

NOAA-HRC Partnership in Flash Flood Forecasting

Robert J. Kuligowski, NOAA/NESDIS Center for Satellite Applications and Research, Camp Springs, MD (Bob.Kuligowski@noaa.gov)
Konstantine P. Georgakakos and Robert Jubach, Hydrologic Research Center, San Diego, CA (KGeorgakakos@hrc-lab.org, RJubach@hrc-lab.org)

Background

The Flood Problem

- Floods and flash floods are one of the most costly natural disasters worldwide. According to the UN International Flood Initiative:
 - Affects > 520 million people/year on average
 - Average of 25,000 deaths/year
 - Average annual damages of US \$50-\$60 billion
- We can't prevent most floods, but improved warning can significantly reduce human and economic consequences!

Sources of Rainfall Information

- Timely rainfall information is critical for issuing flood forecasts with enough lead time to take action.
- Sources:
 - Gauges—most accurate, but very sparse even in highly developed countries, allowing many significant rain-producing storms to evade detection
 - Radar—good accuracy and excellent coverage near radar units, but requires deployment of many units for complete coverage—expensive
 - Satellite—good accuracy for many heavy rain events, global coverage, requires much less resources than gauges or radar
- Satellite is not a “cure-all”, but a highly valuable complement to other sources of rainfall information.

The Hydro-Estimator

- Produces estimates of rainfall every hour (soon to be for every new routine satellite image—every 15 to 60 min in most places).
- Global coverage—60°S to 60°N (Figure 1).
- Available within 3 h; soon to be 30 min.
- Used by US and a number of other national meteorological services for operational forecasting.

