Haiti-Dominican Republic Flash Flood Guidance (HDRFFG) System:
Overview of Past Project

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Hydrologic Research Center

HDRFFG Initial Planning Meeting 07-09 Sep 2015 ONAMET
Santo Domingo, DR

Haiti-Dominican Republic Flash Flood Guidance Project

As part of humanitarian response to the catastrophic earthquake of January 2010, HRC was asked to implement Flash Flood Guidance System (FFGS) to support local and international agencies during subsequent hurricane season.

May 2010 – HRC begins development

July 2010 – Operation of HDRFFG System in real time (no local gauge information)

Aug 2010 – First training held in Martinique

Nov 2010 – Hurricane Tomas

2010 to present – HDRFFG System operational at HRC and products available to NMHSs through secure website.

Haiti-Dominican Republic Flash Flood Guidance Project (v.0)

INPUT DATA IN REAL-TIME

- Satellite Precipitation

  NOAA/NESDIS Geostationary Satellite Hydro-Estimator (4x4 km^2), hourly totals

- Forecast Precipitation

  NOAA/NCEP High Resolution Mesoscale Model Forecast (0-48hrs)

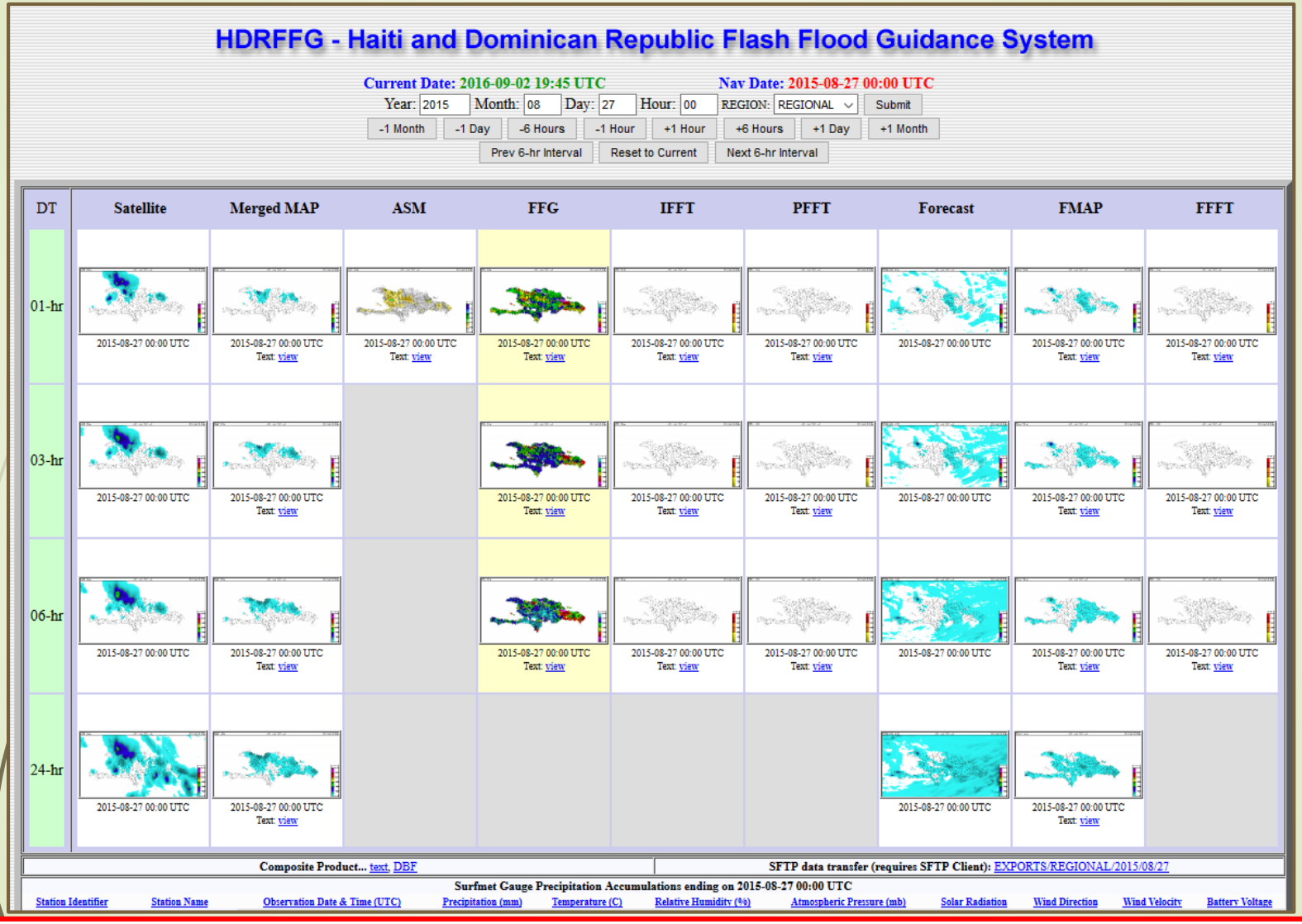
DEVELOPMENT DATA

- Digital elevation data (90m resolution, SRTM)
- Digital soils data (FAO)
- Climatological estimate of temperature for Reference Evapotranspiration
- Rain gauge data from D.R. for limited bias analysis (2006-2010, hourly)

