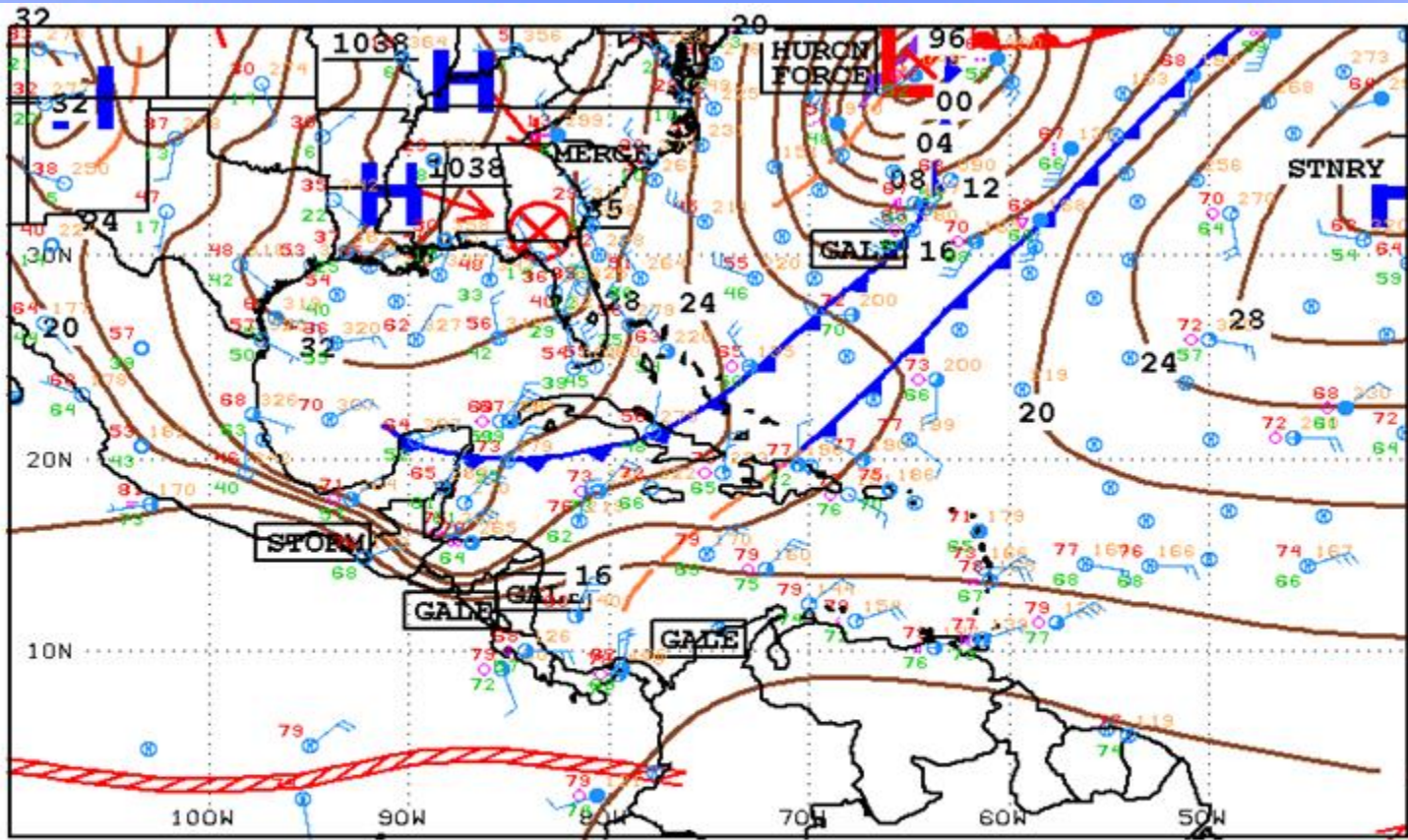


Frontal Season

FRONTAL SEASON

- The frontal season in Dominican Republic includes the months from November to April.
- The more frequent are those that cross the meridian of the country, statistically 4 to 5 systems cross as cold front, the rest pass near the north coast but as a weak system. The migratory anticyclons produce occasionally temperature drops.
- The season coincides with the drought at the SW and W of the country, this drought could become severe if there is El Niño at the Ecuatorial Pacific.
- Last year Dominican Republic had a strong drought that caused high impact in the water supply for the population.

Cold Front Models Effectiveness



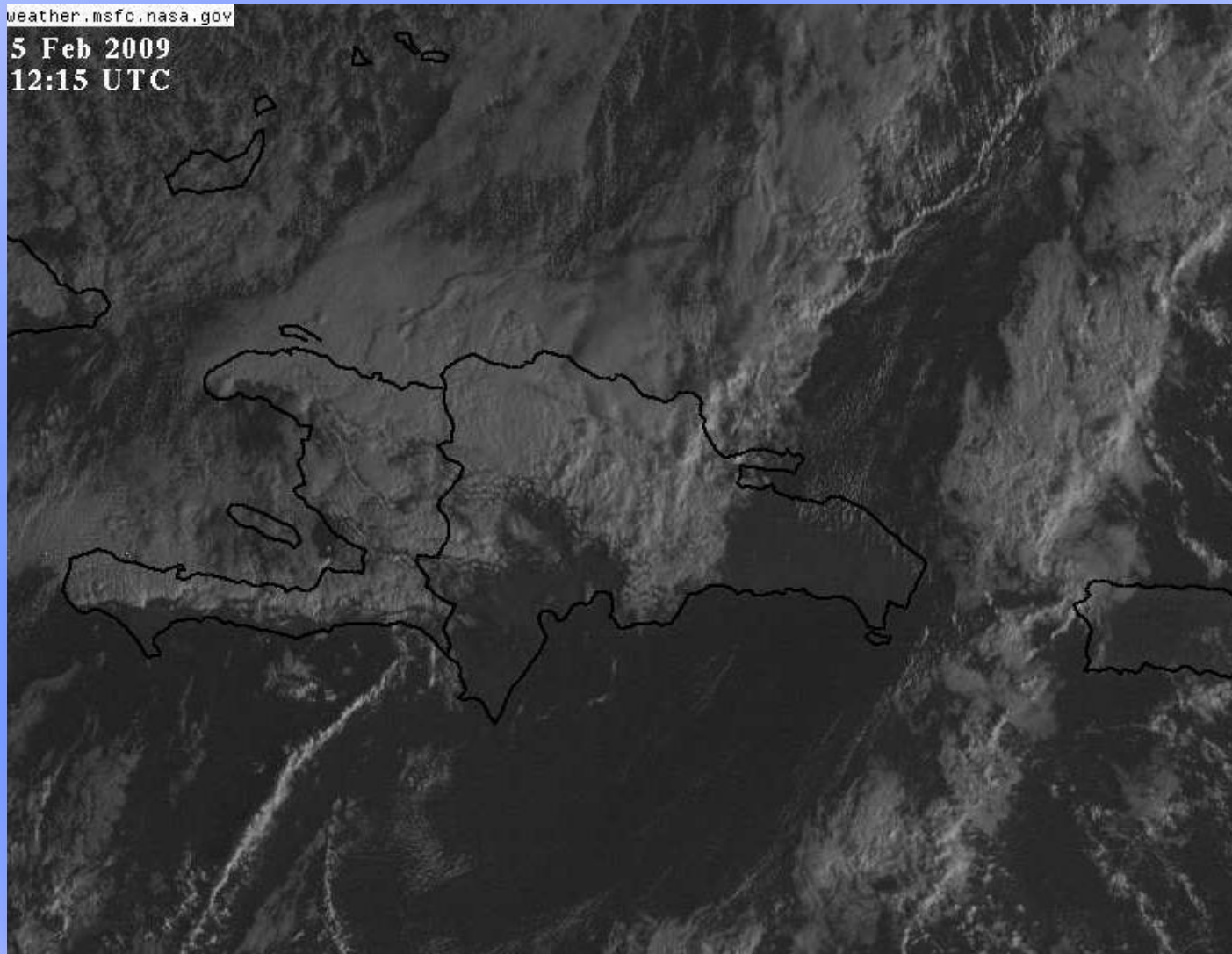
06Z SOUTHWEST NORTH ATLANTIC SFC ANALYSIS
 ISSUED: Thu Feb 5 08:51:18 UTC 2009
 THUNDERSTORMS: SCALLOP LINES

TROPICAL PREDICTION CENTER
 MIAMI, FLORIDA
 BY TAFB ANALYST: RJW
 COLLABORATING CENTERS: TPC OPC HPC

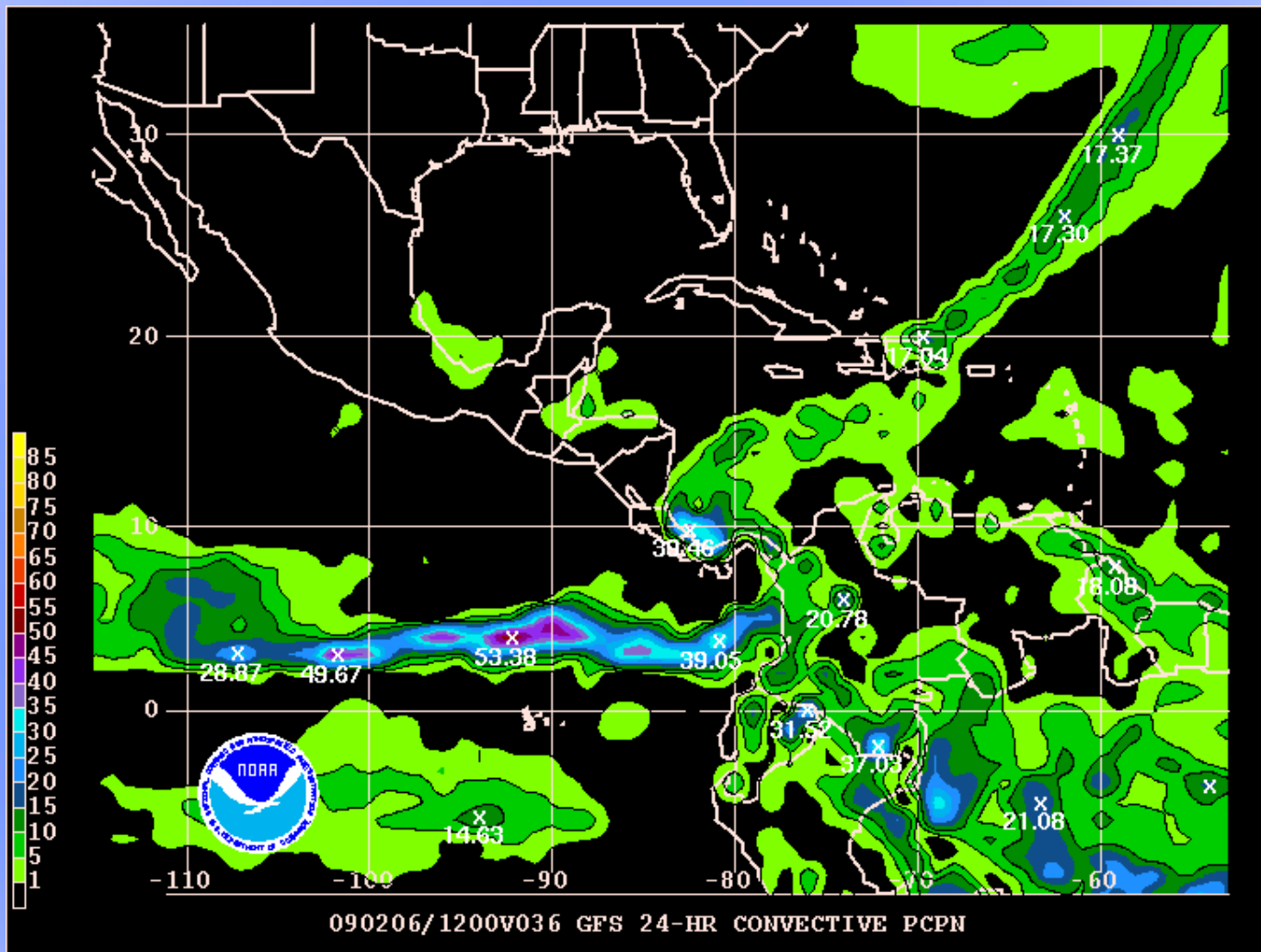
Two frontal systems... one over eastern Cuba and other over the northwest of Dominican Republic

weather.msfc.nasa.gov

5 Feb 2009
12:15 UTC



IR image shows progress on cloudiness at center, north and northwest. Thursday february 5. At 12:15 UTC.