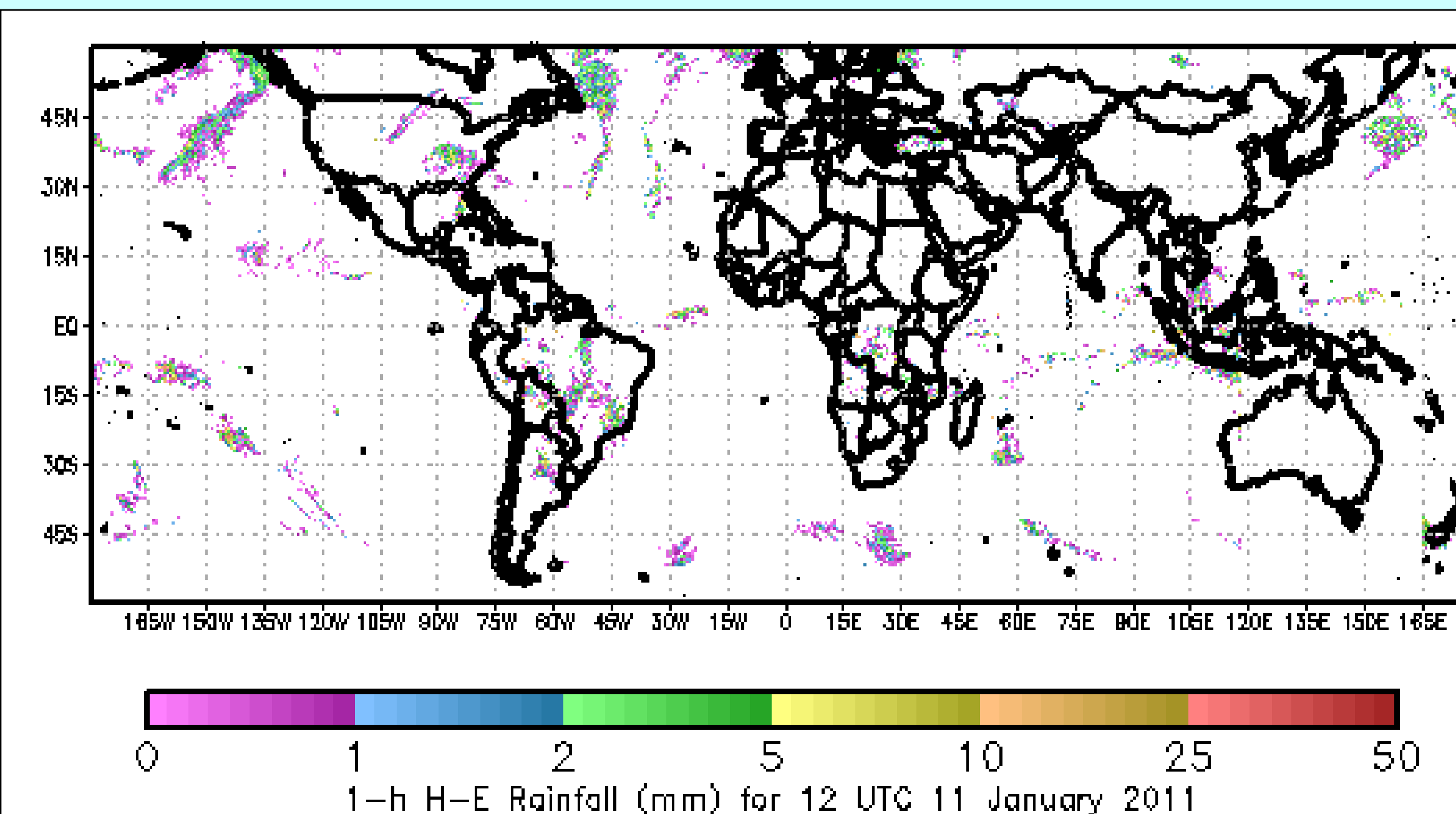


Figure 1. Sample Hydro-Estimator rainfall field.

How the Partnership Works

The Flash Flood Guidance Partnership

- Collaboration between NOAA and the Hydrologic Research Center (HRC) to provide Flash Flood Guidance (FFG) systems for different parts of the world is supported by a MOU among NOAA, HRC, WMO, and USAID.
- NOAA provides satellite rainfall estimates for a HRC-developed forecasting tool used by in-country weather services to identify regions of flash flood risk.
- Currently and nearly operational systems (including some radar-driven) cover close to 10% of the world's population (Figure 2).

