



TRMM-based Flood Monitoring Tools



Objective

To provide an overview of TRMM-based heavy rainfall detection and flood monitoring tools

Outline

- Review of TRMM and Multi-satellite Precipitation Analysis (TMPA)
- Overview of Current Heavy Rain, Flood and Landslide Estimates
- Overview of Extreme Rainfall Detection System 2 (ERDS2)
- Global Disaster Coordination and Alert System - Global Flood Detection System (GDACS-GFDS)
- Global Flood Monitoring System (GFMS)

Review of TRMM and Multi-satellite Precipitation Analysis (TMPA)

TRMM Multi-satellite Precipitation Analysis (TMPA)

Combination of TRMM - TMI, PR, VIRS with passive microwave, infrared and visible measurements available from national and international satellites provides rainfall data with --

Temporal Resolution : 3-hourly
Spatial Resolution: 0.25°x0.25°
Spatial Coverage: Global 50°S to 50°N

Available in Near-real time data and also gauge-calibrated research quality version with ~ 3-month latency

TMPA is available in near-real time and will be replaced by GPM –based near-real time rainfall data in 2016

TRMM Multi-satellite Precipitation Analysis (TMPA)

TMPA is used in a number of flood monitoring tools:

- Overview of Current Heavy Rain, Flood and Landslide Estimates
- Overview of Extreme Rainfall Detection System 2 (ERDS2)
- Global Disaster Coordination and Alert System - Global Flood Detection System (GDACS-GFDS)
- Global Flood Monitoring System (GFMS)

Overview of Current Heavy Rain, Flood and Landslide Estimates

http://trmm.gsfc.nasa.gov/publications_dir/potential_flood_hydro.html

TRMM Tropical Rainfall Measuring Mission 

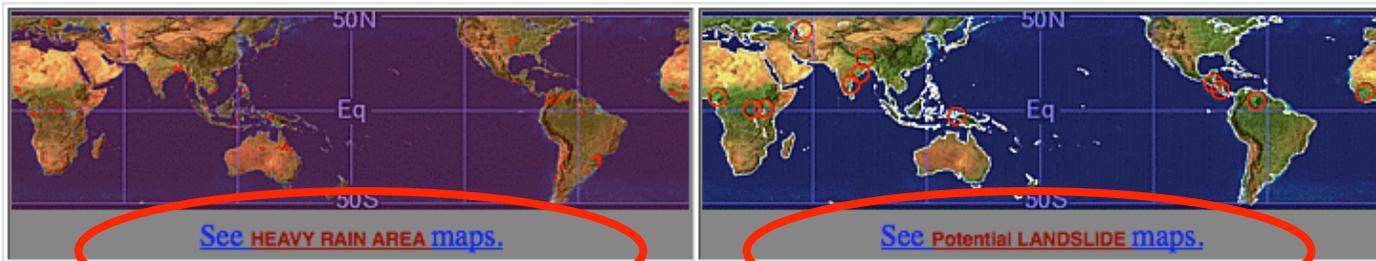
+ ABOUT TRMM + NEWS + PUBLICATIONS + SEARCH + CONTACTS + DATA + IMAGE POLICY

Current Heavy Rain, Flood and Landslide Estimates

(Rain information from Real-Time TRMM Multi-Satellite Precipitation Analysis [TMPA/3B42])

22 NOV 2013 1800 UTC

(Observation Time of Last Data Processed)