Within 36 hours, the maximum accumulated values were expected at the north.

Convective Activity

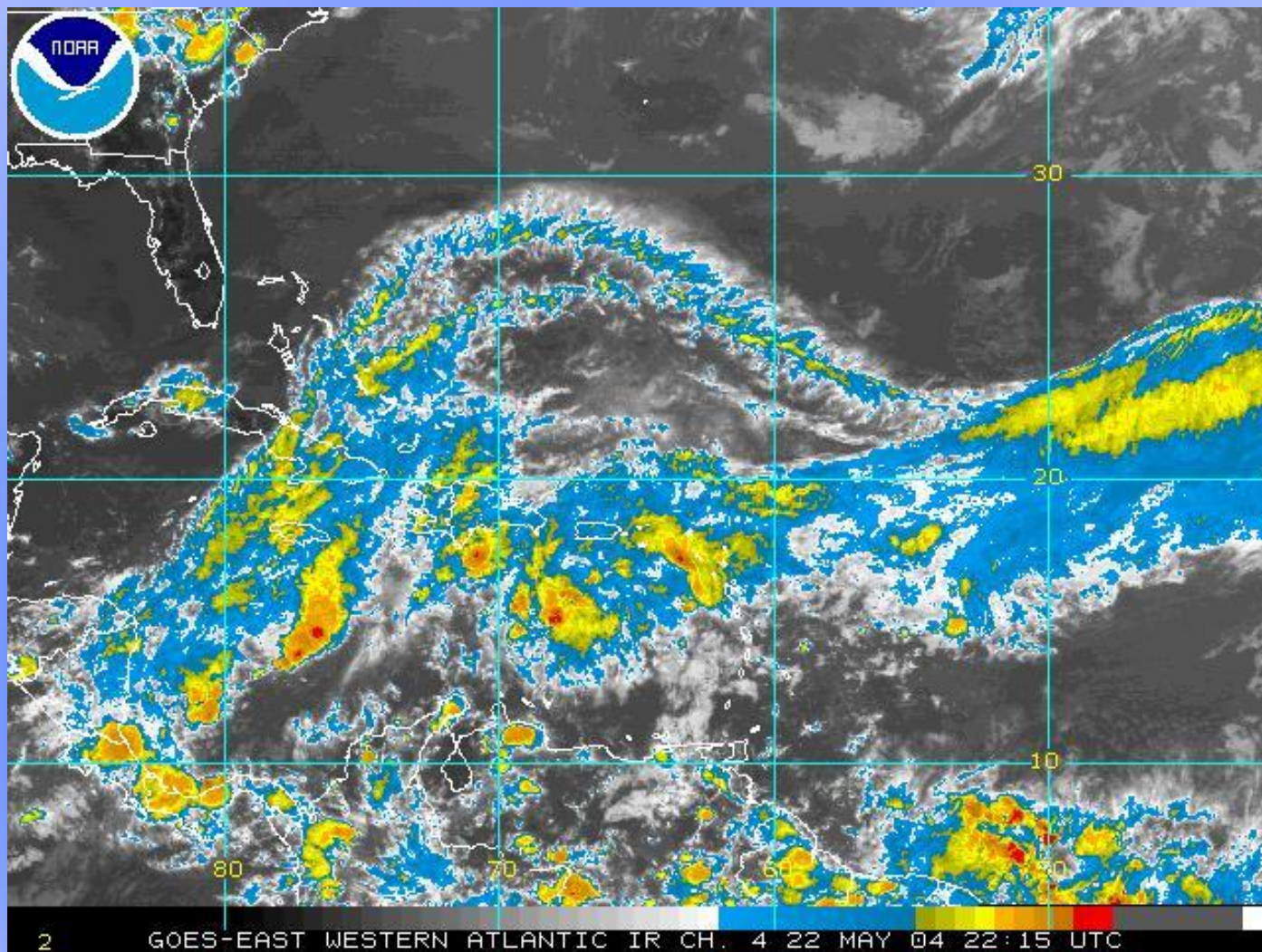
During this period our country receives greater precipitation of large Mesoscale Convective Complexes (MCC), which emerge from the Intertropical Convergence Zone (ITCZ), which has seen very active during this time. The major contribution of rain is observed in the regions, NE, SW and the southern part of the Western Region. In May some tropical waves moving through Dominican Republic Meridian, but the axis is located below 13 degrees latitude north.

Also, some low pressures in the mid level affect to Dominican Republic generating showers and thunderstorms in the afternoon and first hours in the night