OUTPUT PRODUCTS IN REAL-TIME

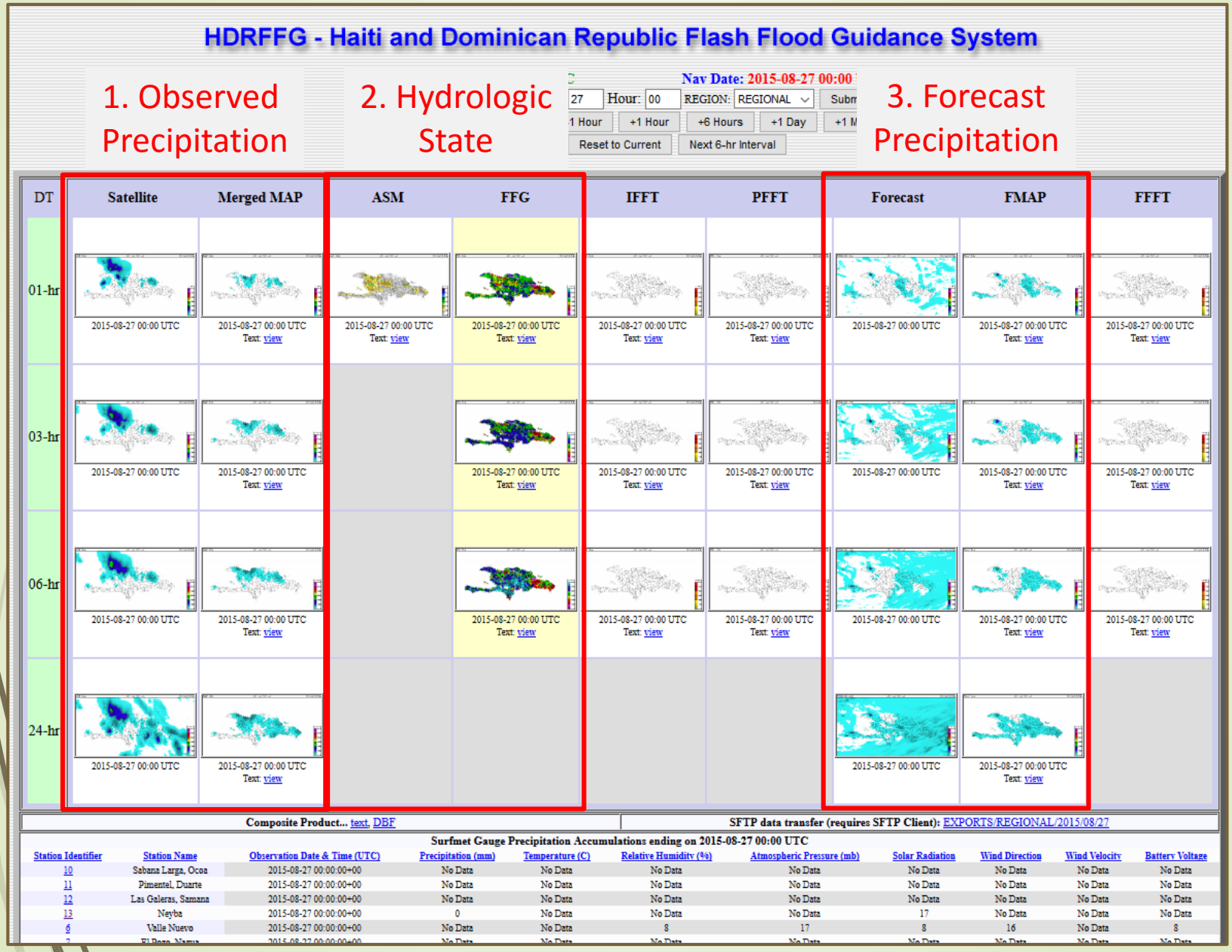
- Catchment based, mean areal estimates (median area of 72km^2)
- Hourly updates
  - Mean Areal Precipitation (1, 3, and 6-hour durations)
  - Average Soil Water Fraction
  - Flash Flood Guidance / Flash Flood Threat (1, 3, and 6-hour durations)
  - Forecast Mean Areal Precipitation (1, 3, and 6-hour durations)

Haiti-Dominican Republic Flash Flood Guidance Project (v.0)



Forecaster Interface designed to provide operational NHMS forecasters with up-to-date information on key variables for rapid assessment of flash flood risk.

HDRFFG (v.0) System Products



HDRFFG (v.0) System Products

HDRFFG - Haiti and Dominican Republic Flash Flood Guidance System

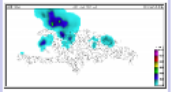
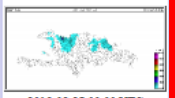
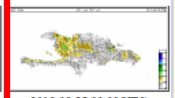
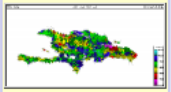
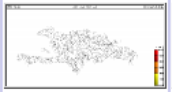
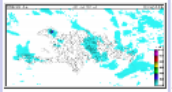
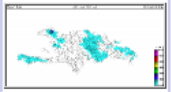
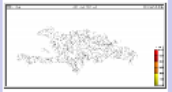
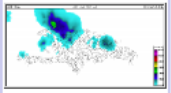
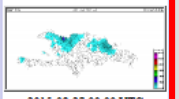
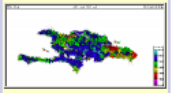
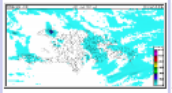
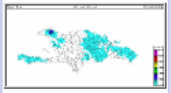
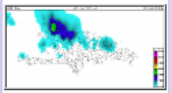
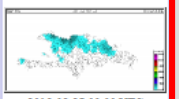
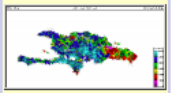
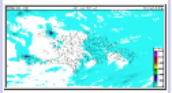
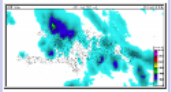
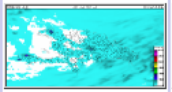
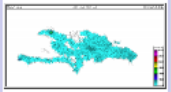
Observed Precipitation

Current Date: 2016-09-02 19:45 UTC Nav Date: 2015-08-27 00:00 UTC

Year: 2015 Month: 08 Day: 27 Hour: 00 REGION: REGIONAL Submit

-1 Month | -1 Day | -6 Hours | -1 Hour | +1 Hour | +6 Hours | +1 Day | +1 Month

Prev 6-hr Interval | Reset to Current | Next 6-hr Interval

DT	Satellite	Merged MAP	ASM	FFG	IFFT	PFFT	Forecast	FMAP	FFFT
01-hr	 2015-08-27 00:00 UTC	 2015-08-27 00:00 UTC Text: view	 2015-08-27 00:00 UTC Text: view	 2015-08-27 00:00 UTC Text: view	 2015-08-27 00:00 UTC Text: view	2015-08-27 00:00 UTC Text: view	 2015-08-27 00:00 UTC	 2015-08-27 00:00 UTC Text: view	 2015-08-27 00:00 UTC Text: view
03-hr	 2015-08-27 00:00 UTC	 2015-08-27 00:00 UTC Text: view		 2015-08-27 00:00 UTC Text: view	2015-08-27 00:00 UTC Text: view	2015-08-27 00:00 UTC Text: view	 2015-08-27 00:00 UTC	 2015-08-27 00:00 UTC Text: view	2015-08-27 00:00 UTC Text: view
06-hr	 2015-08-27 00:00 UTC	 2015-08-27 00:00 UTC Text: view		 2015-08-27 00:00 UTC Text: view	2015-08-27 00:00 UTC Text: view	2015-08-27 00:00 UTC Text: view	 2015-08-27 00:00 UTC	2015-08-27 00:00 UTC Text: view	2015-08-27 00:00 UTC Text: view
24-hr	 2015-08-27 00:00 UTC	2015-08-27 00:00 UTC Text: view					 2015-08-27 00:00 UTC	 2015-08-27 00:00 UTC Text: view	