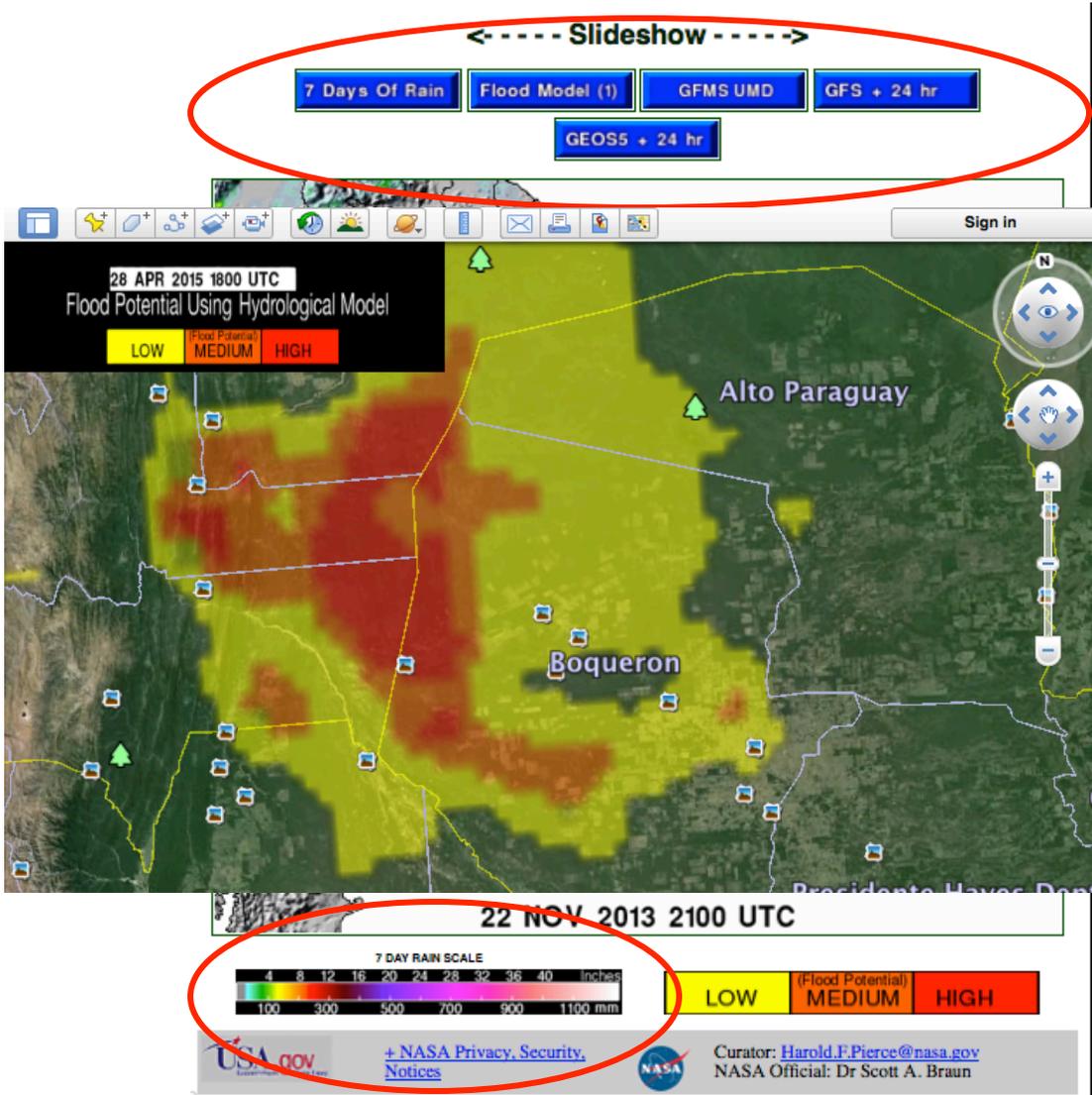


Click on the maps below for **regional displays** with more information



potential_flood.html

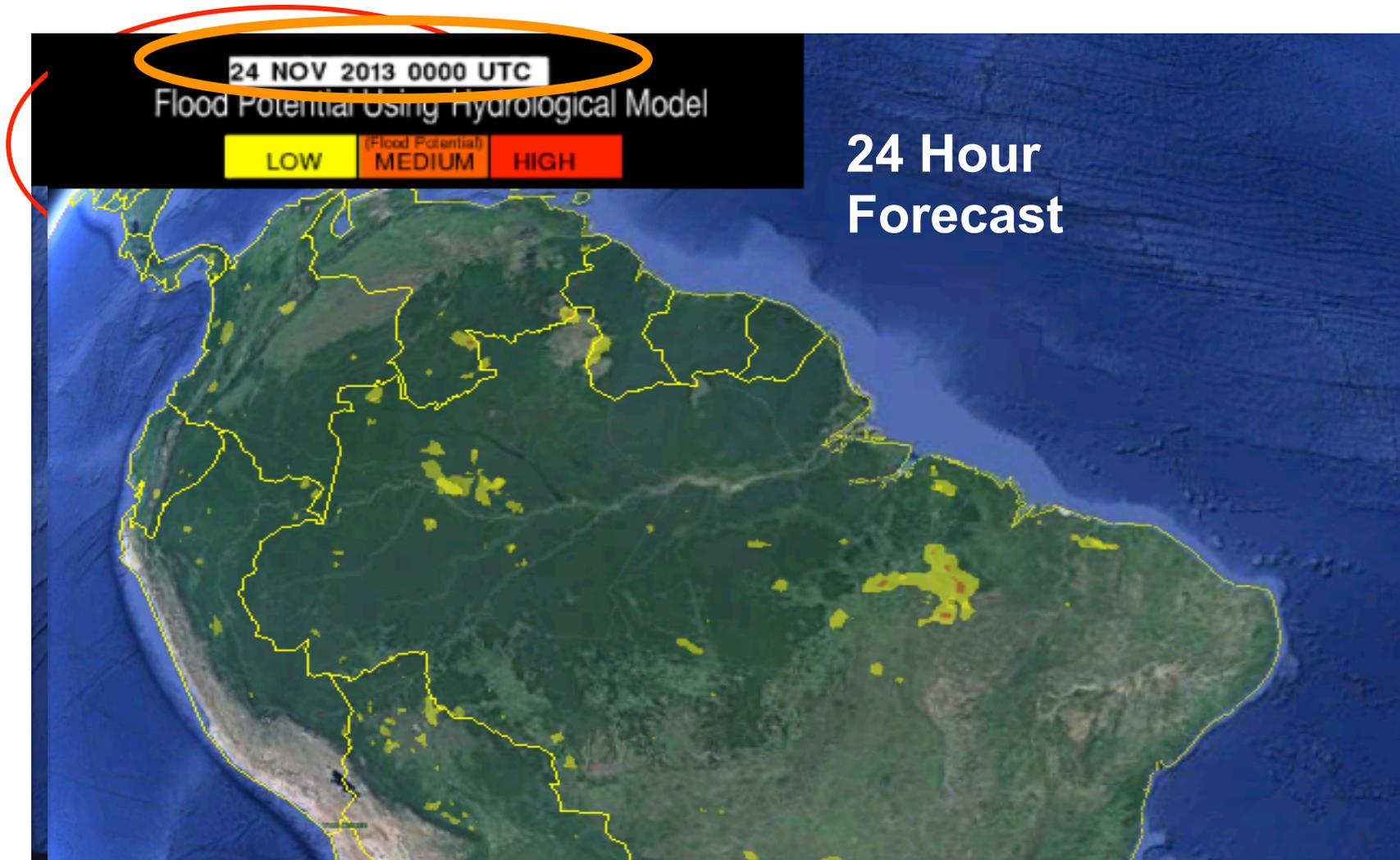
http://trmm.gsfc.nasa.gov/publications_dir/potential_flood_hydro.html