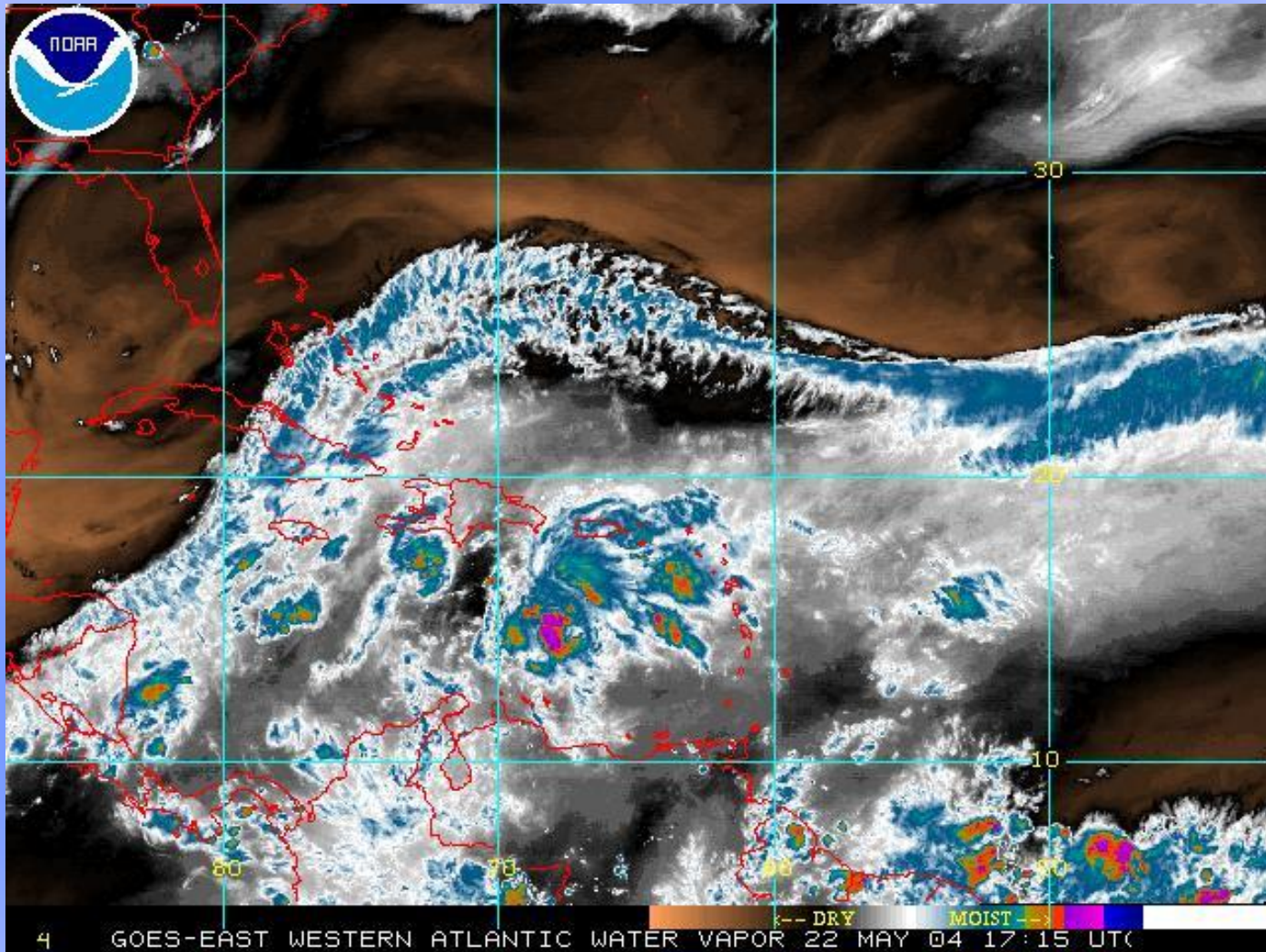
SOME SAMPLES

Floods in Jimani

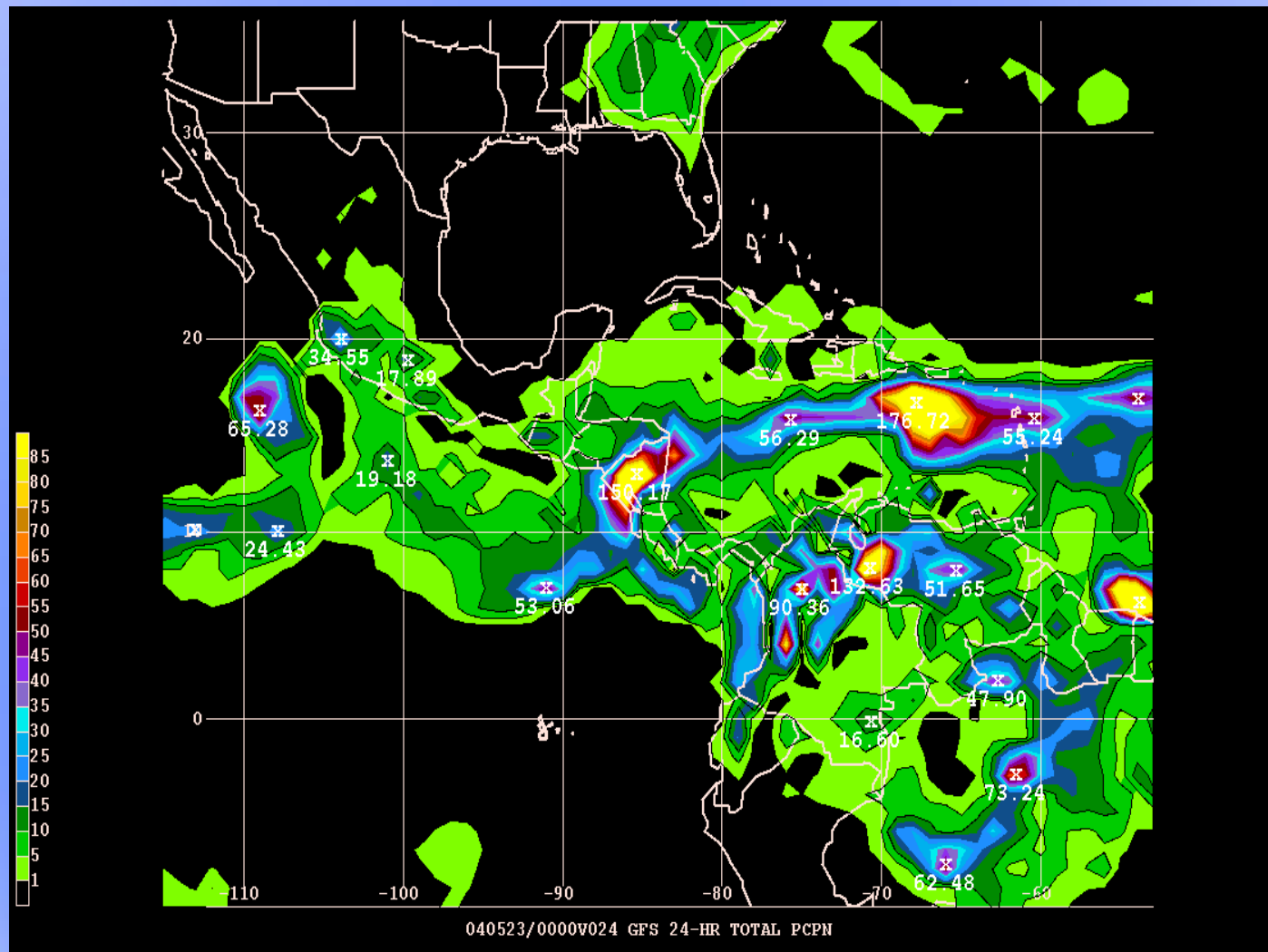
May 2004



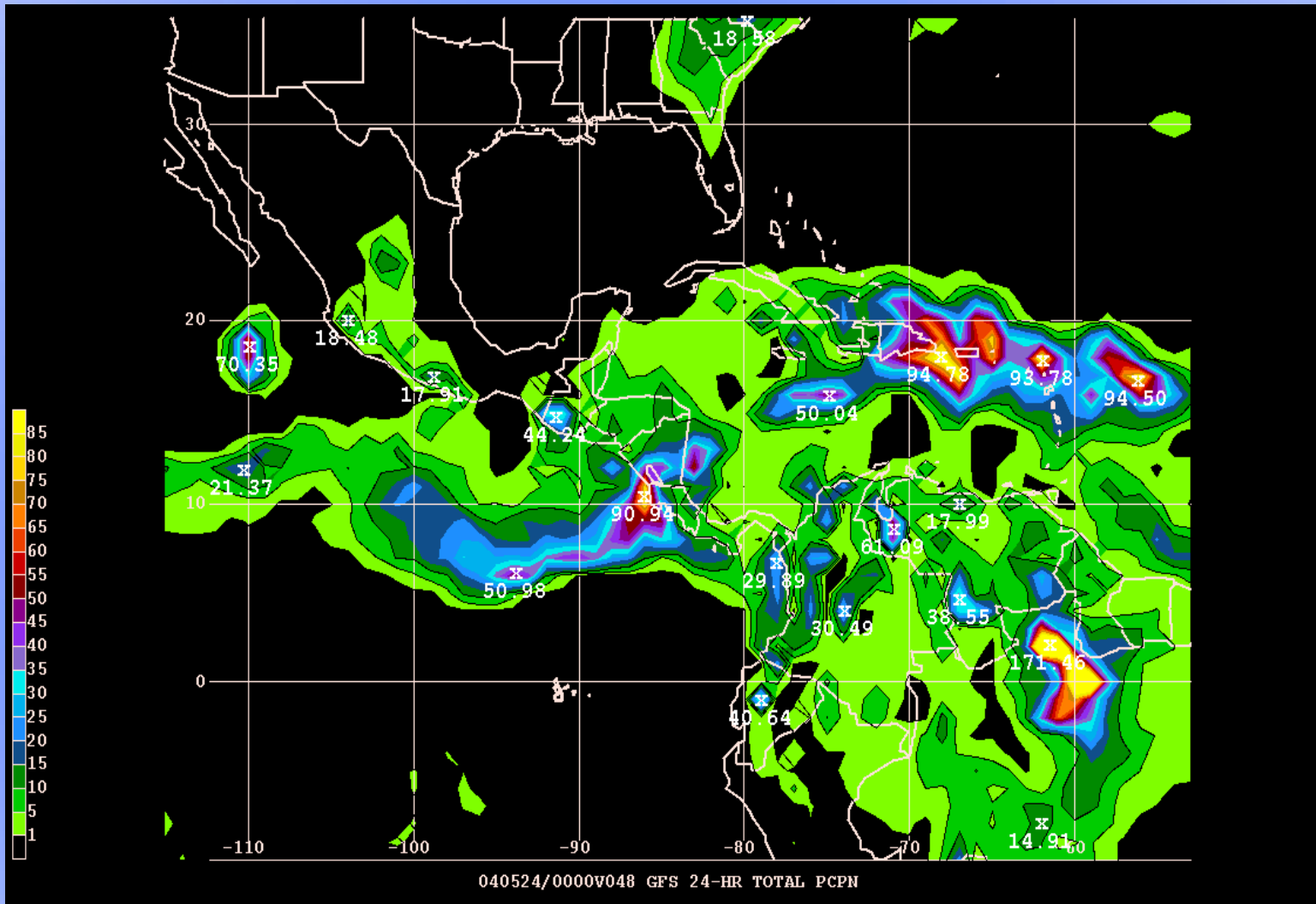
Satellite image showed rain shower and isolated thunderstorms activities on western pacific, moving towards northeast.



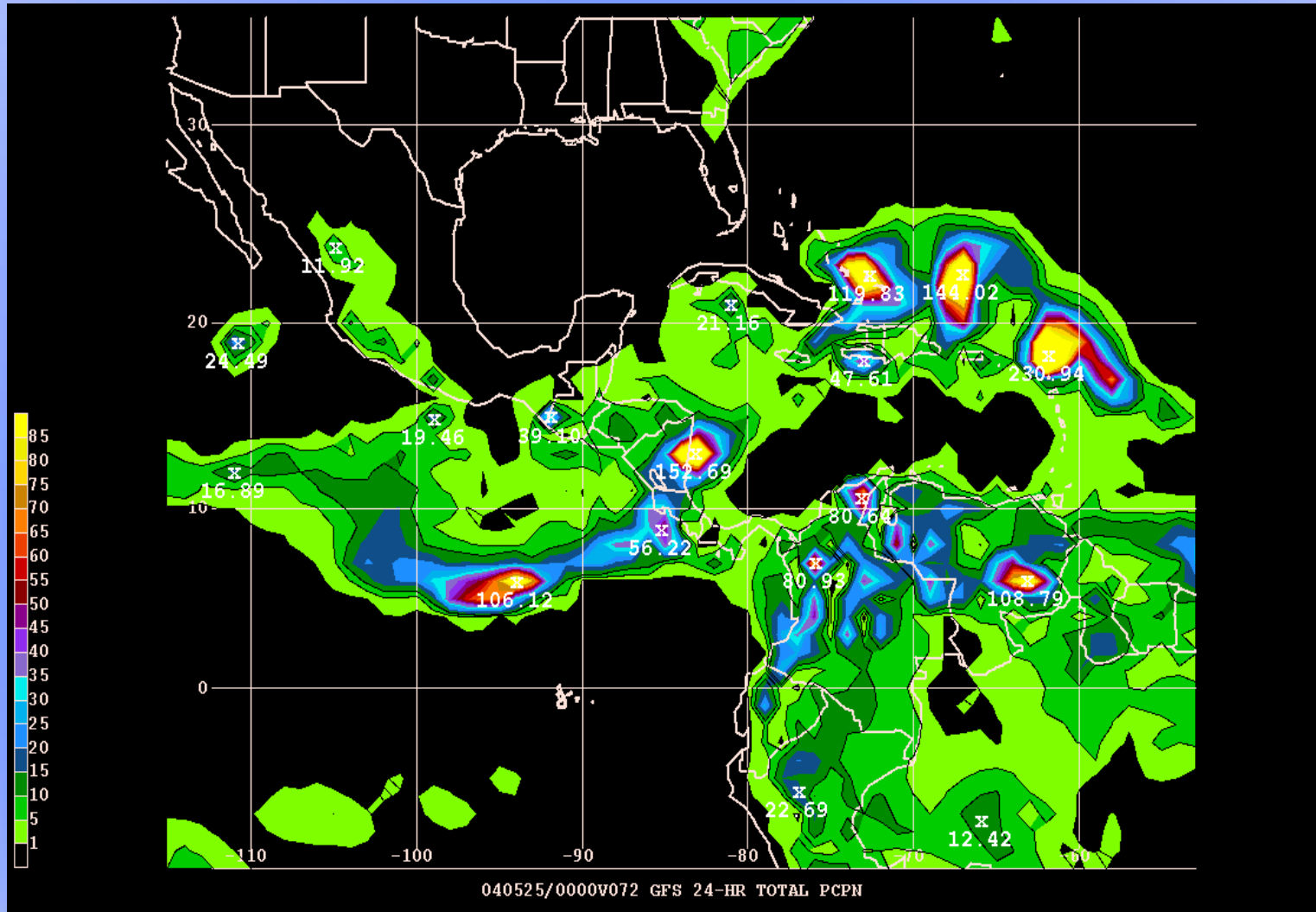
Water vapor image, showed high humidity on the Caribbean area.



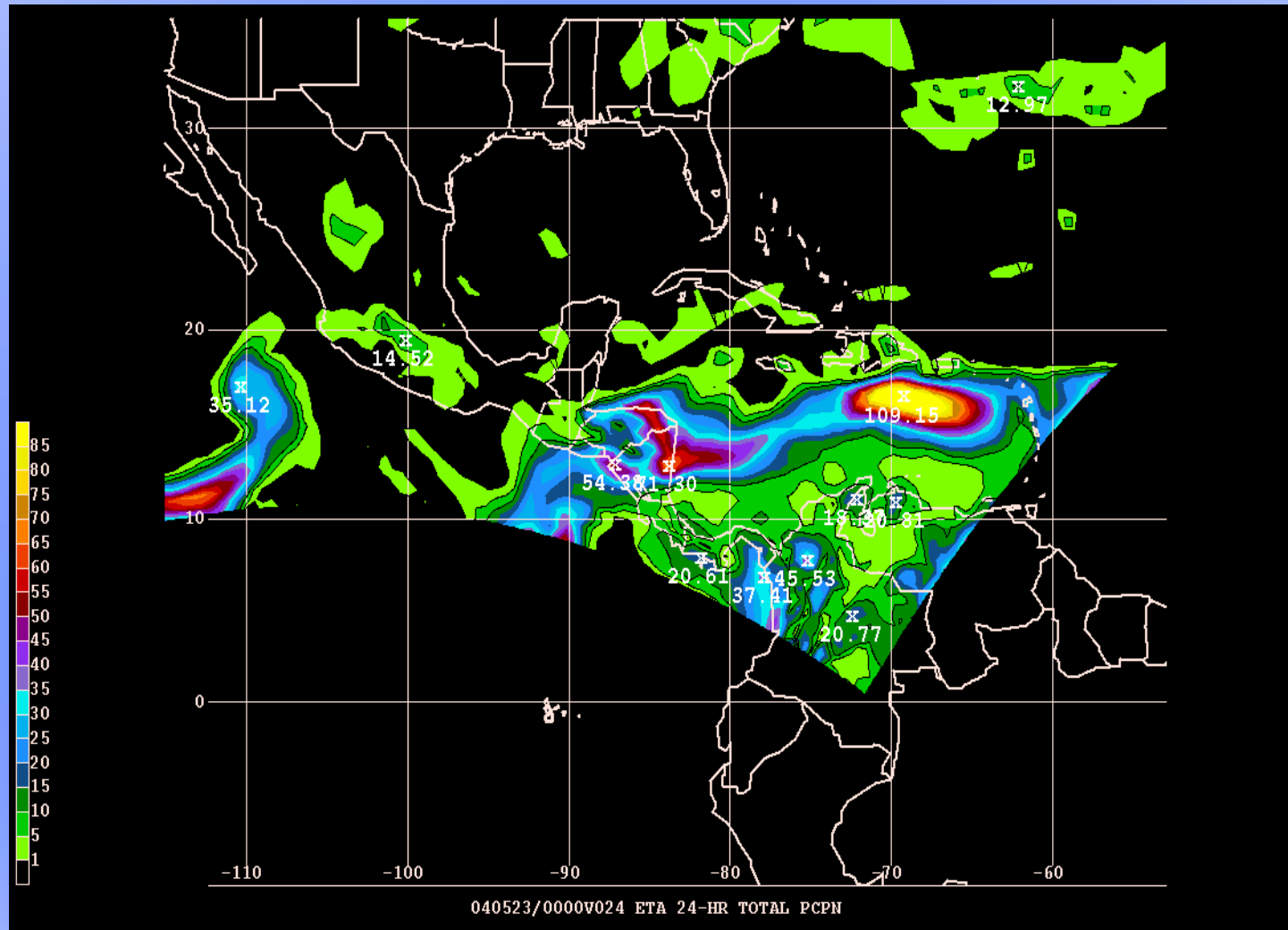
GFS model forecast, showed 176 accumulated mm, at south of the country.