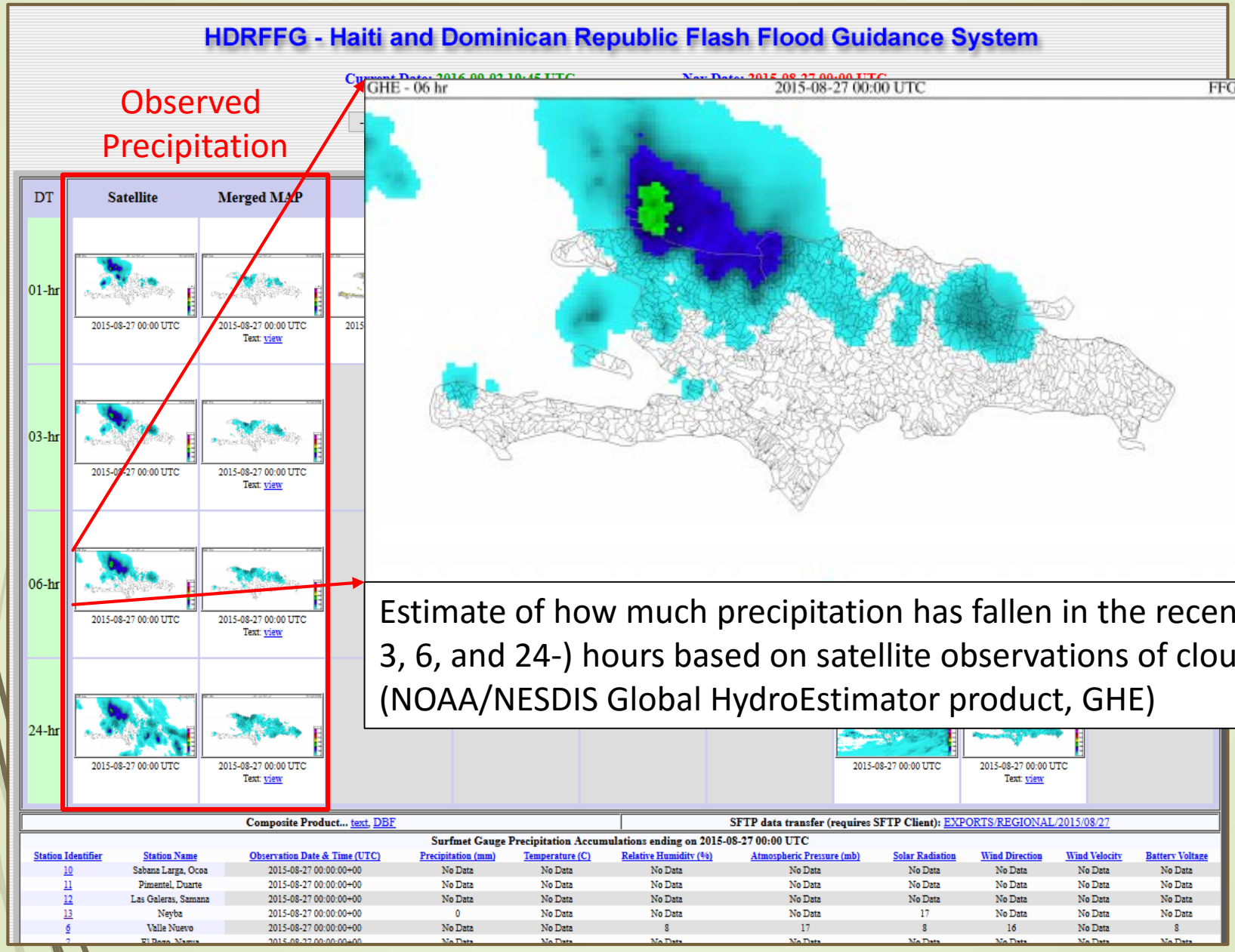
Composite Product... text, DBF

SFTP data transfer (requires SFTP Client): EXPORTS/REGIONAL/2015/08/27

Surfmet Gauge Precipitation Accumulations ending on 2015-08-27 00:00 UTC

Station Identifier	Station Name	Observation Date & Time (UTC)	Precipitation (mm)	Temperature (C)	Relative Humidity (%)	Atmospheric Pressure (mb)	Solar Radiation	Wind Direction	Wind Velocity	Battery Voltage
10	Sabana Larga, Ocoa	2015-08-27 00:00:00+00	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
11	Pimentel, Duarte	2015-08-27 00:00:00+00	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
12	Las Galeras, Samana	2015-08-27 00:00:00+00	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
13	Neyba	2015-08-27 00:00:00+00	0	No Data	No Data	No Data	17	No Data	No Data	No Data
6	Valle Nuevo	2015-08-27 00:00:00+00	No Data	No Data	8	17	8	16	No Data	8
7	El Pozo, Nagua	2015-08-27 00:00:00+00	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data