Provides global maps (50°S-50°N) of:

- Heavy rain
- Accumulated rain over 24, 72 and 168 hours
- Potential Landslide
- Flood Potential

http://trmm.gsfc.nasa.gov/publications_dir/potential_flood_hydro.html



Maps available on Google Earth

Extreme Rainfall Detection System (ERDS)

<http://erds2.ithacaweb.org/>

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MISSION AND COMPETENCES

<http://erds2.ithacaweab.org/>

Provide scientific analysis and services to the WFP and the broader humanitarian community in support of environmental emergencies for disaster preparedness and response



1. remote sensing
2. hydrology
3. meteorology
4. cartography
5. GIS

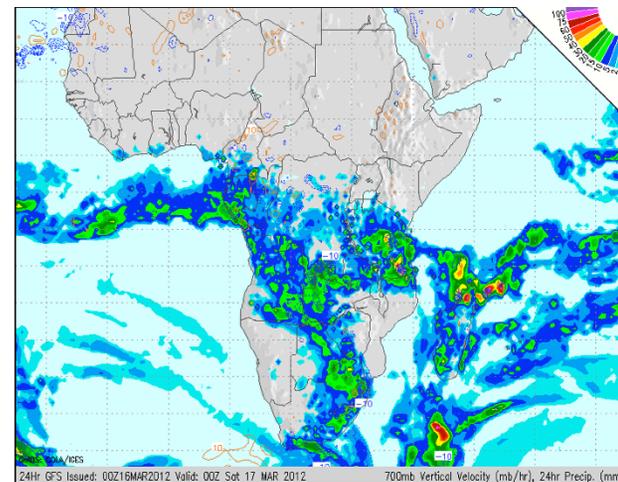
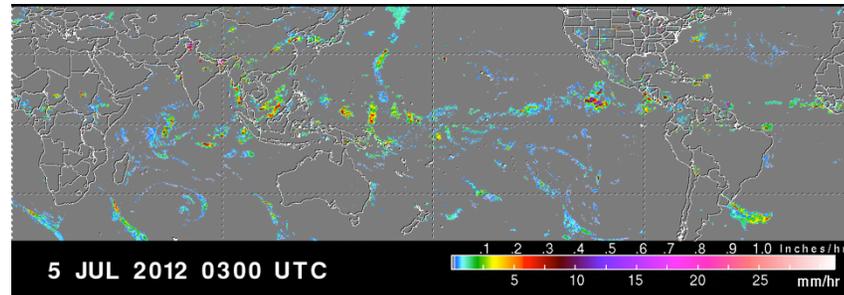
ERDS – Extreme Rainfall Detection System

The **Extreme Rainfall Detection System (ERDS)** is a service aimed at providing **timely** and **easy to understand alerts** related to **exceptional rainfalls** and **potential flood events** at global scale.