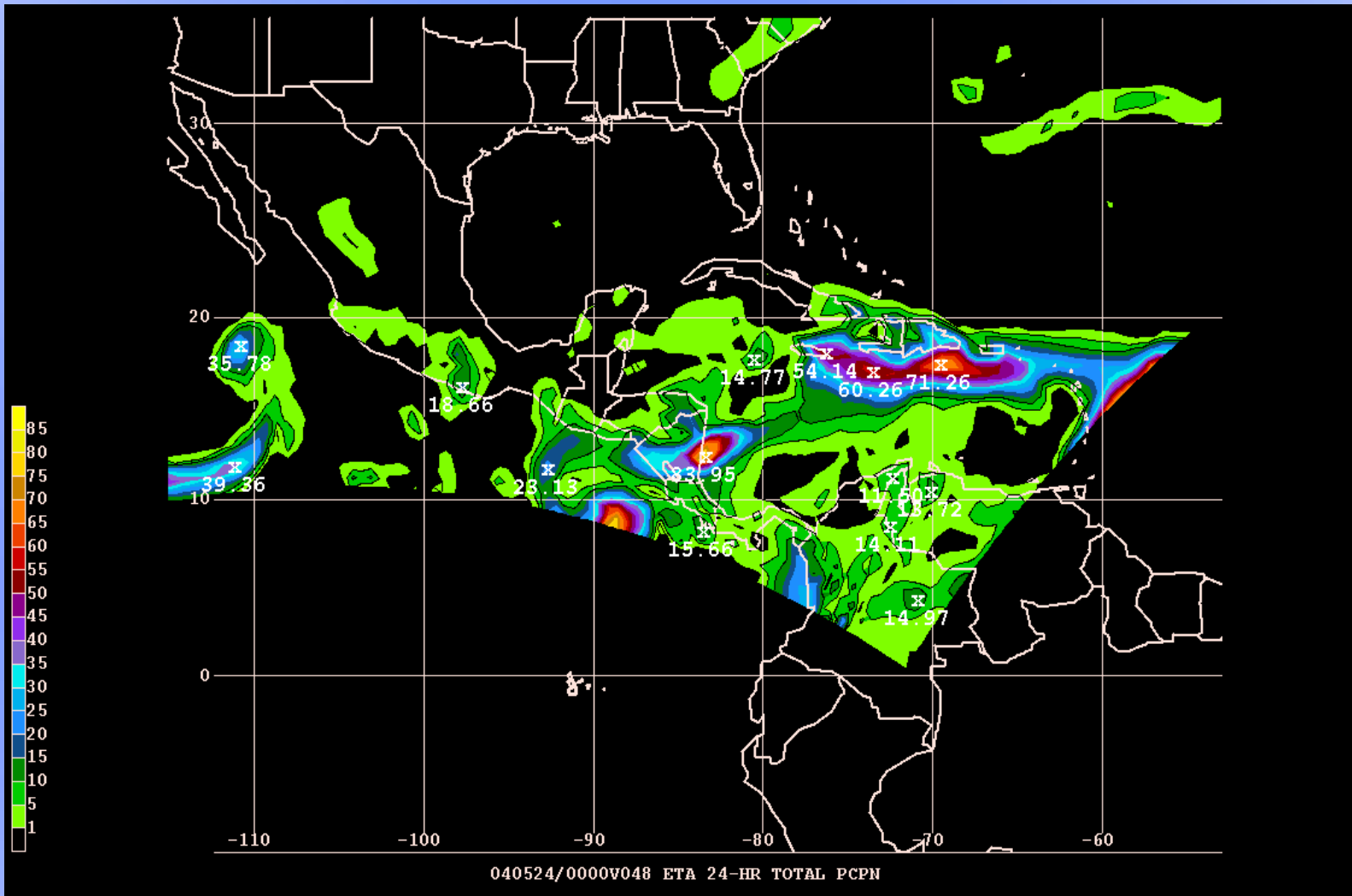
In 48 hours, a GFS showed the maximum rainfall at the center and east.



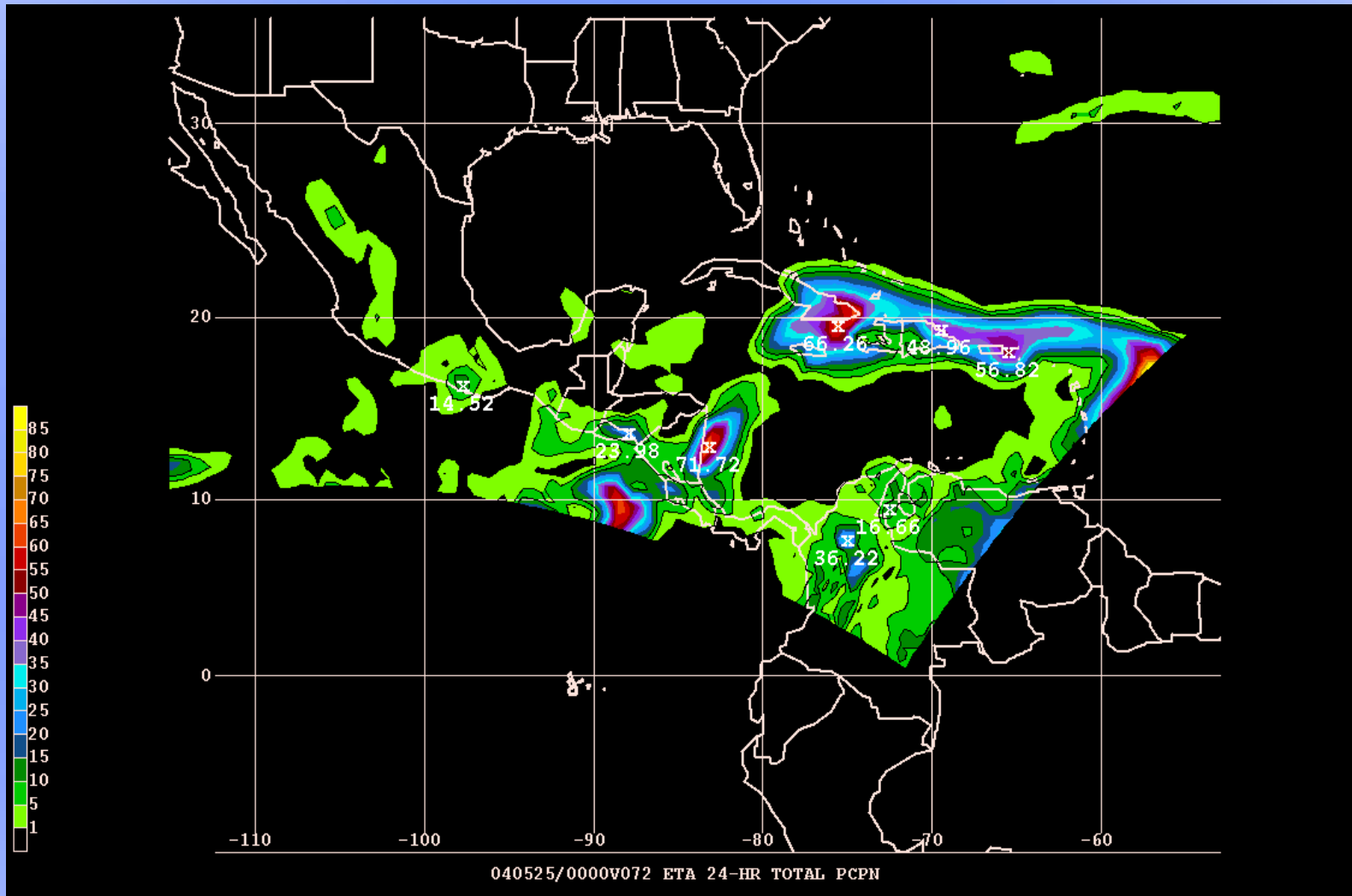
In 72 hours, the GFS, showed the maximum rainfall at north area.



The ETA model in 24 hours, presented a maximum rainfall at the south.



The ETA model in 48 hours, with the highest activity at south, some at the east.



At 72 hours, ETA showed a maximum towards eastern Cuba and the Mona Channel.