HDRFFG (v.0) System Products



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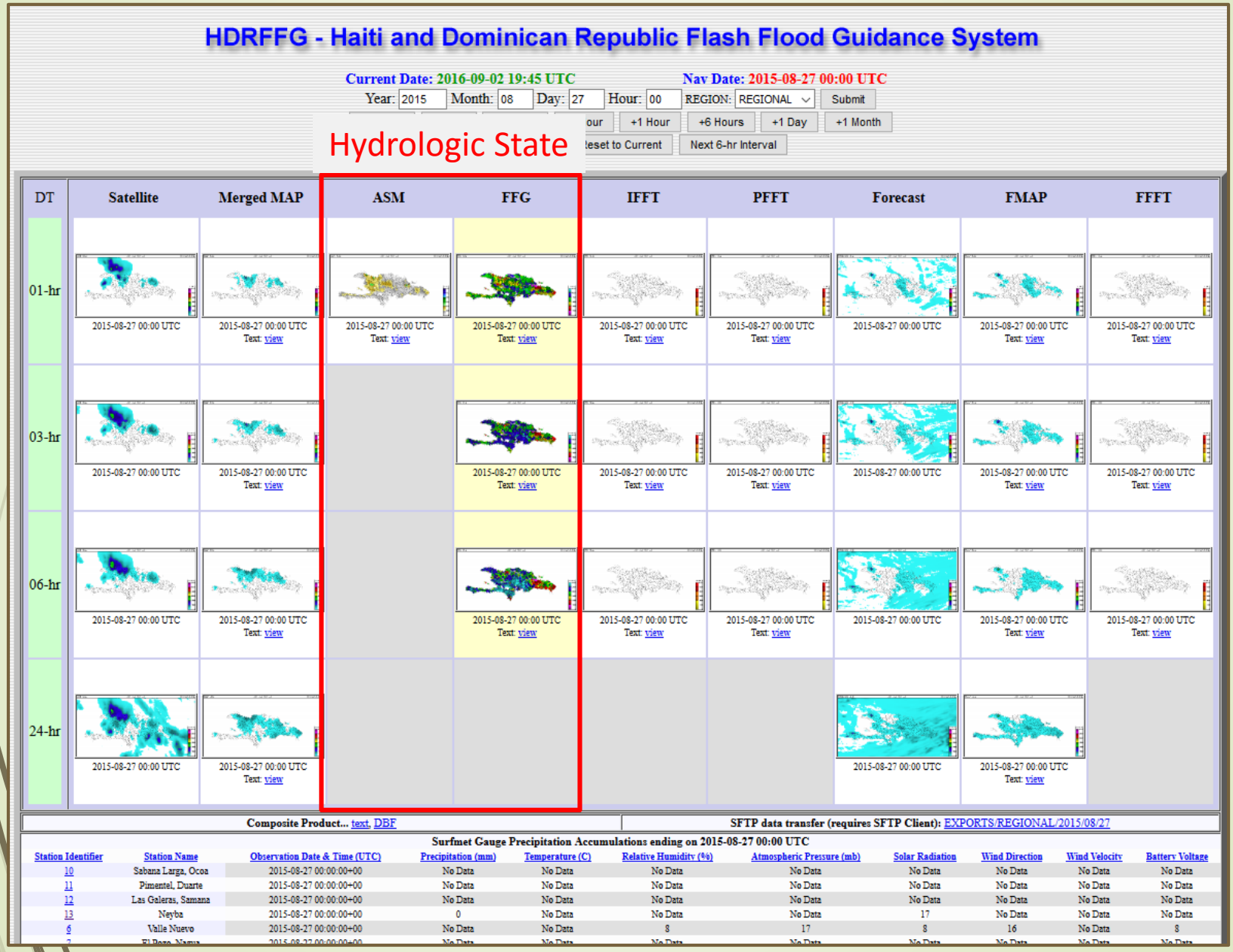
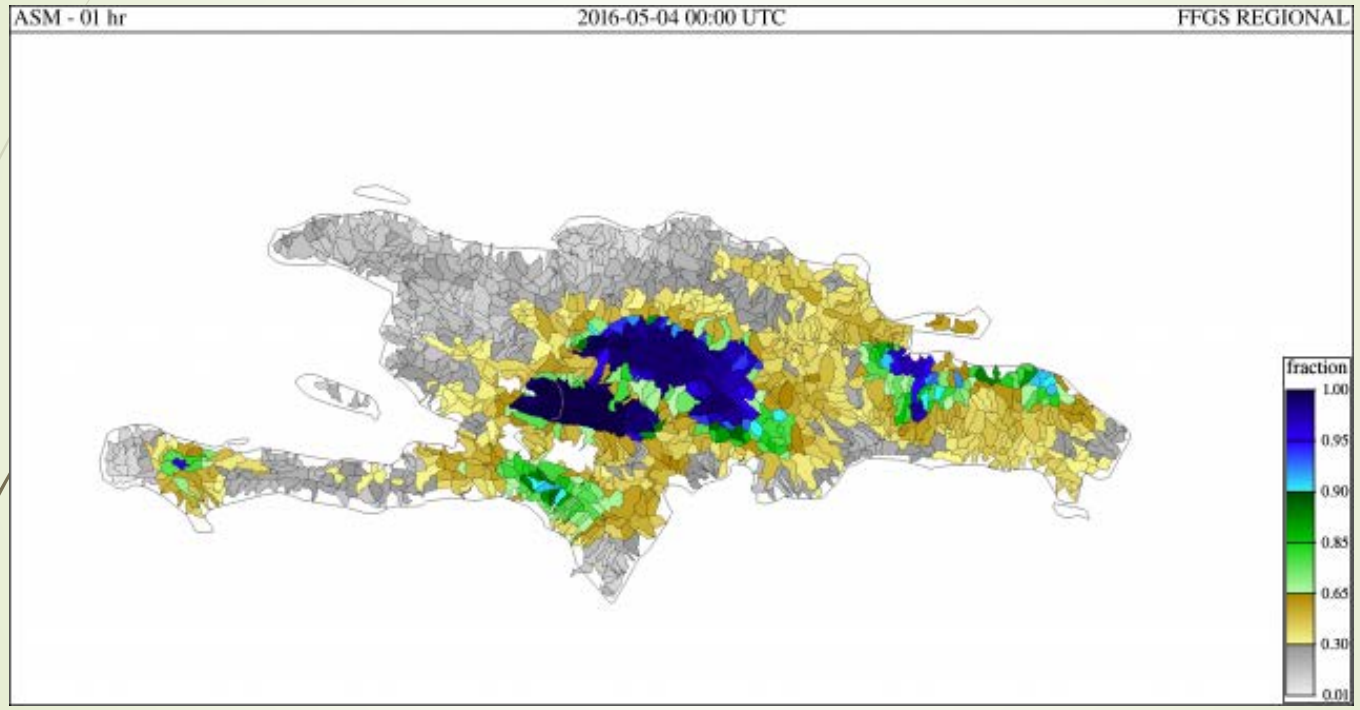


HDRFFG (v.0) System Products

Hydrologic State

1. Average Soil Moisture (ASM)

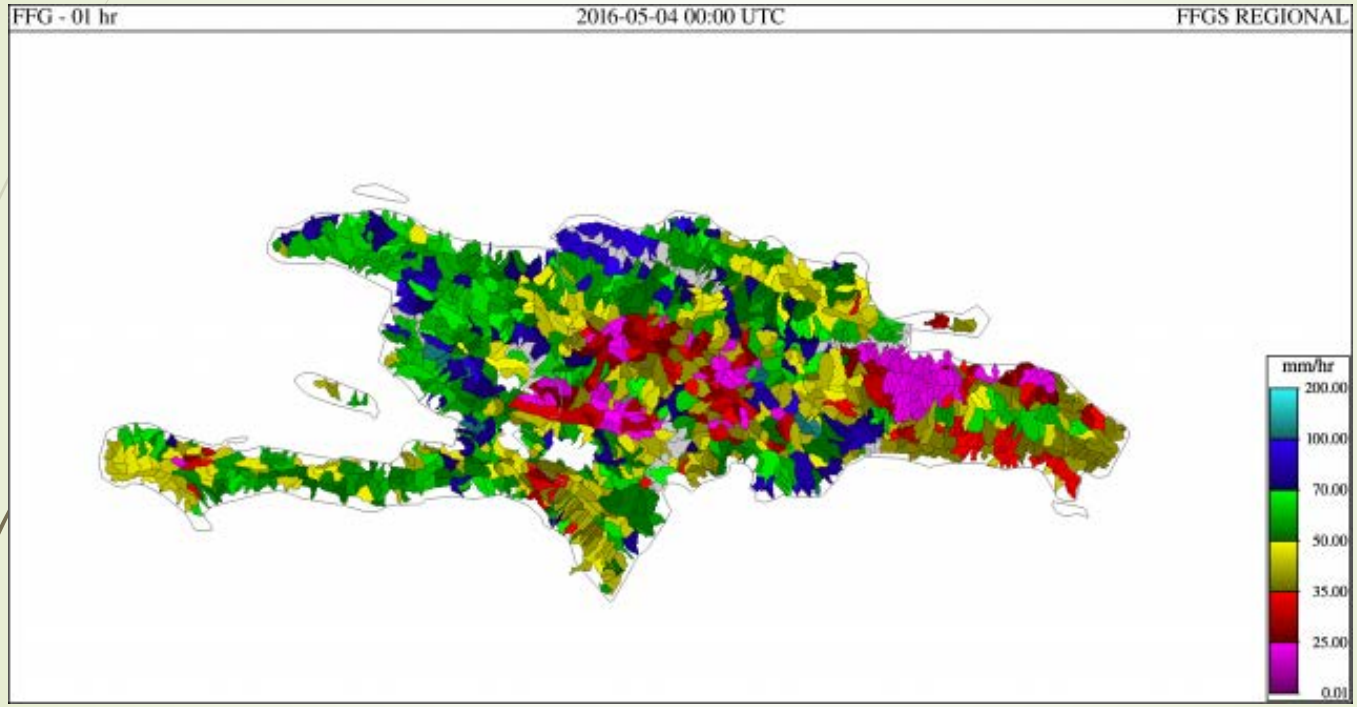


An estimate of the level of saturation (fraction) in the upper soil layer.