INPUT DATA

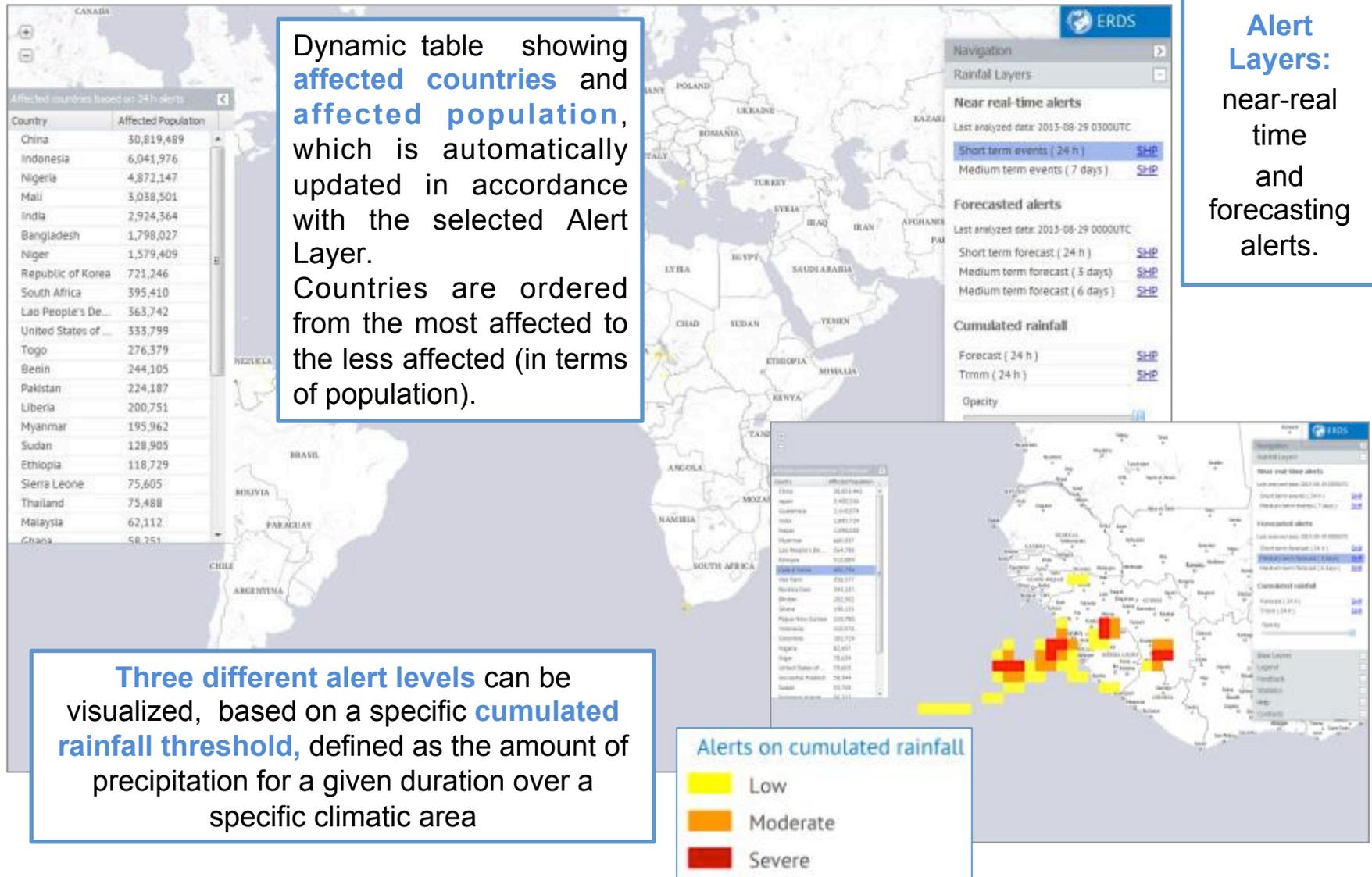
1. Tropical Rainfall Measuring Mission (TRMM) Multisatellite Precipitation Analysis (TMPA) necessary for the **near-real time detection** of heavy rainfall (**0.25° spatial resolution**)
2. NOAA-GFS (Global Forecast System) deterministic model necessary for **forecasted precipitation alerts** (**0.5° spatial resolution**)

OPEN SOURCE DATA



OUTPUTS

<http://erds2.ithacaweb.org/>



Global Disaster Coordination and Alert System - Global Flood Detection System (GDACS-GFDS)

Global Flood Detection System

<http://www.gdacs.org/flooddetection/>

An experimental system to detect and map in near-real time major river floods based on daily passive microwave satellite observations. The purpose is to identify and measure floods with potential humanitarian consequences.