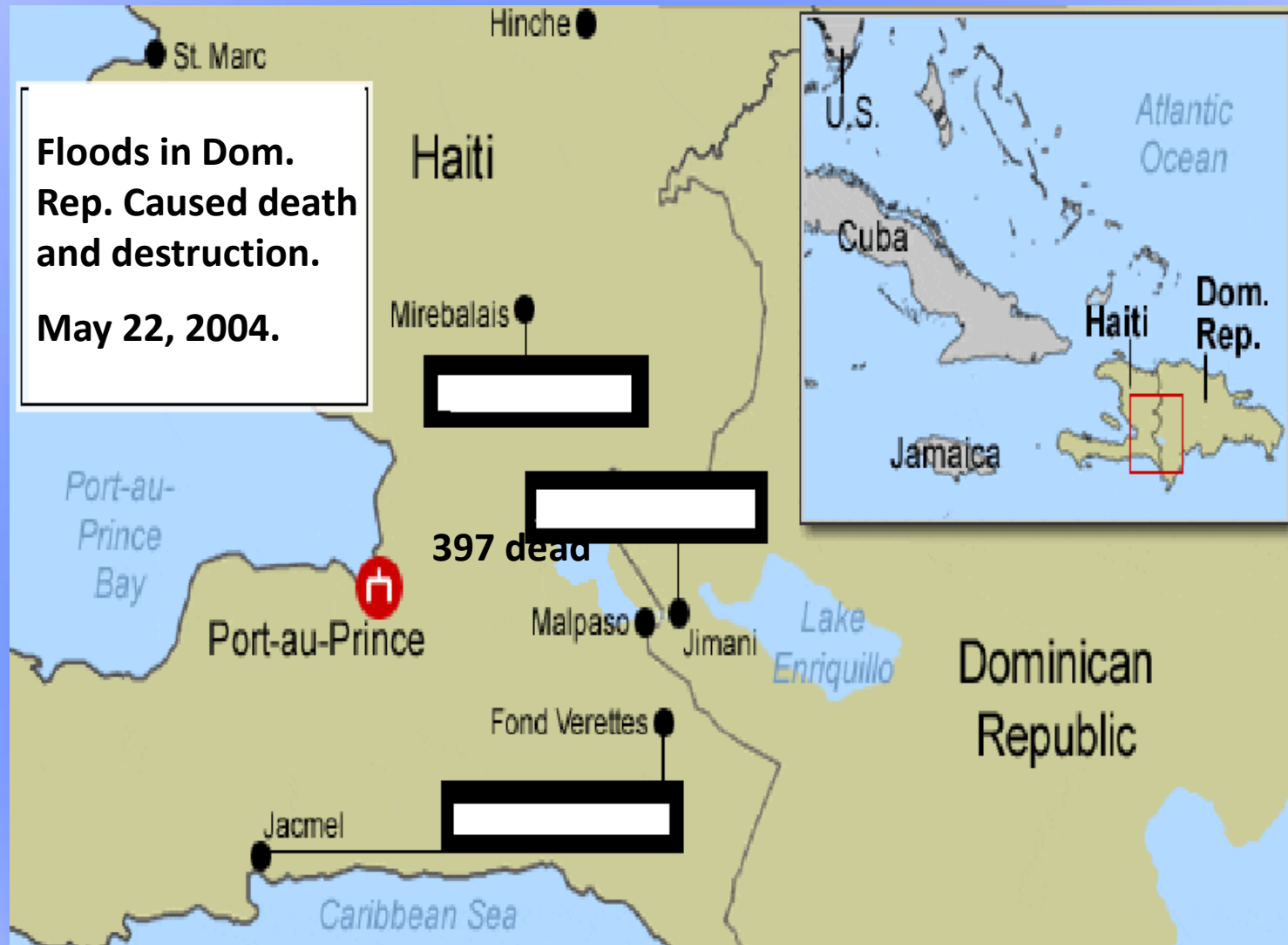
The Consequences



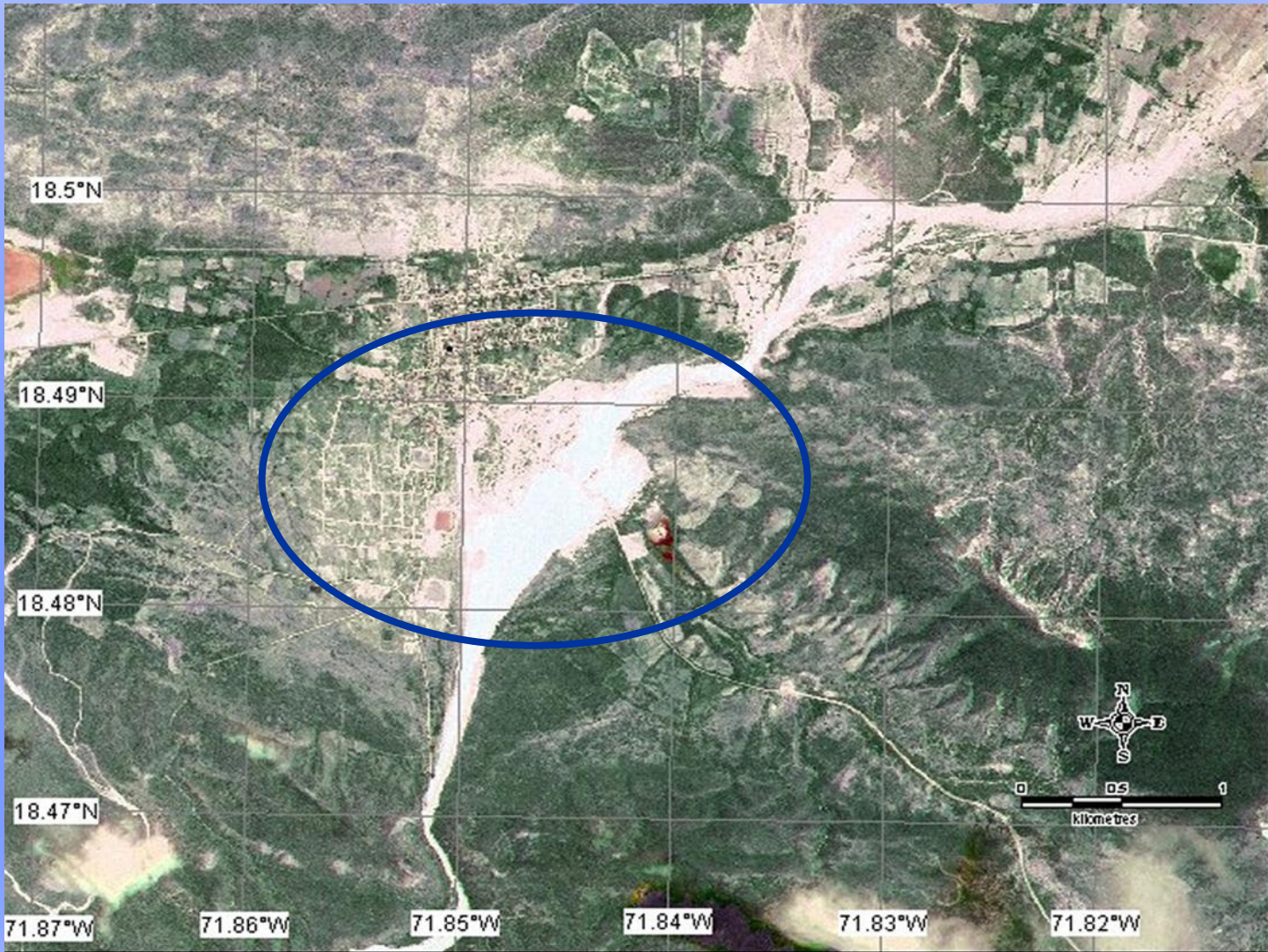
Flooded occurred at Rio Blanco, SW Jimani, it destroyed La Cuarenta neighborhood, leaving 397 dead.

**Floods in Dom.
Rep. Caused death
and destruction.**

May 22, 2004.

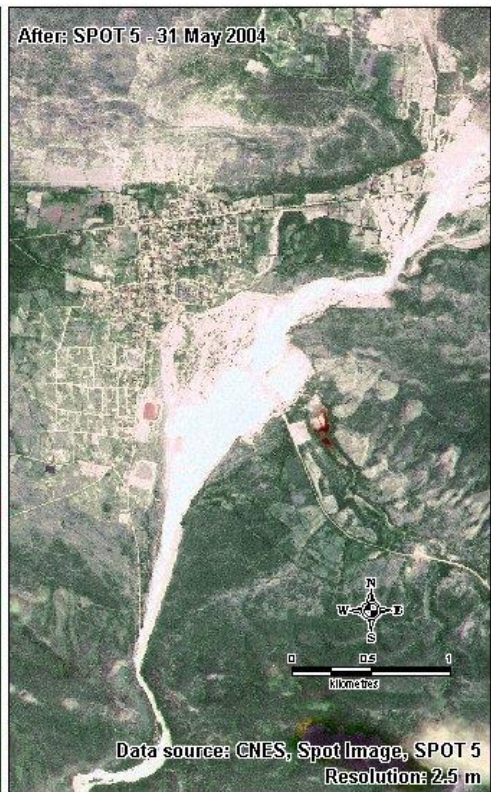


The disaster area. The numerical models did not indicate heavy rain in that zone.



The area within the circle was the most affected.

For this disaster, custom maps can be created for humanitarian staff. Please contact charter@unosat.org or telephone +41 22 767 4020



Jamani Floods & landslides Before - after



Satellite image interpretation key

Houses and streets	Road and agricultural fields	Cloud and shadow

Disaster type: Floods and landslides
Disaster date: 25 May 2004 (ongoing)
Datum: WGS84
Projection: UTM Zone 19 North
Map created 4 June 2004.

The International Charter on Space and Major Disasters aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through authorized users. Since 1 July 2003 the Charter is available to support the United Nations with satellite imagery. Contact the UN Office for Outer Space Affairs for further information (ooosa@unvienna.org).

The depiction and use of boundaries, geographic names and related data shown here are not warranted to be error free nor do they necessarily imply official endorsement or acceptance by the United Nations.

This map was produced by the UNOSAT project headed by UNITAR and executed by UNOPS. UNOSAT is a UN-Private consortium providing satellite imagery and related geographic information to UN humanitarian and development agencies and their implementing partners. See www.unosat.org for further information.



At left the Rio Blanco with its normal course. At right, the river growth can be appreciated.













Devastated zone, with the growth of Rio Blanco.



Tropical Activity (Aug., Sept., Oct.)

This season is involved in Tropical Cyclone Season starting on 1ST June until November 30TH.

From August to October there has been a major tropical cyclone formation that directly or indirectly affect our country.

Rainfall is distributed throughout the national territory, but the largest amounts falls on the Northeast, Southeast and Southwest.

The West Region, which is normally dry, receives its highest rainfall this season influenced by tropical cyclones.



HYDROLOGIC RESEARCH CENTER
A Non-Profit Research Corporation, Established 1993

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HDRFFG
Haiti & Dominican Republic
Flash Flood Guidance
System

Copyright © 2010 Hydrologic Research Center

(This page will auto-refresh every 30 seconds)

Most Recent HDRFFG Data Products

Experimental advisory products of the HDRFFG. Please contact Meteo-France Martinique and the Haiti and Dominican Republic Weather Services for official interpretations, assessments and warnings.

Sistema HDRFFG

Tormenta Tropical Chantal 8-10/7/13

por Rosario Alfaro

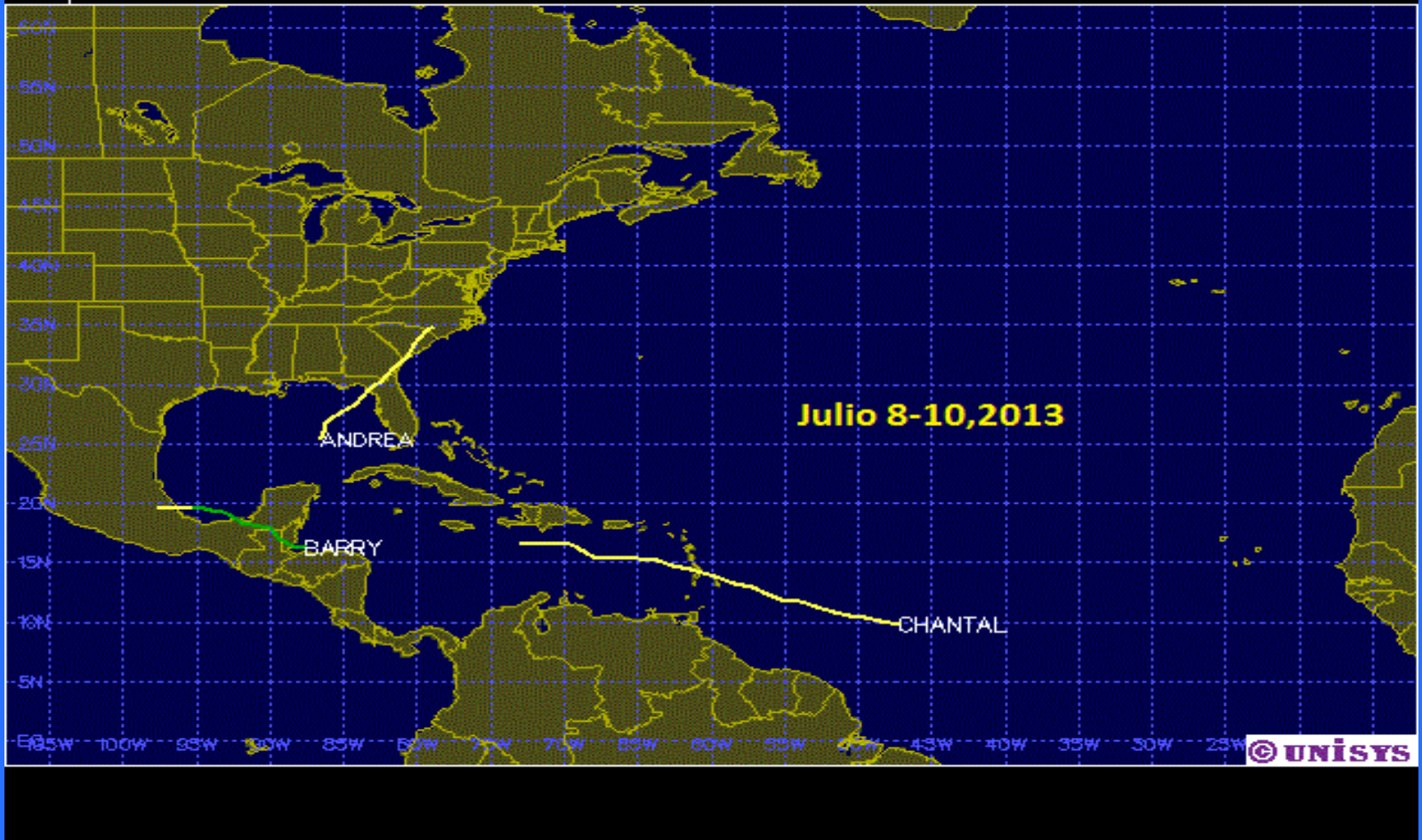
arosario@joss.ucar.edu

Rosario.Alfaro@noaa.gov



Tropical Storm Tracks

Year 2013



HDRFFG - Haiti and Dominican Republic Flash Flood Guidance System

Current Date: 2013-08-09 16:42 UTC

Nav Date: 2013-07-10 18:00 UTC

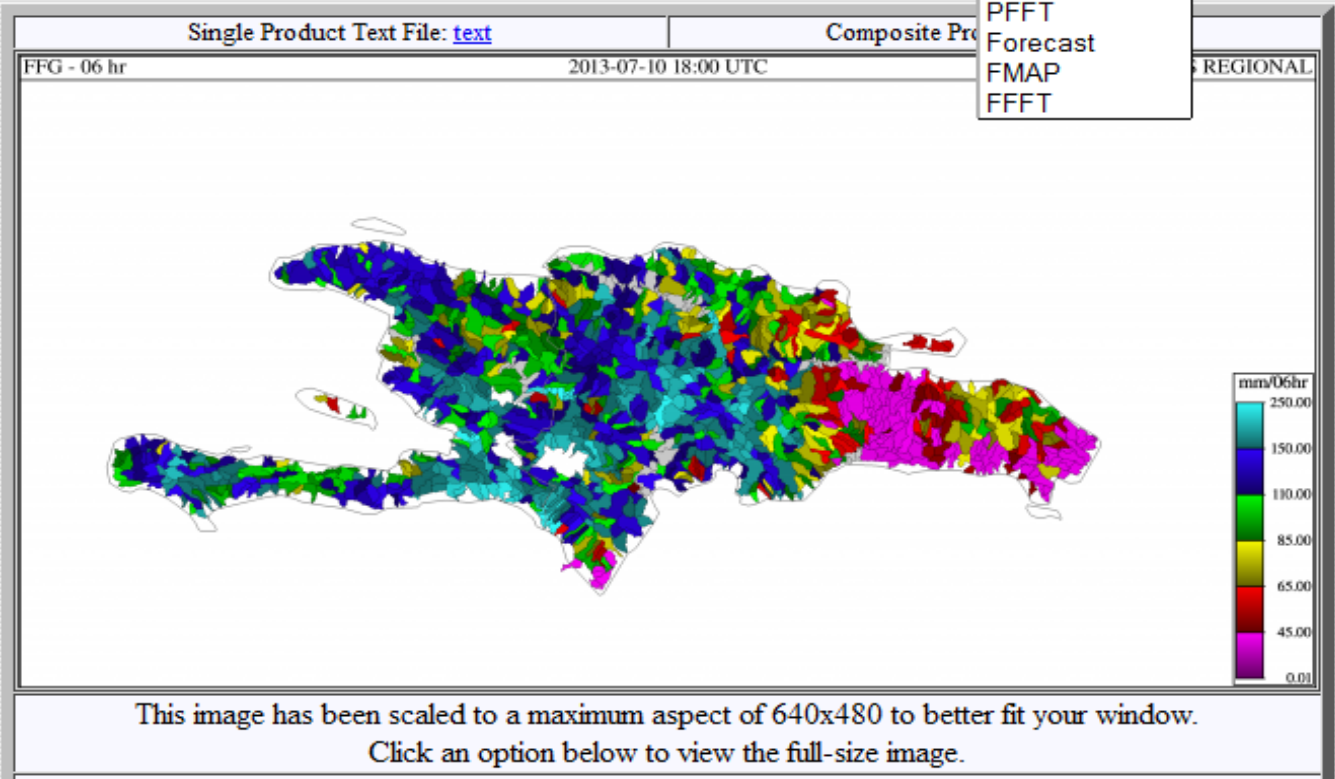
Year: 2013 Month: 07 Day: 10 Hour: 18 REGION: REGIONAL PRODUCT: FFG DT: 06-hr Submit