HDRFFG (v.0) System Products

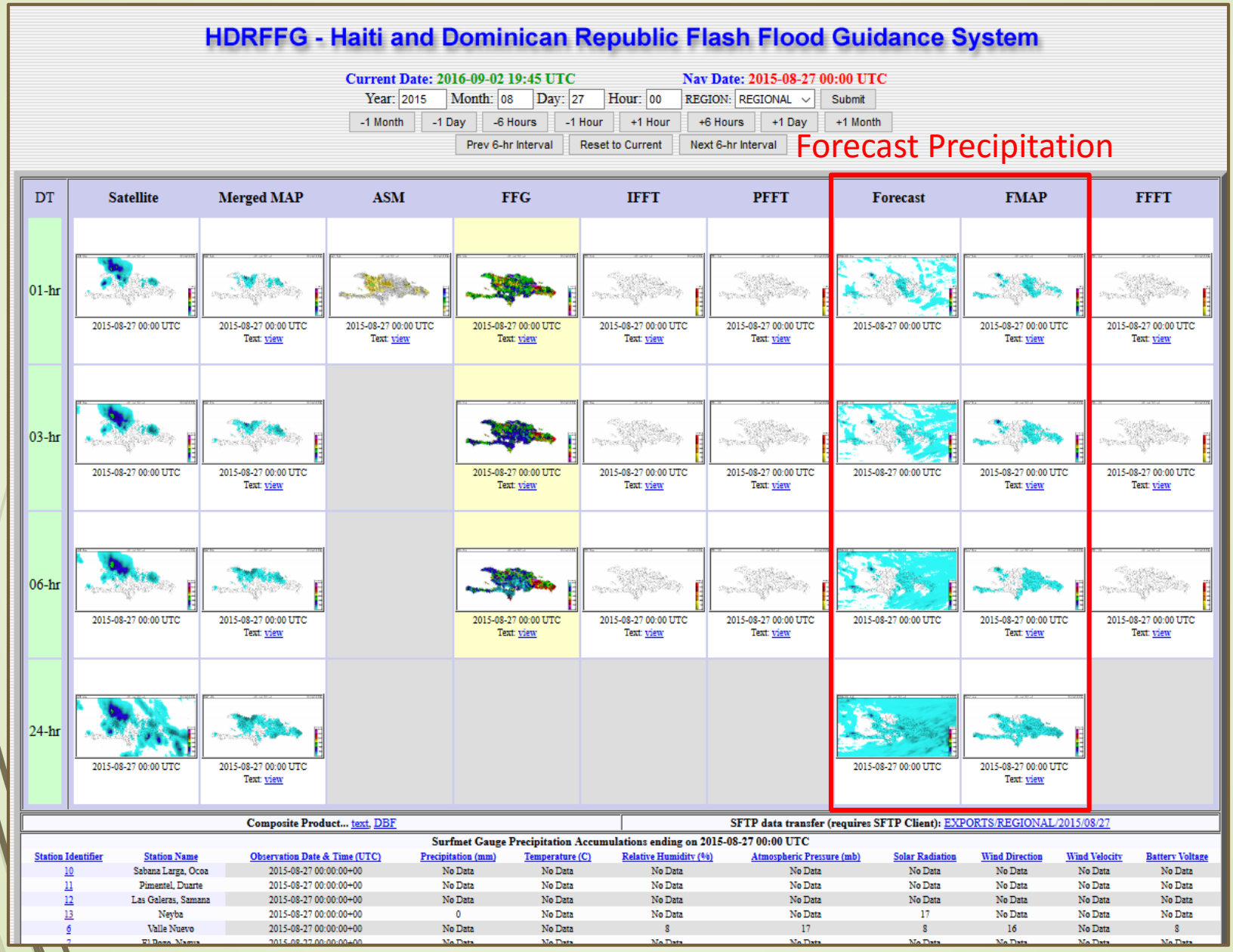
Hydrologic State

2. Flash Flood Guidance (FFG)

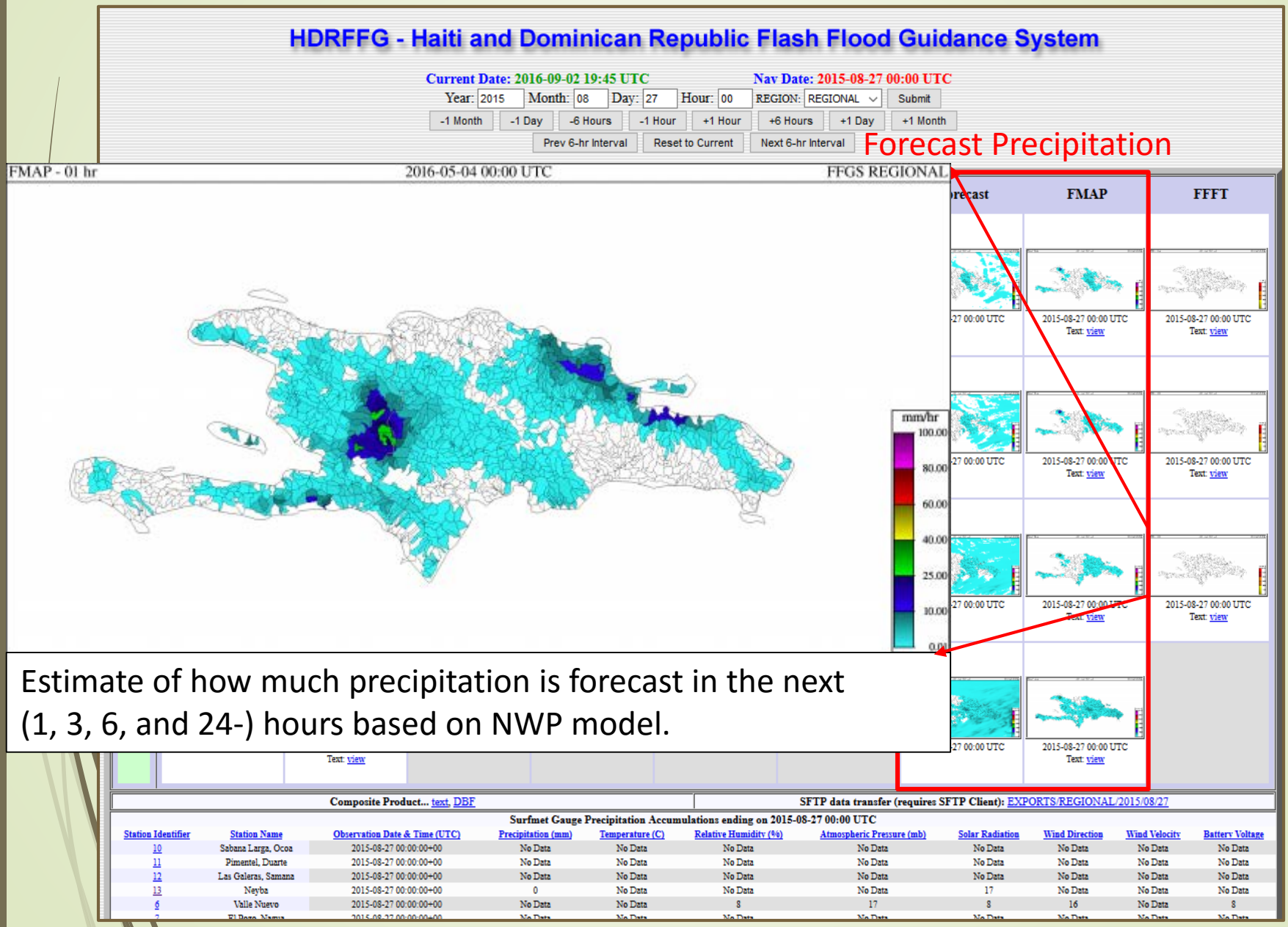


An estimate of how much precipitation of a given duration over a small watershed is sufficient to produce a “flooding condition” at the stream draining that watershed.

HDRFFG (v.0) System Products



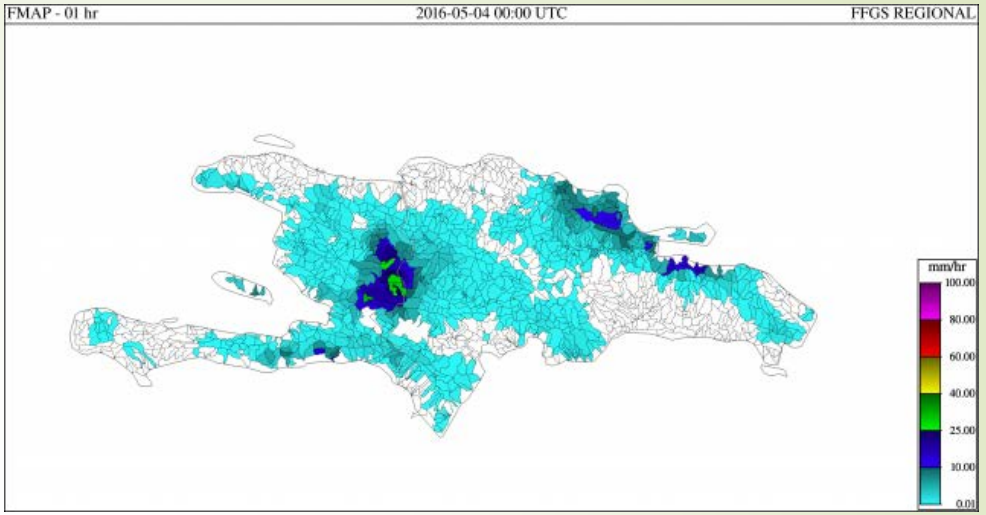
HDRFFG (v.0) System Products



HDRFFG (v.0) System Products

Forecast Precipitation

- NOAA/NCEP produced high resolution mesoscale models
- QPF is weighted combination of WRF-NMM and WRF-ARW models with differing configurations and parameterizations