Home

Current floods

Global map

Search areas

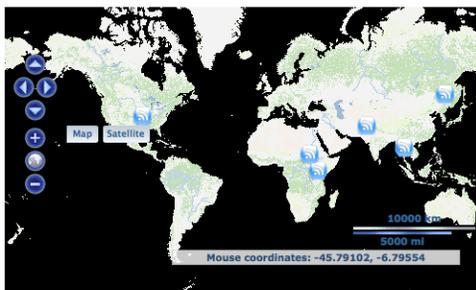
Custom areas

Regions

Download

About

The Global Flood Detection System monitors floods worldwide using near-real time satellite data. Surface water extent is observed using passive microwave remote sensing (AMSR-E and TRMM sensors). When surface water increases significantly (anomalies with probability of less than 99.5%), the system flags it as a flood. Time series are calculated in more than 10000 monitoring areas, along with small scale flood maps and animations.



GFDS currently monitors around 10000 areas, defined in collaboration with [partners](#). For these areas, the flood signal is further processed to generate time series, flood maps and flood animations. See a full list of [current floods](#) or [search for areas](#) by river, country or name.



All data are available as global raster maps. The brightness temperature measured by AMSR-E and TRMM sensors is normalized into a water signal (showing the amount of surface water in each pixel). For each pixel, anomalies in surface water are calculated by comparing the values to the normal surface water (see methodology). The flood magnitude is defined as the number of standard deviations above the mean.



We're open for collaboration with water authorities and researchers. You can [request](#) access to the data, [download client software](#) or set up your own monitoring sites.

Full map view

Dfo | Emm | Floods

- Site 100119 in Bolivia (on river), (12.0431828391734; Magnitude detected); Near Escoma
- Site 12173 in China (on river Brahmaputra) (11.4937393758129; Magnitude detected); Site 11756 (River Brahmaputra)
- Site 2393 in New Zealand (on river Rangitikei) (10.1269463453337; Magnitude detected); Site 2402 (New Zealand)
- Site 1511 in Kenya (on river Nzoia) (8.833333333333333; Magnitude detected); Site 1520 (Kenya)
- Site 12165 in China (on river Brahmaputra) (8.34496401950551; Magnitude detected); Site 11748 (River Brahmaputra)

- Information about current floods
- Global flood maps
- Data Download
- Interactive Maps

Global Flood Detection System

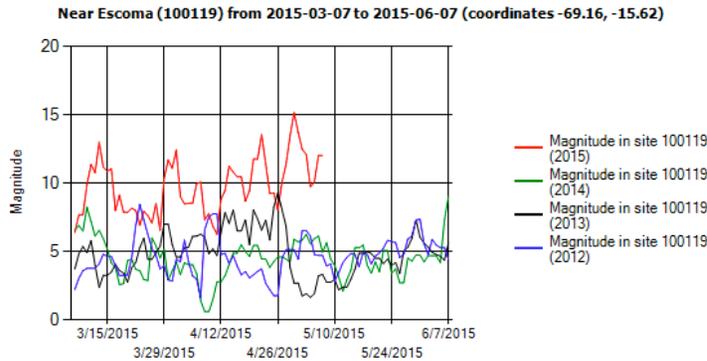
<http://www.gdacs.org/flooddetection/>

Flood Detection and River Discharge Based on TRMM TMI and GCOM-W Brightness Temperatures (Similar to the FDO)

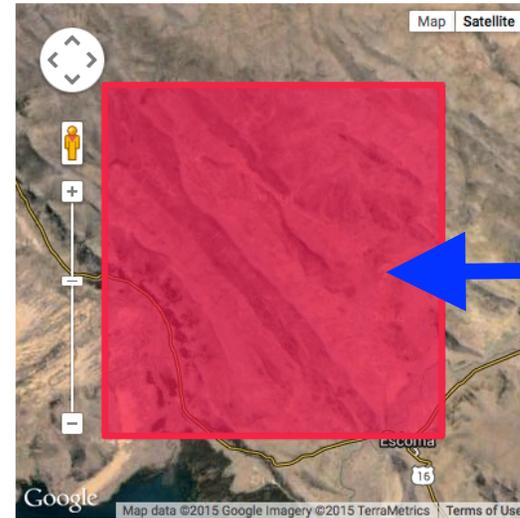
Current Status Data Maps and animation Graphs

Current Data

The flood magnitude is a measure of the size of the flood. Since lower signals generally accounts for increased water coverage, extreme events, or major floods, should represent anomalies in the time series of a given site. The reference value for normal flow is calculated as the average signal for the site since June 2002. Flood magnitude is defined as the number of standard deviations (sd) from the mean (avg). [Read more...](#)