[-1 Month](#) [-1 Day](#) [-6 Hours](#) [-1 Hour](#) [+1 Hour](#) [+6 Hour](#) [+](#)

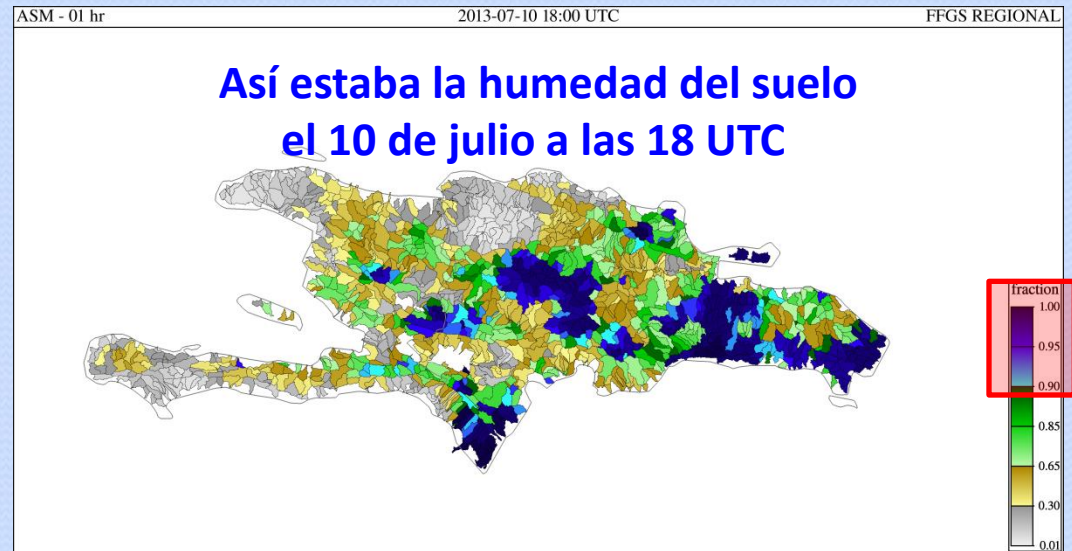
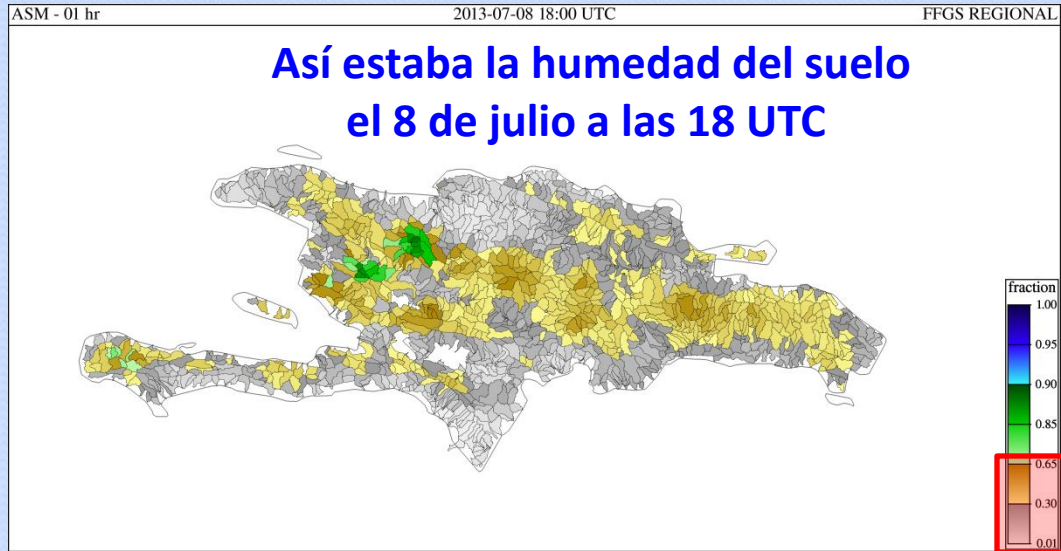
[Prev 6-hr Interval](#) [Reset to Current](#) [Next 6-hr Interval](#)

[Return to Main](#)

- Satellite
- Merged MAP
- ASM
- FFG**
- Prev FFG
- IFFT
- PFFT
- Forecast
- FMAP
- FFFT

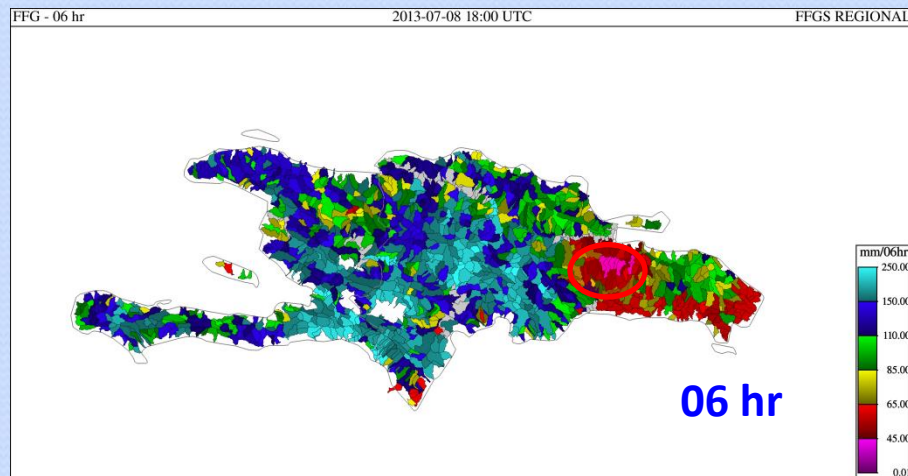
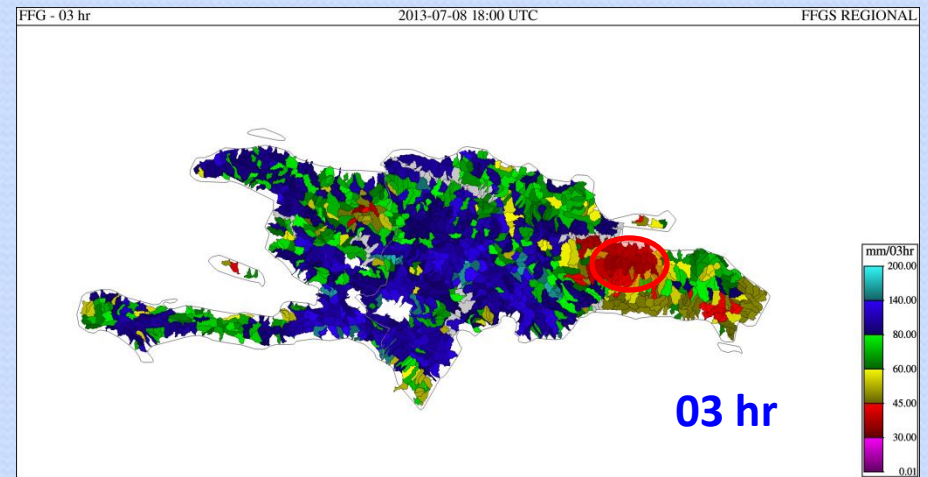
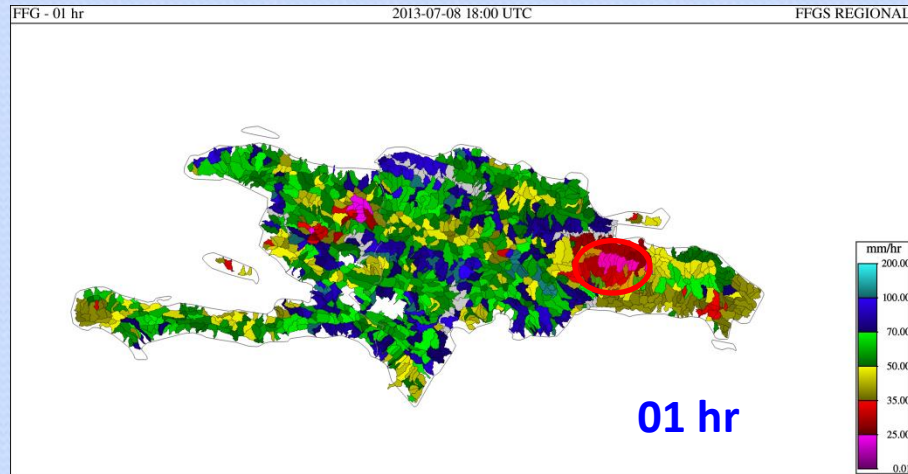


Humedad del suelo (Average Soil Moisture, ASM)



Guía de crecidas repentinas(Flash flood Guidance, FFG)

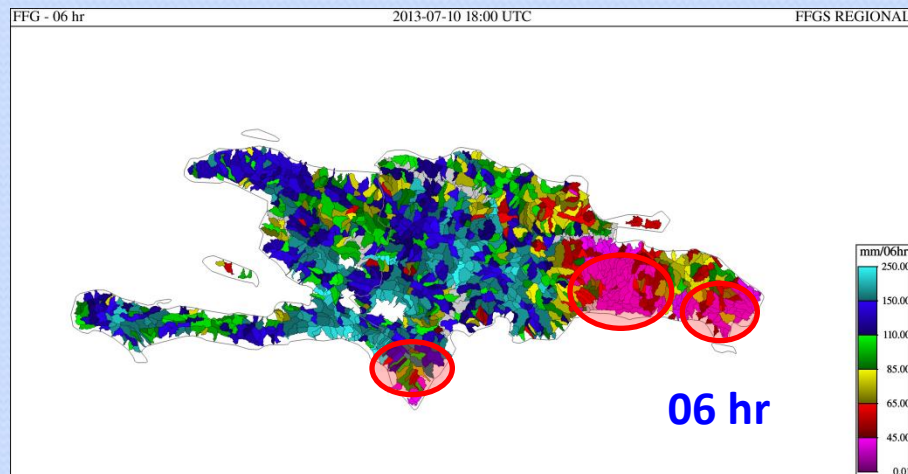
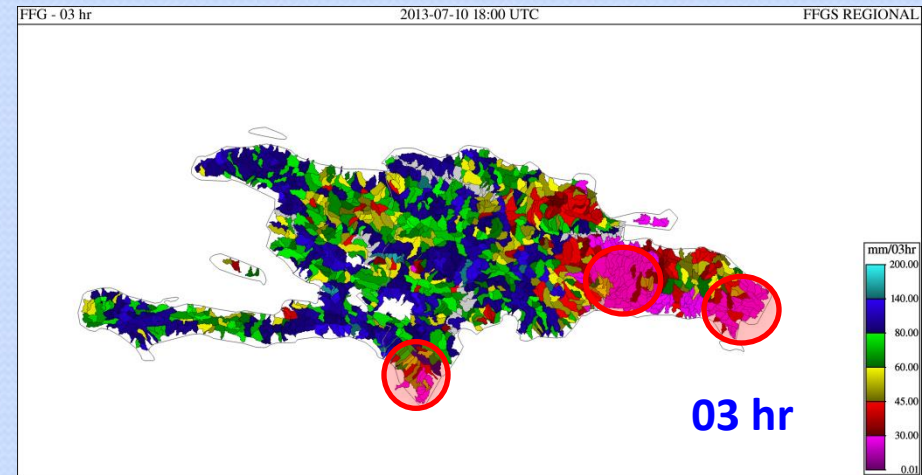
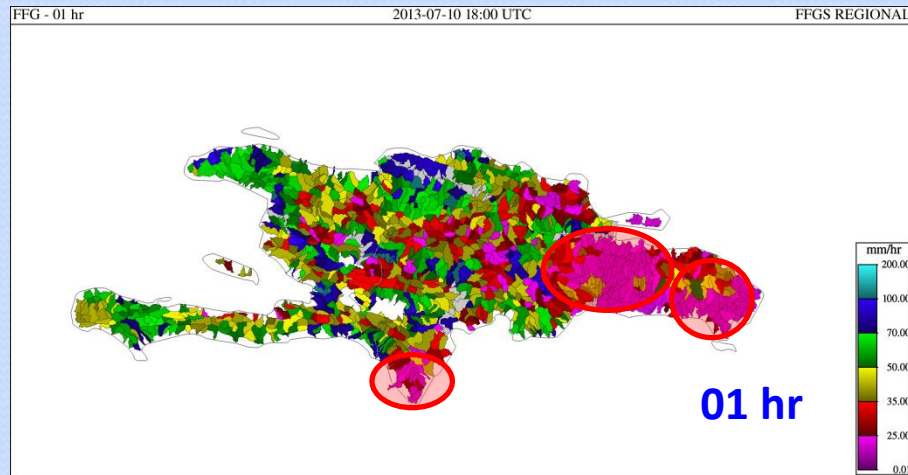
Julio 8, 18 UTC