- QPF provided to HRC for ingest into HDRFFG.



2010 assessment of QPF:

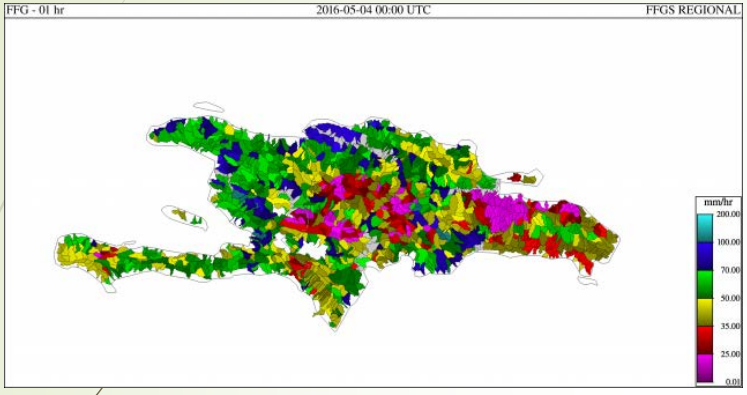
- *run-to-run consistency was generally low*
- *Forecast skill limited in weakly-forced conditions*
- *Evaluation of QPF by HDR forecasters required*

	WRF-NMM	WRF-ARW
Horizontal grid spacing (km)	4.0	5.15
Vertical levels	35 sigma-pressure hybrid	35 sigma
PBL/turbulence	MYJ	YSU
Microphysics	Ferrier	WSM3
Land-Surface	NOAH	NOAH
Radiation (SW/LW)	GFDL/GFDL	Dudhia/RRTM
Convection	None parameterized	None parameterized

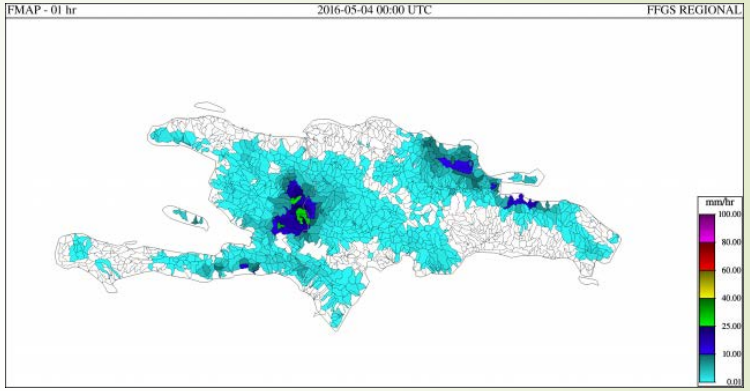
HDRFFG (v.0) System Products

Fundamental Concept of FFG Use:

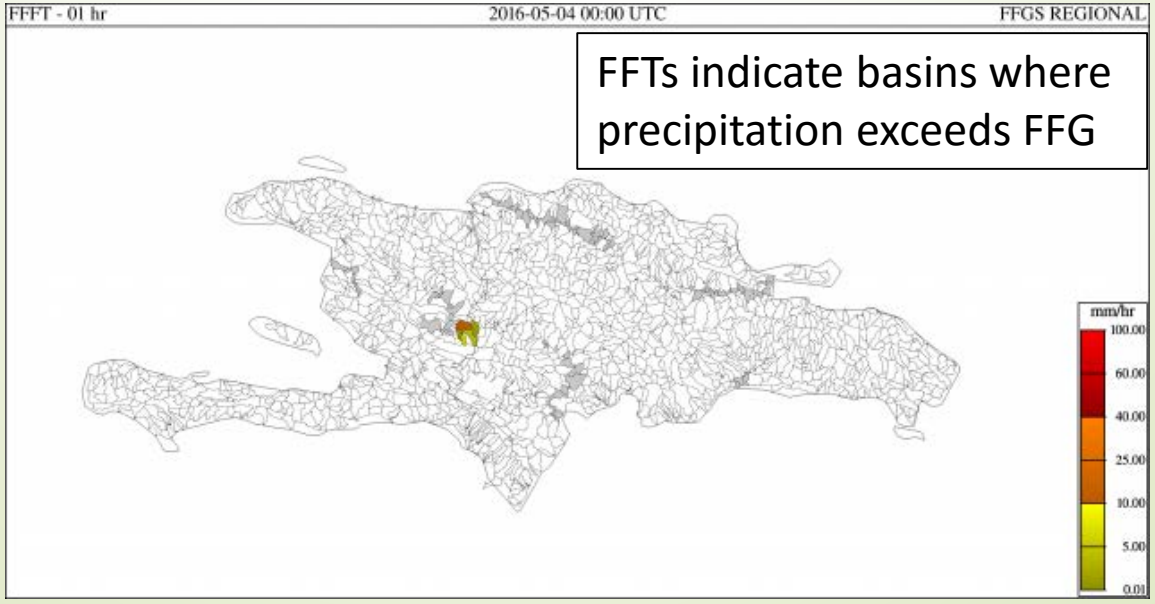
FFG: How much rain is needed



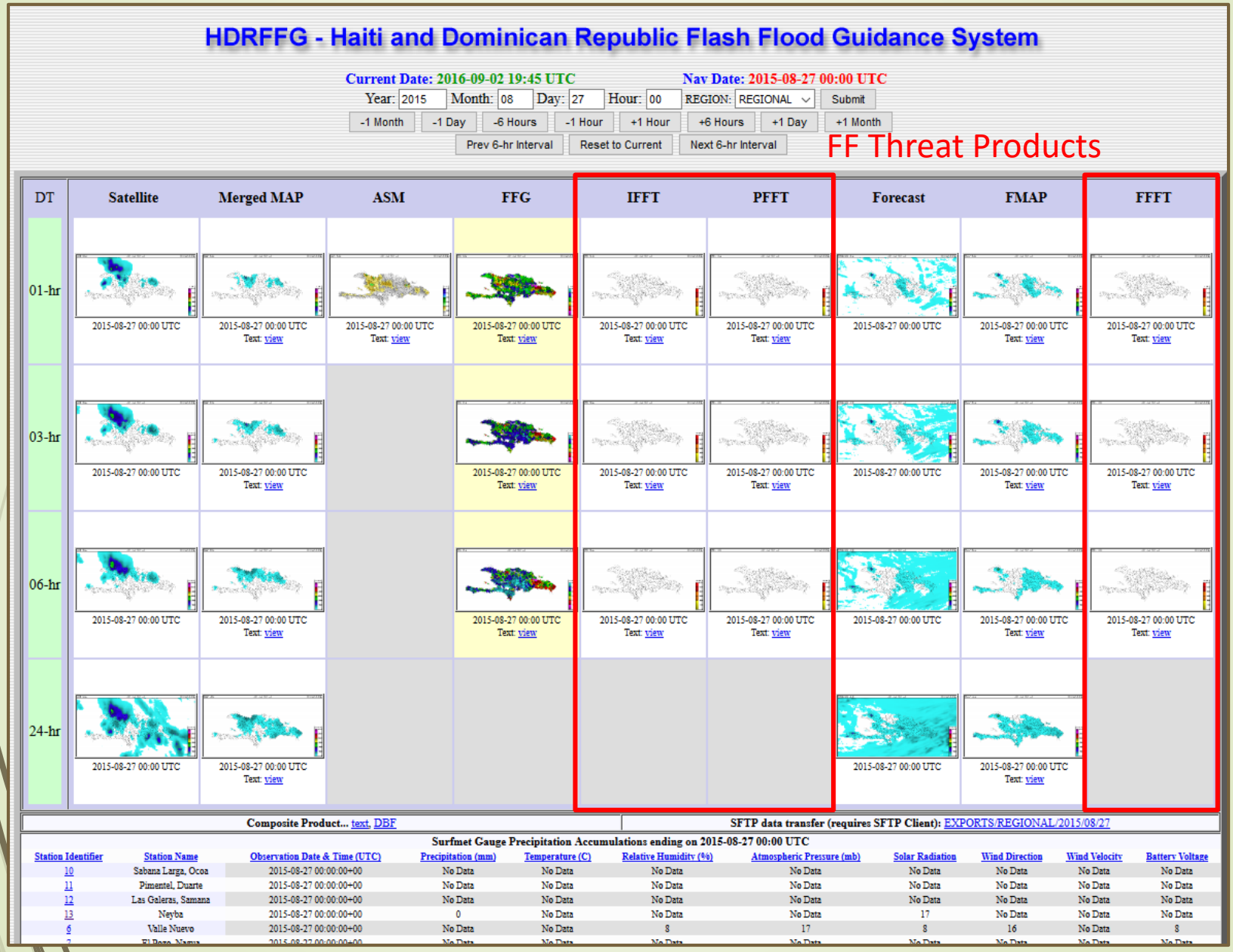
FMAP: How much rain is forecasted



Flash Flood Threat (FFT) Products

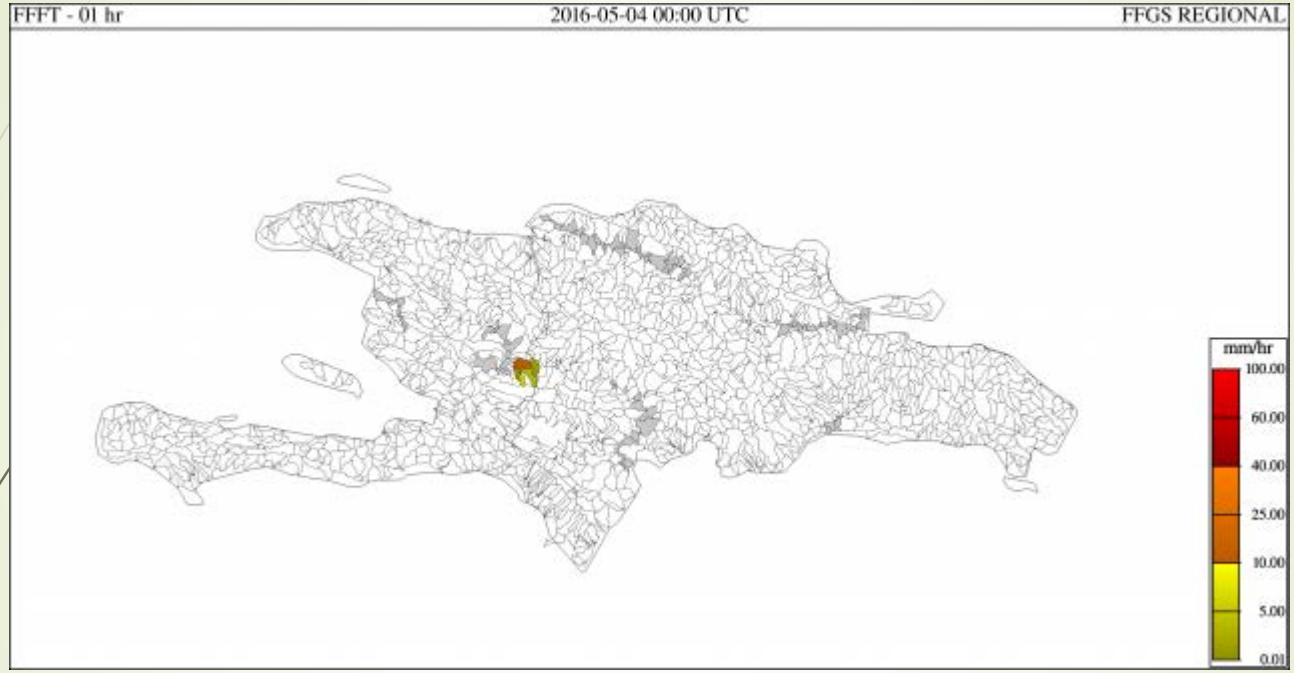


HDRFFG (v.0) System Products



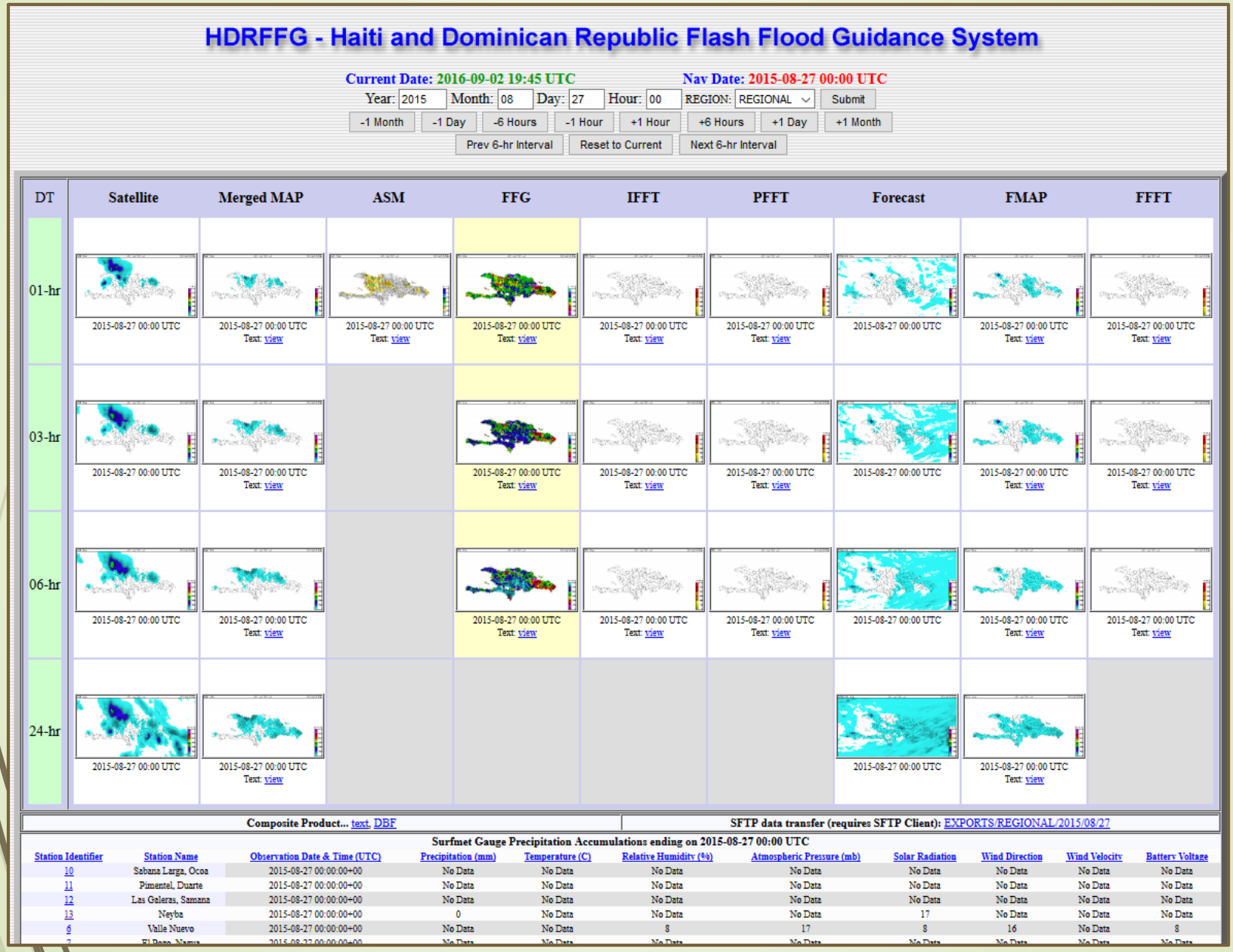
HDRFFG (v.0) System Products

Flash Flood Threat – Necessary Cautions



FFT products are an automated, system calculation of the difference between FFGs and MAPs for appropriate durations and times. This are *not* intended as a warning product! *The role of the operational forecaster in assessing the current situation (observed and forecast precipitation) is **critical**.*

HDRFFG (v.0) System Products



Prior HDRFFG Project Training

Two prior training sessions held which focused on use of the HDRFFG System by operational hydrometeorological forecasters.

27-29 Aug 2013: Hosted by ONAMET, Dominican Republic

- 22 participants from several agencies: ONAMET (Oficina Nacional de Meteorologia), CAASD (Corporacion de Acueducto y Alcentarillados), EGEHID (Emprese de Generacion Hidroelectrica), INAPA (Instituto Nacional Agua Potable y Alcantarillados), INDRHI (Instituto Nacional de Recursos Hidraulicos), and SGN (Servicio Geologico Nacional)

24-26 Jun 2015: Hosted by CNM, Haiti

- 14 participants from CNM (Centre National de Meteorologie) and SNRE (Service National des Ressources en Eau)

HDRFFG Under WMO GFFGS Programme

- Establishment of Regional Center to support HDRFFGS
- Re-establish communication of real-time data
- Update HDRFFG System software to current WMO standard
  - GHE, MWGHE precipitation estimates
  - Potential for ingest of forecast precipitation from multiple models (as available)
- Training support under Flash flood Guidance System Hydrometeorologist Training Program

Haiti-Dominican Republic Flash Flood Guidance Project

Image from floodlist.com

for your kind attention