[Customize this graph](#) | Download data: [HTML](#) [RSS](#)



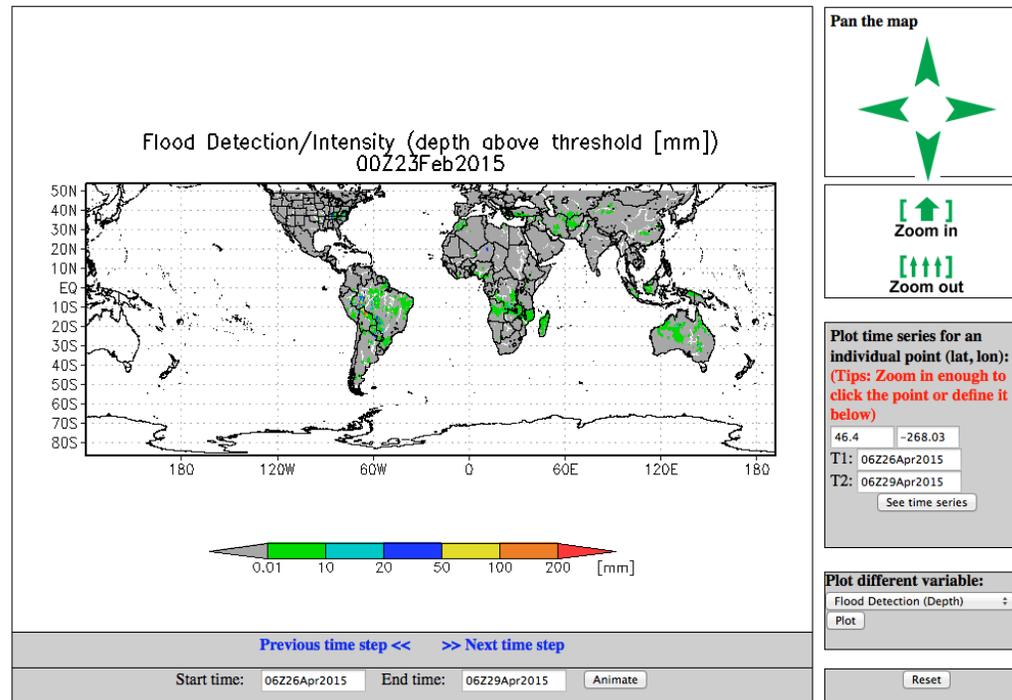
Affected Area

River Discharge

Global Flood Monitoring System (GFMS)

Global Flood Monitoring System (GFMS)

<http://flood.umd.edu>



Provides global maps, time series, and animations (50°S-50°N) of:

- Instantaneous Rain
- Accumulated rain over 24, 72, and 168 hours
- Streamflow rates and flood detection at 1/8th degree (~12 km) and also at 1 km

Global Flood Monitoring System (GFMS)

<http://flood.umd.edu>

Uses a hydrological model together with remote sensing data for flood detection

- **Inputs: TRMM and Multi-satellite Precipitation (TMPA)
Surface temperature and winds from MERRA**
- Runoff generation from U. Washington Land Surface Model (Variable Infiltration Capacity - VIC)
- Runoff routing model from the U. Maryland

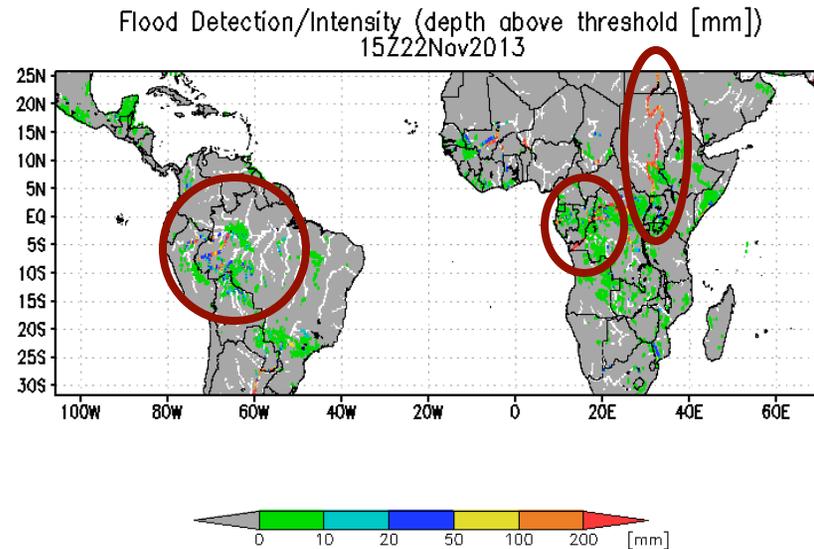
For details see:

Wu, H., R. F. Adler, Y. Tian, G. J. Huffman, H. Li, and J. Wang (2014), Real-time global flood estimation using satellite-based precipitation and a coupled land surface and routing model, *Water Resour. Res.*, 50, 2693.2717, doi:10.1002/2013WR014710.