Diferentes escalas de colores

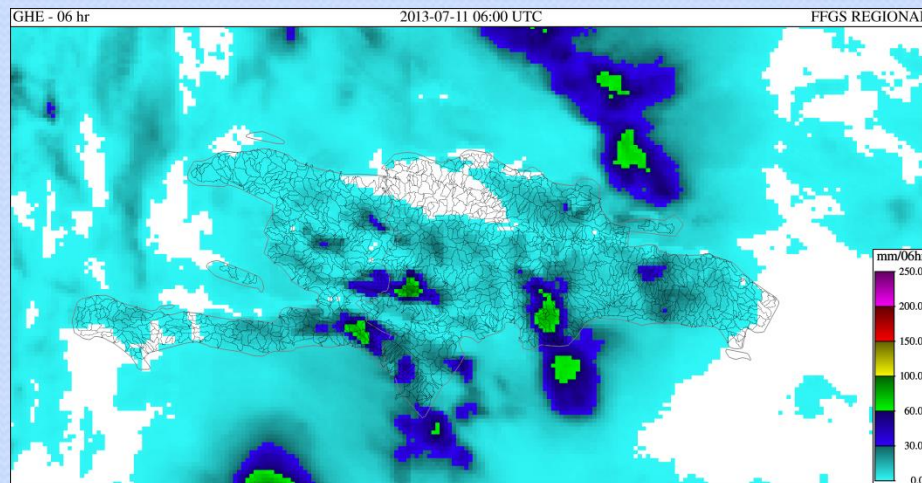
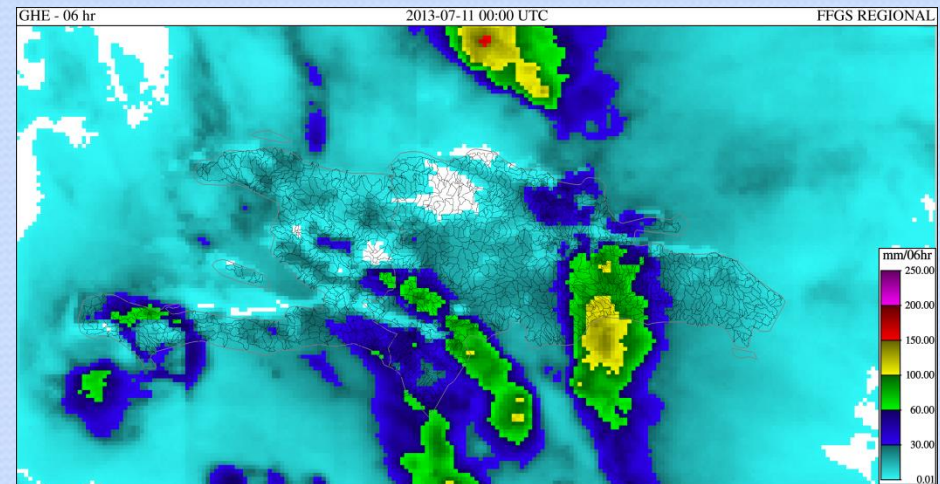
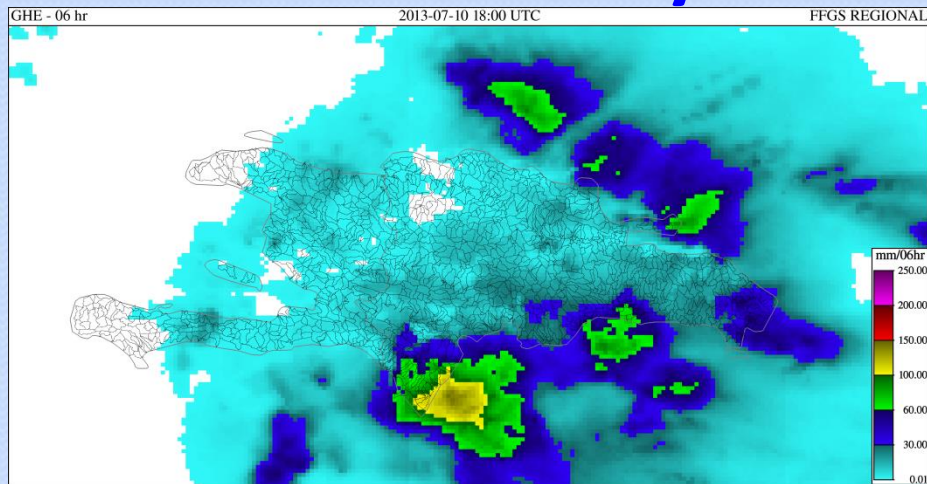
Guía de crecidas repentinas(Flash flood Guidance, FFG)

Julio 10, 18 UTC



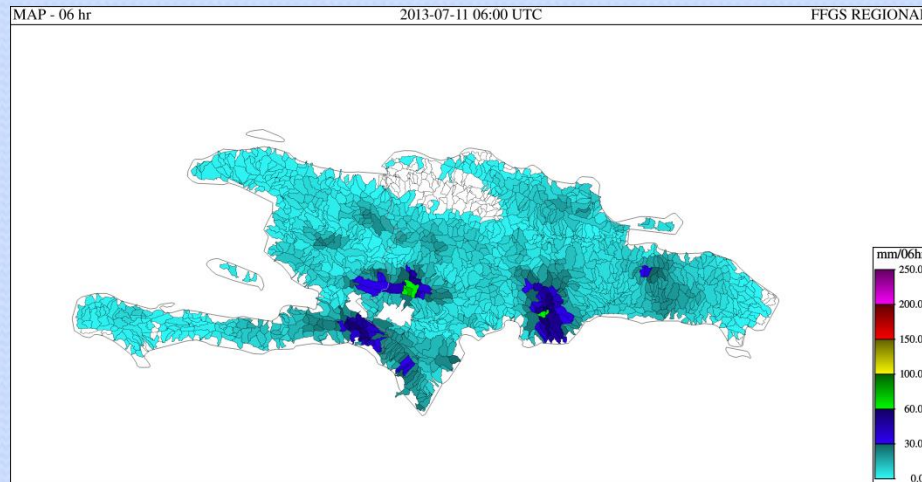
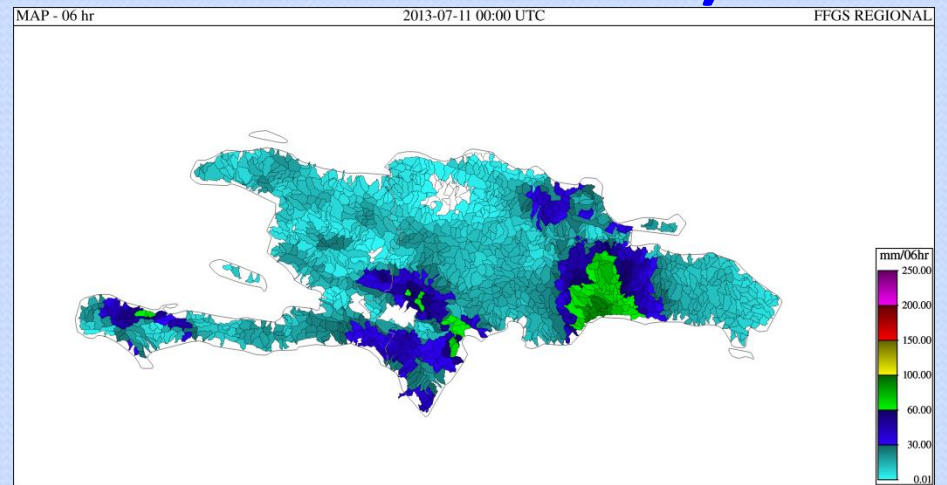
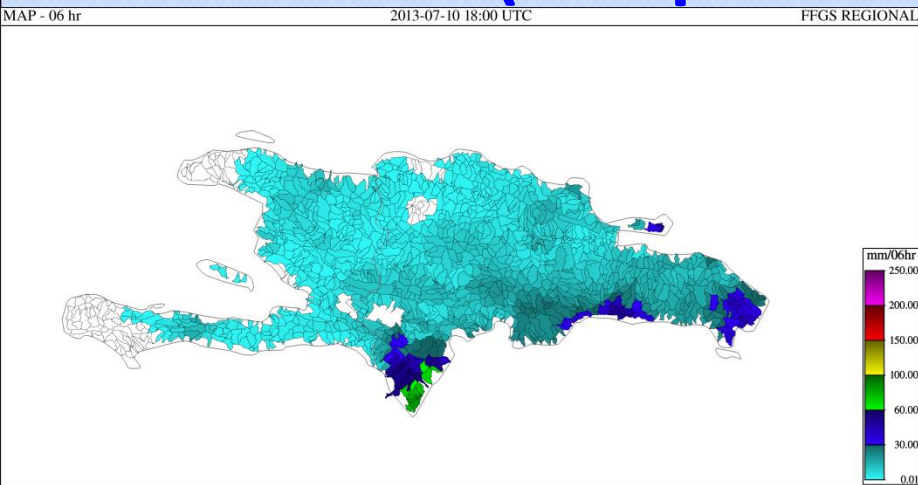
Diferentes escalas de colores

Lluvia por pixel (4 x 4 km²), July 10 at 18 July 11 at 06 and 12 UTC



- Lluvia areal vs puntual
- ¿Se pueden verificar estos datos con datos de estaciones en tiempo real o con reportes de campo?