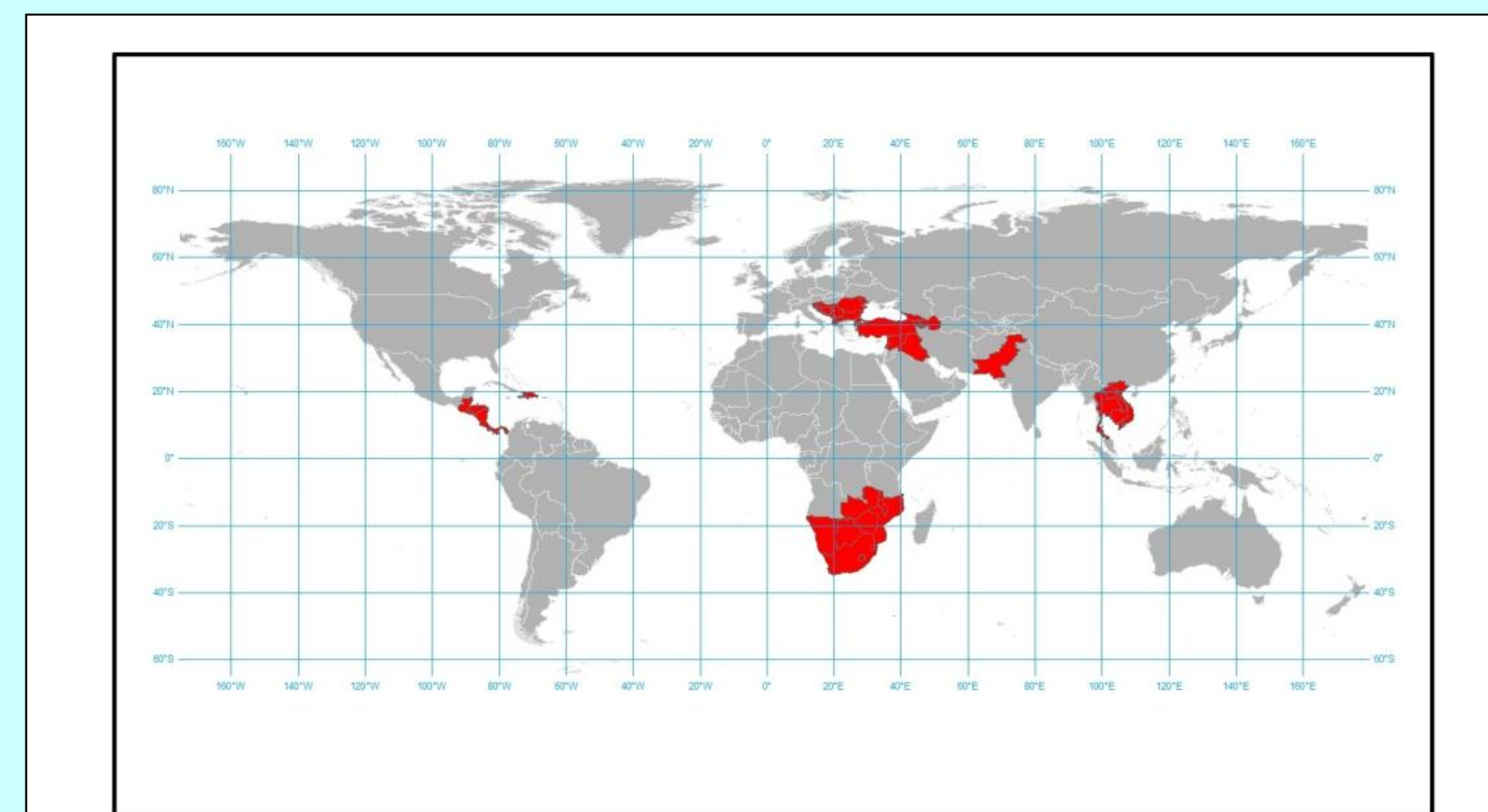


Figure 2. Coverage of current and planned Flash Flood Guidance systems.

How It Works

- A hydrologic model developed at HRC uses past rainfall, ground cover and soil information, channel geomorphologic information and topography to determine the amount of rainfall over a given time period that is adequate to initiate flash flooding.
- These threshold values are then compared in real time to estimates of rainfall from the Hydro-Estimator (bias-corrected by available raingauge data) to identify regions at risk for flooding (Figure 3).
- NOT a full hydrograph forecast—just a forecast of flood risk.

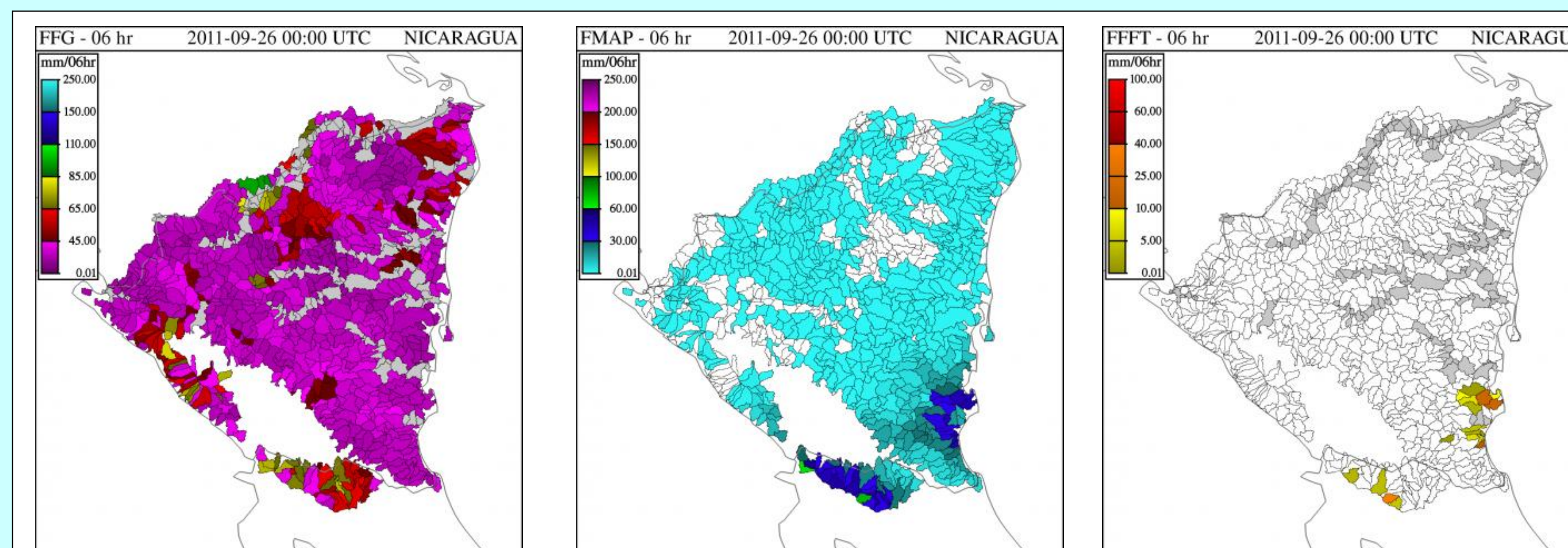


Figure 3. Example of how Flash Flood guidance works over Nicaragua: flash flood guidance amounts (left) are compared with estimated rainfall (center) to identify regions of flash flood risk (right).