Wu H., R. F. Adler, Y. Hong, Y. Tian, and F. Policelli (2012), Evaluation of Global Flood Detection Using Satellite-Based Rainfall and a Hydrologic Model. *J. Hydrometeor.*, 13, 1268.1284

Global Flood Monitoring System (GFMS)

<http://flood.umd.edu>

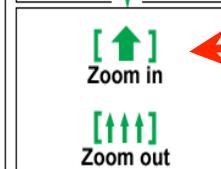
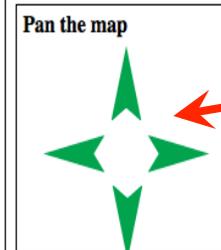
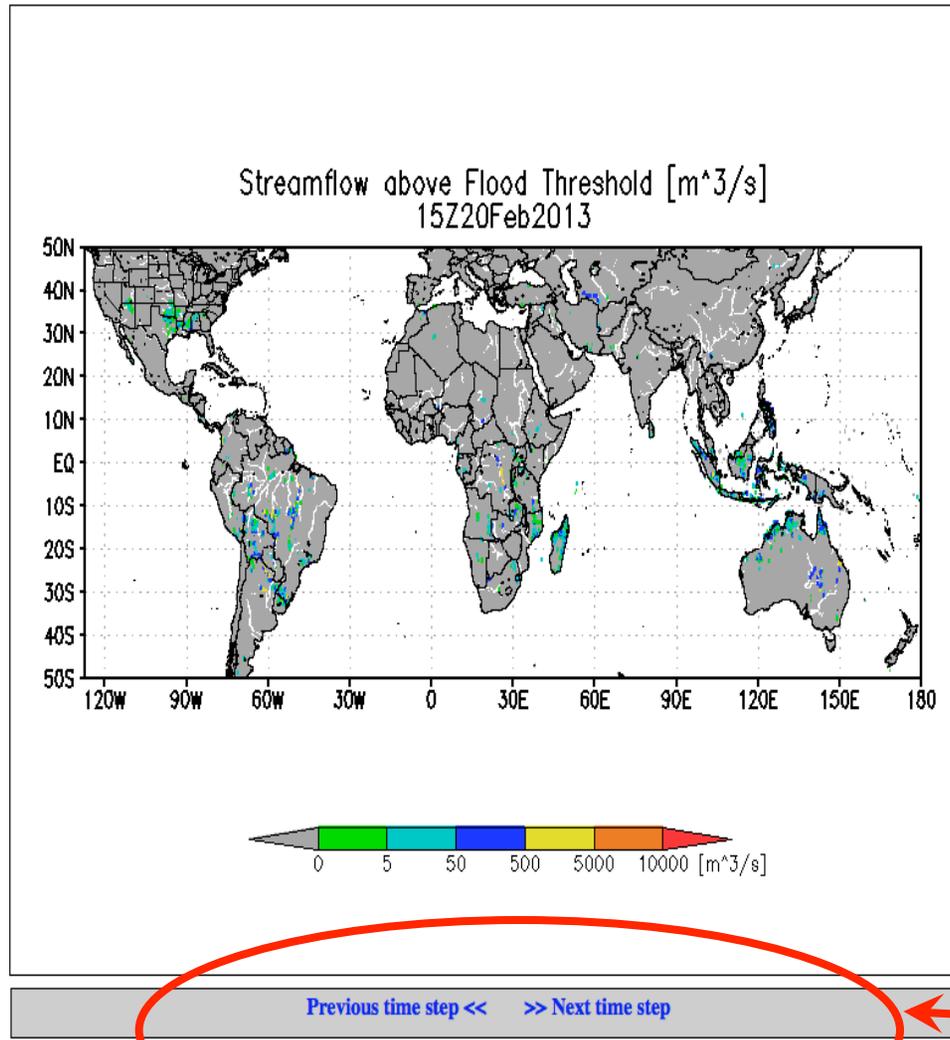


FLOOD IDENTIFICATION uses the calculated water depth (mm) relative to the Reference Level at each grid (1/8th degree)

REFERENCE LEVEL at each grid calculated from 12-year global hydrology model run using satellite rainfall data. Reference Level is 95th percentile of Routed Runoff (water depth) + factors related to basin size