Lluvia media en el área de las cuencas (MAP) (comparable con los valores FFG)

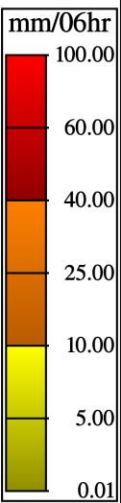


MAP-FFG = IFFT

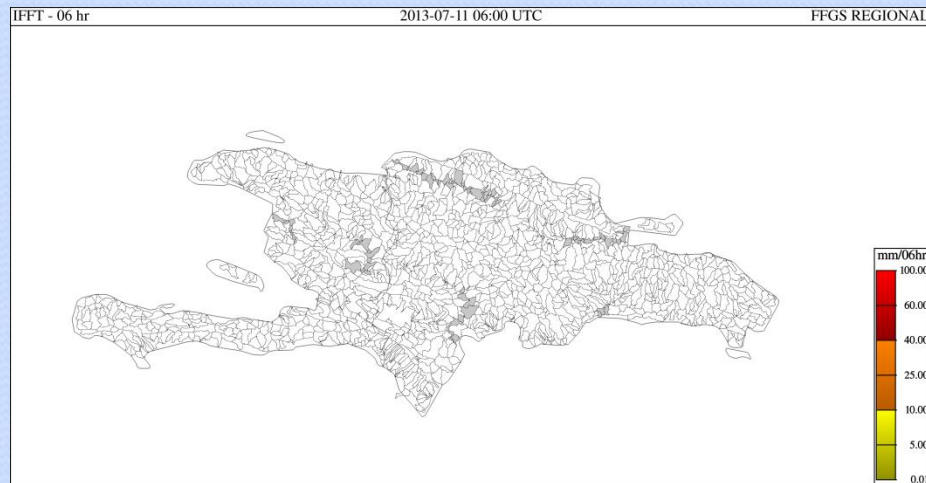
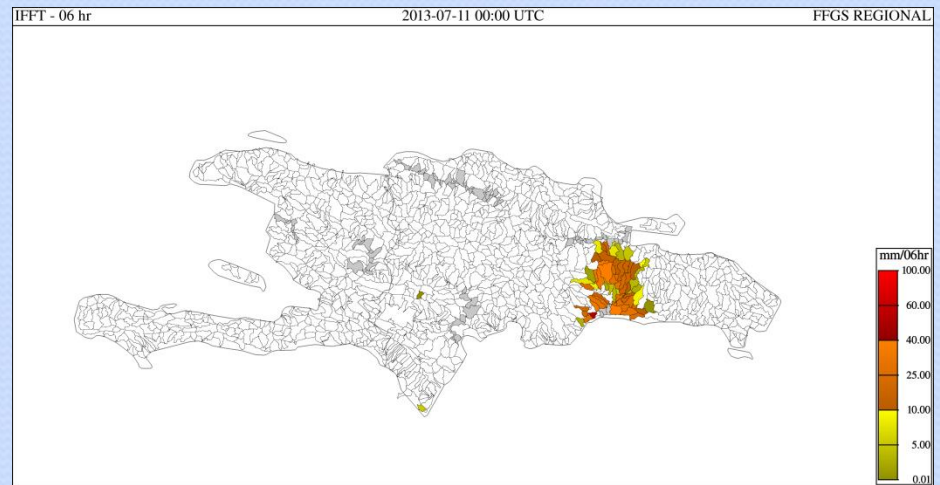
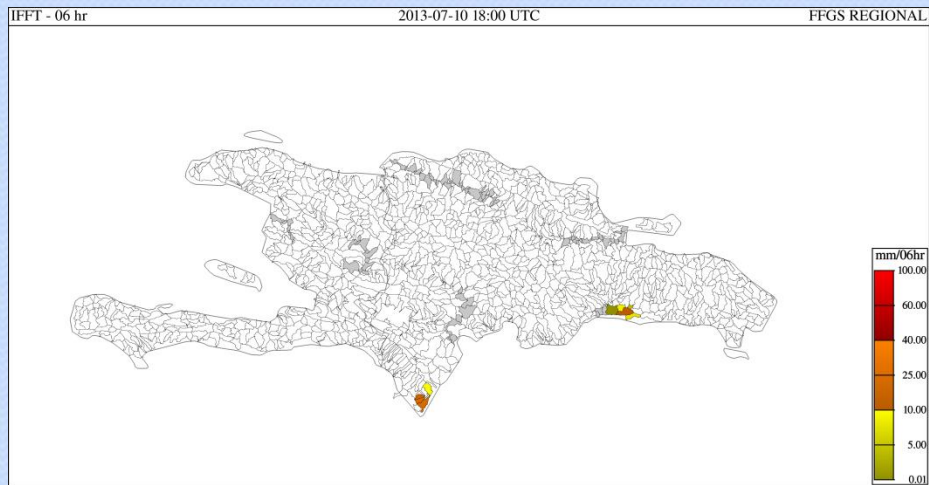
IFFT - 06 hr

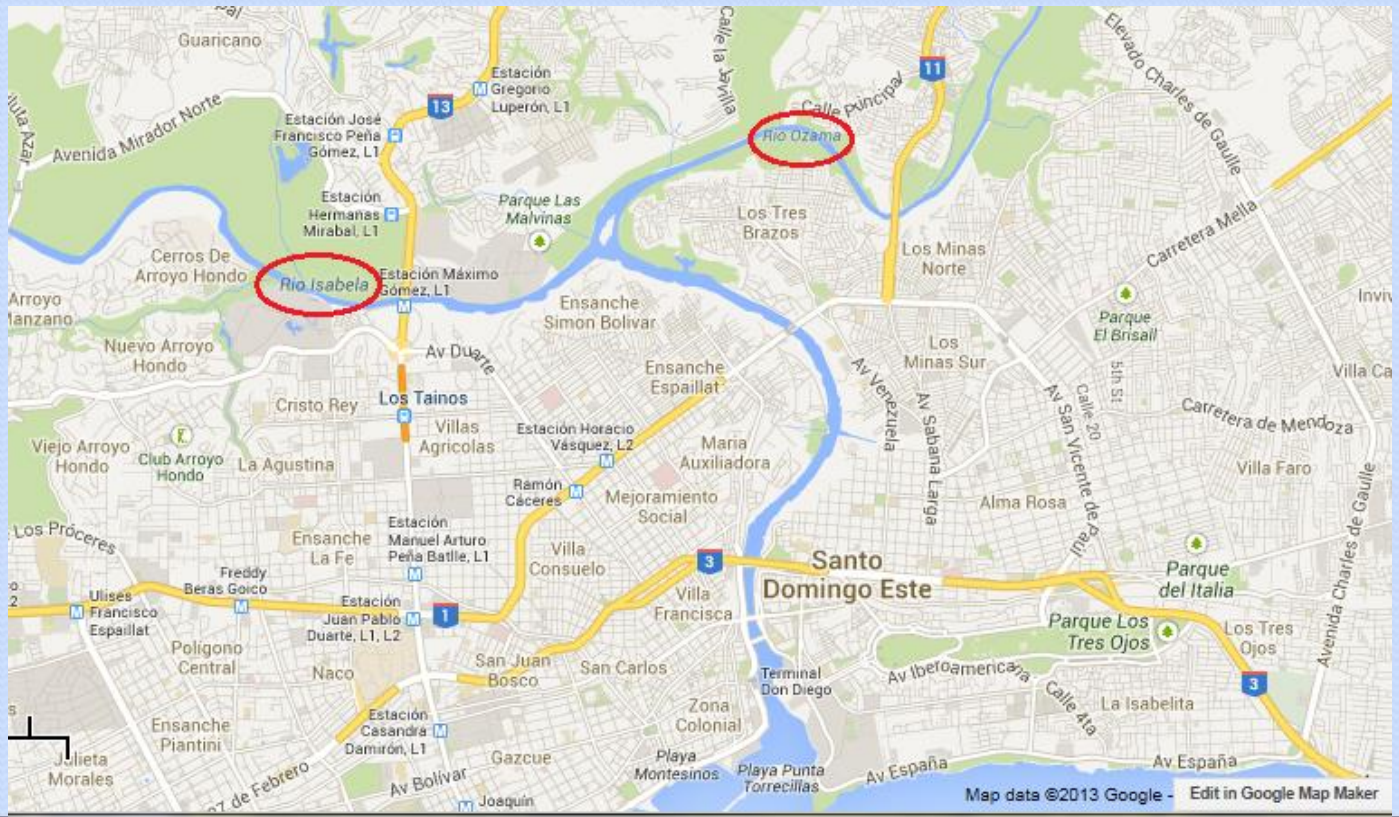
2013-07-11 00:00 UTC

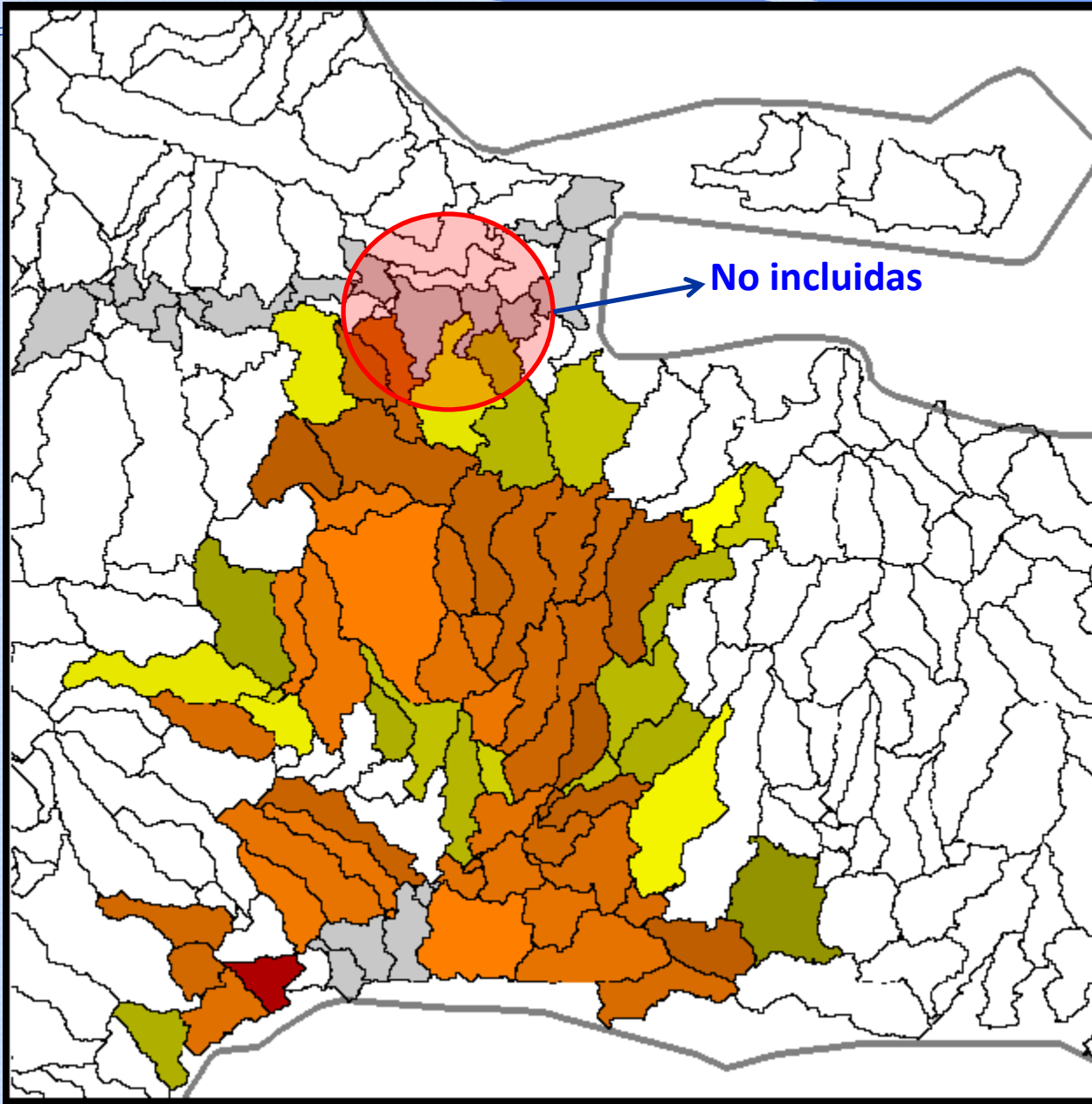
FFGS REGIONAL



MAP-FFG = IFFT







Conclusions

Conclusions

- **The Dominican Republic is located under the 20° Latitud North, in the Tropical Zone, and due to the mountain systems, makes very difficult the efectiveness of the models.**
- **Is urgent for the National Weather Service to continue the restoration of the automatic stations network, because quite frequently flash flood occurs, specially during the convective activities season, and also for the impact of active frontal systems over the Northwest zone.**
- **It is necessary to restore the two radar that we have. The radar located at the East part of the country in Punta Cana, is currently out of service, and also not covers the total area Dominican Republic, the other in Santo Domingo on the Natioanl weather Service have has more than sixteen years of line.**
- **We propose to acquire another place at the Northwest area of our contry that will allows us to give support to Haiti.**

Conclusions

- **The uncertainties of the numerical models, should be clearly explained to users, specially those who manage emergencies, in case of hurricanes, mesoscale systems, and other due to local effects.**
- **We are not evaluating the effectiveness of the prediction numerical models, we understand that necessary mechanisms should be established in order to make them more reliable.**

Conclusions

- **The GFS model is currently the most reliable, has given good results when dealing with well-defined weather systems, but its trun weak on the meso-scale phenomena have little reliability .. In these cases it plays an important role the experience of the forecaster .**
- **The Rep. Dom. is not using the flash flood guidance because technicians have not received sufficient training to use the tool.**

Conclusions

- We would like to participate an exchange of experience with countries in the region working with the products of flash flood guidance regarding the preparation and verification tool.
- We understand that this tool to be effective and may be of benefit to emergency institutions in Rep. Dom . , it should be defined an interagency technical compromise between the scientific institutions of the country
- It is necessary to make all the existing inventory of the infrastructure, observations related to networks , watersheds , communication and the system and flow levels .
- We believe the key is to define an integrated data platform, products and information that will support the development of this project.



Thanks for Your Attention



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