Basic Implementation Steps

- Identify interested regions and secure necessary partnerships and support.
- Implement the “nuts-and-bolts” of the system: computer hardware and software, parametric databases, and communications (for both data ingest and forecast dissemination).
- Provide training on how to maintain the system and use its output in operational forecasting.

Success Stories

Namibia

- February/March 2011—heaviest rainfall in many areas in >120 years of records caused extensive flooding, most notably in normally dry areas.
- Satellite rainfall estimates used extensively in Namibia Hydrological Service (NHS) bulletins—very positive feedback from NHS.

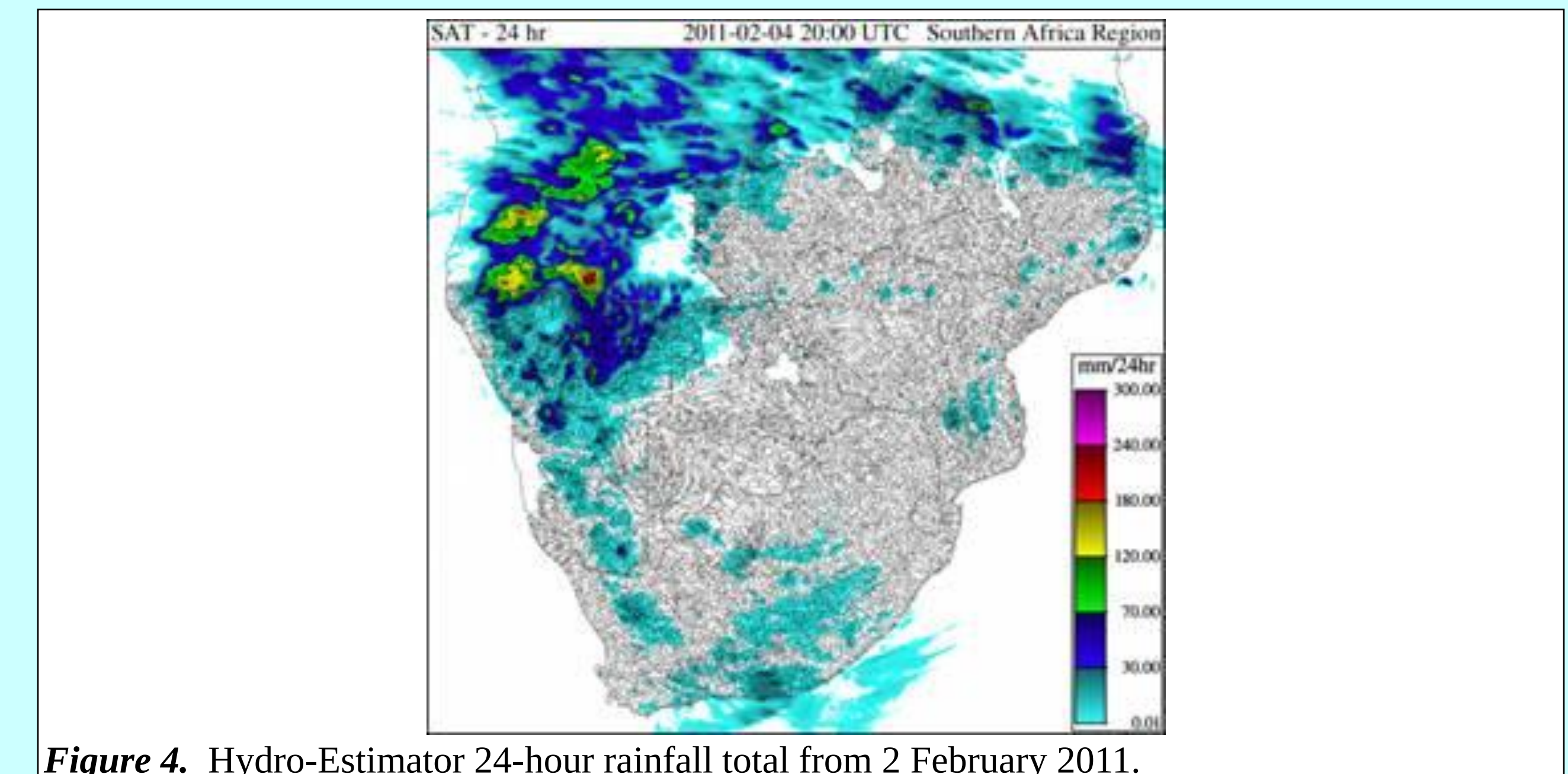


Figure 4. Hydro-Estimator 24-hour rainfall total from 2 February 2011.