Global Flood Monitoring System (GFMS)

<http://flood.umd.edu>



Plot time series for an individual point (lat, lon): (Tips: Zoom in enough to define the point)

0 26.38

T1: 15Z17Feb2013

T2: 15Z20Feb2013

See time series

Plot different variable:

Streamflow above Threshold

Plot

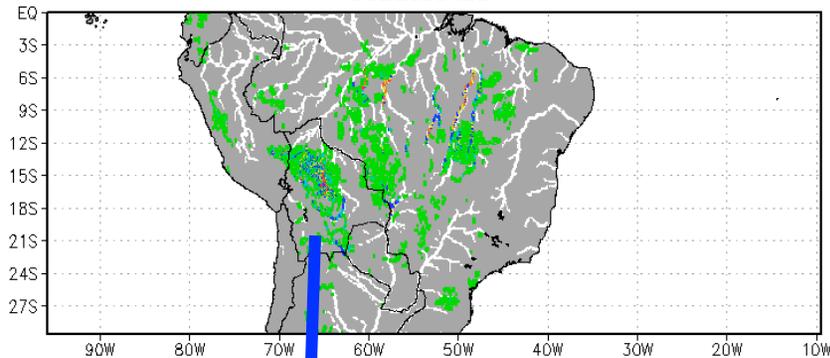
Reset

- Map navigation
- Zoom in/out
- Select individual grid point for data for time sequence
- Plot different variables
- 3-hourly output

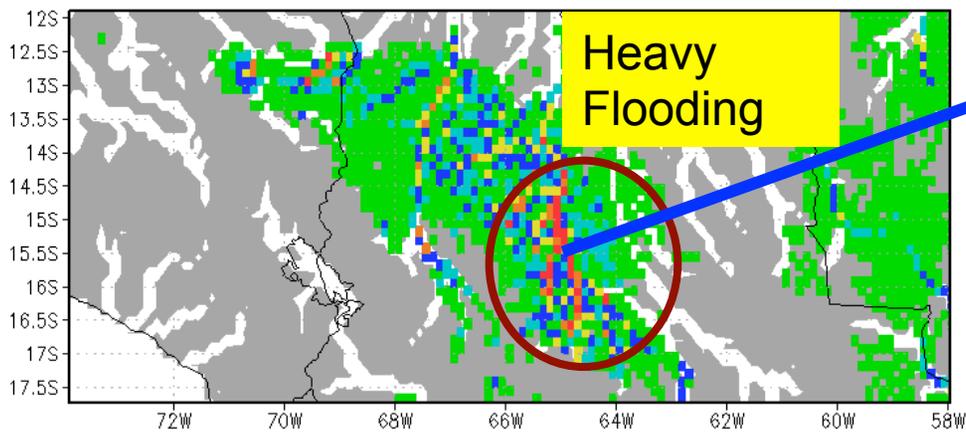
GFMS: Flood Intensity in Bolivia

26 January, 2014

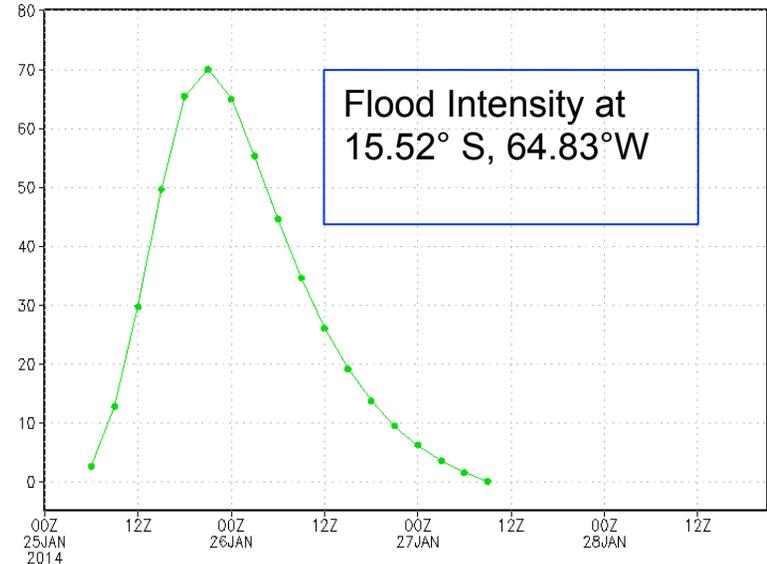
Flood Detection/Intensity (depth above threshold [mm])
06Z26Jan2014



Flood Detection/Intensity (depth above threshold [mm])
06Z26Jan2014



Flood Detection/Intensity (depth above threshold [mm])
00Z25Jan2014 21Z28Jan2014



Live Demonstration of GFMS