Thailand

- March 2011—heavy monsoon rains in southern Thailand produced floods that affected 286,000 people.
- The Mekong River Commission (MRC) did not have direct responsibilities in many of the affected regions but did use the products to monitor the situation and update their public website. Feedback was very positive.

Haiti

- November 2010—heavy rain and flooding from Hurricane Tomas.
- Flash Flood Guidance products routinely were provided to the Haiti Meteorological Service, Météo-France, USAID / OFDA, U. S. Army SOUTHCOM, WMO, and the UN Development Program.
- Very positive feedback, including use of products by SOUTHCOM for humanitarian assistance / disaster relief planning.

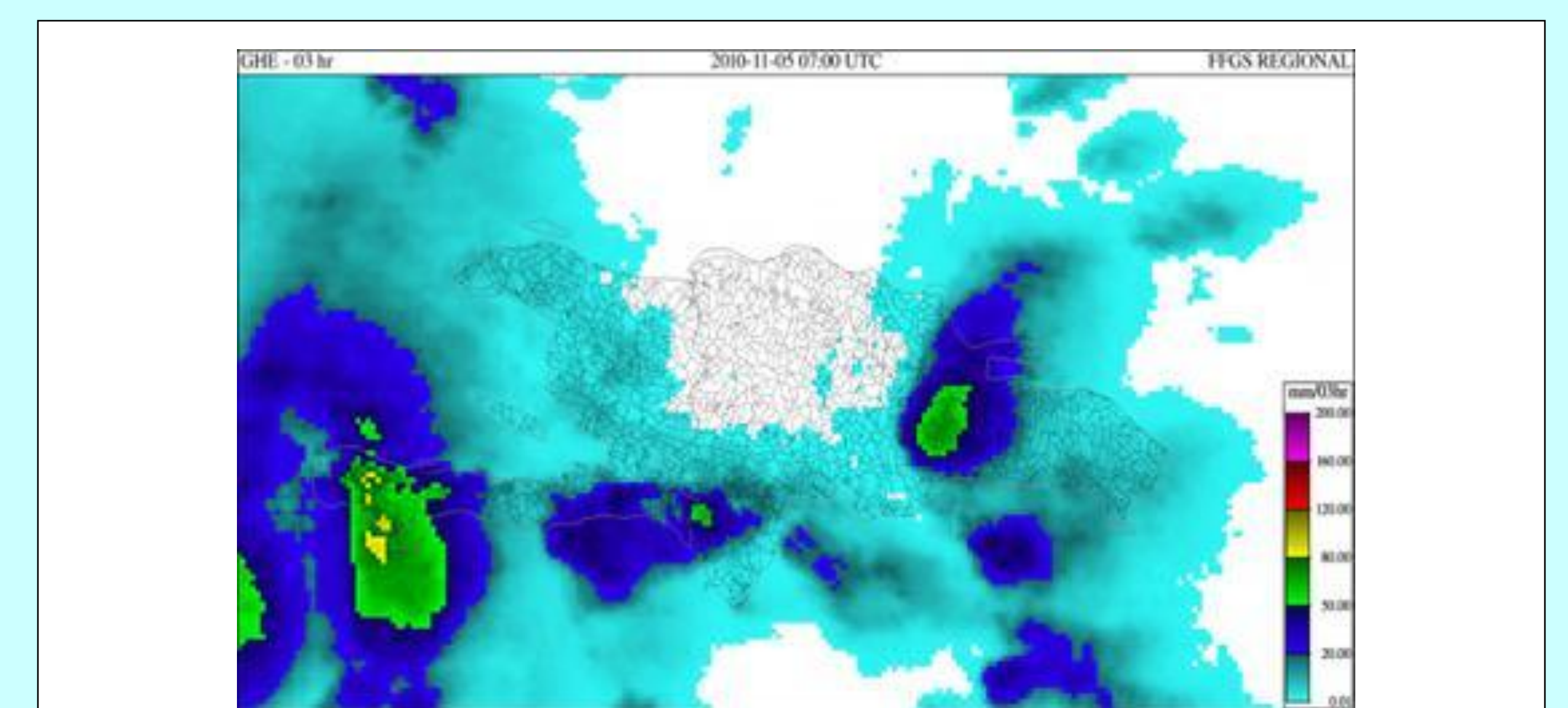


Figure 5. Hydro-Estimator rainfall total for the 3 hours ending 7 UTC 5 November 2010.