

Welcome to NASA Applied Remote Sensing Training (ARSET) Webinar Series

Flood Monitoring using NASA Remote Sensing Data

Course Dates: November 19, 26 December 3, 10
Time: 8-9 a.m. Eastern U.S. Time (13-14 p.m. UTC)



ARSET

Applied Remote Sensing Training
A project of NASA Applied Sciences



<http://water.gsfc.nasa.gov/>

Modules in English
and Spanish

Case
Studies

Upcoming trainings

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NASA National Aeronautics & Space Administration
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Flight Projects | Sciences and Exploration

Applied Remote Sensing Training Water Resource Management

NASA Earth Science Division | NASA Applied Sciences Program

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- Publications
- Personnel

Project Description

The goal of this NASA Applied Remote Sensing Education and Training project is to increase the utility of NASA Earth Science and model data for decision-makers and applied science professionals in the area of Water Resources Management Applications. The project conducts trainings and other capacity building activities on utilization of NASA satellite remote sensing and model data for a variety of water management applications including floods and snow related topics. Training activities are a combination of lectures and hands-on activities that teach professionals how to access, interpret, and apply NASA rainfall, snow, cloud, and atmospheric humidity products at regional and global scales with an emphasis of Case Studies. This website provides access to educational materials and regular updates on upcoming events and workshops.

If you would like more information about any of the activities and materials available on this site or to request a training please contact: Ana.I.Prados@nasa.gov

Scheduled Trainings

Webinar: NASA Remote Sensing Data for Water Resources Management

October 17 - November 14, 2013
Thursdays at 1 pm EDT (5 pm UTC)

For further Information
contact: amita.v.mehta@nasa.gov

Course is free but you must register [here](#)

▶ [Webinar Agenda - pdf, 111.69 kB:](#)

Stay Informed

If you would like to be informed of upcoming workshops and project activities please sign up for [List Serv](#).

Course Instructors

- Amita Mehta (ARSET) amita.v.mehta@nasa.gov
- Brock Blevins (ARSET) bblevins37@gmail.com

Guest Speakers Today:

- Elena Cristofori (ITHACA) ele.christofori@gmail.com
- Adriana Albanese (ITHACA) adriana.albanese@polito.it

**ITHACA: Information Technology for Humanitarian Assistance
Cooperation and Action**

Other Contributions to this Course

Spanish Translation: David Barbato (ARSET)

General Inquiries/questions about ARSET:

Ana I. Prados (ARSET) aprados@umbc.edu

Certificates of Completion (upon request):

You must attend all 4 live sessions

You must submit the homework assignments

For Webinar Recording Link :

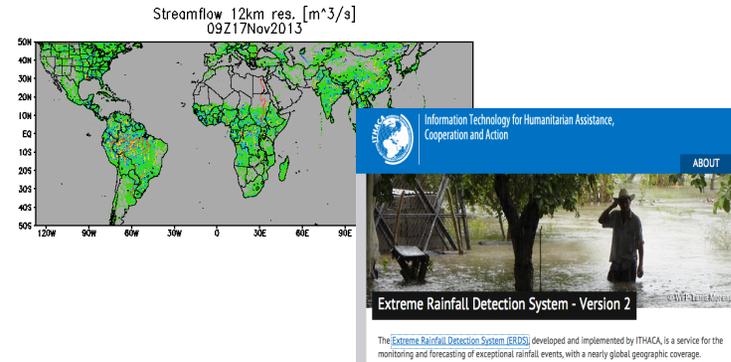
Contact : Marines Martins

Email: marines.martins@ssaihq.com

Course Outline



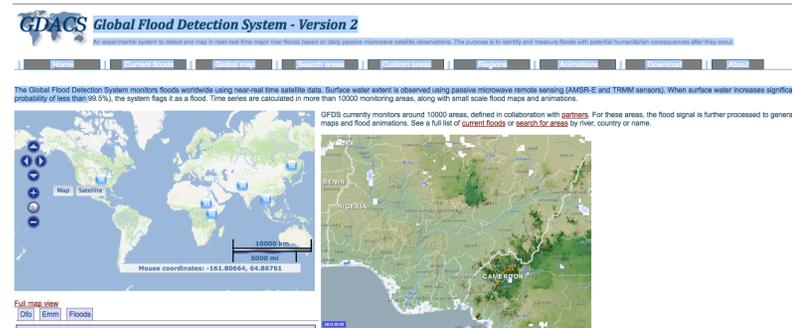
Week 1: Overview of Remote Sensing and Flooding Tools



Week 2: TRMM-based Tools - Extreme Rainfall Detection System and Global Flood Monitoring System



Week 3: MODIS-based Tools – MODIS Inundation and Dartmouth Flood Observatory



Week-4: Global Flood Detection System, multi-satellite flooding case studies with GIS

Interactive Flood Tools

- **NASA-TRMM Current Heavy Rain, Flood, and Landslide Estimates**
- **Global Flood Monitoring System (GFMS)**
- **Extreme Rainfall Detection System (ERDS)**
- Global MODIS Inundation Mapping
- Dartmouth Flood Observatory (DFO)
- Global Disaster Alert and Coordination System (GDACS)/
Global Flood Detection System (GFDS)

All the tools include Interactive Maps and Regional Sub-setting and zooming capability of flooding events

Week-2 Outline

Overview and Demonstration of Tropical rainfall measuring Mission (TRMM)-based Flooding Tools

- **Extreme Rain Detection System (ERDS)**
- **TRMM Current Heavy Rain, Flood and Landslide Estimation**
- **Global Flood Monitoring System (GFSM)**

Recall from Week-1

TRMM and MERRA Products

TRMM Multi-satellite Precipitation Analysis (TMPA)

TRMM Product Name 3B42

(Used for flood monitoring applications)

TRMM 3B42:

Combines PR and TMI rain rates

Inter-calibrates passive microwave rain rates from
SSM/I, AMSR and **AMSU-B** satellite sensors

Inter-calibrates with national and international **geostationary and NOAA low earth orbiting satellites infrared measurements** by using **VIRS**

Final rain product is calibrated with rain gauge analyses on a monthly time scale.

SSM/I: Special Sensor Microwave Imager

AMSR: Advanced Microwave Scanning Radiometer

AMSU: Advanced Microwave Sounding Unit

TMPA Surface Rain Rate Data (mm/hour)

TRMM 3B42RT : Near-Real Time

TRMM 3B42 : Adjusted with surface rain gauge measurements on monthly basis

Spatial Resolution: 0.25°x0.25° latitude-longitude

Spatial Coverage: 50° S to 50° N, Global

Temporal Resolution: 3-hourly, Daily,

Temporal Coverage: 1998 to present

Modern Era Retrospective-analysis for Research and Applications: MERRA

<http://gmao.gsfc.nasa.gov/merra/>

- Merges remote sensing and in-situ observations with the latest Earth systems models
- Weather, climate, climate variation for both research and applied decision making

MERRA Temperature, Humidity, and Wind

Surface skin and Air Temperature

Temperature Profile

East-West and North-South wind components

Humidity (Water Vapor) Profile

Spatial Resolution: $2/3^\circ \times 1/2^\circ$ latitude-longitude
and $1.25^\circ \times 1.25^\circ$, 42 vertical levels

Spatial Coverage: Global

Temporal Resolution: Hourly, Daily, Monthly

Temporal Coverage: 1979 to present

Extreme Rainfall Detection System

TRMM Current Heavy Rain, Flood and Landslide Estimates

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

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

TRMM Tropical Rainfall Measuring Mission 

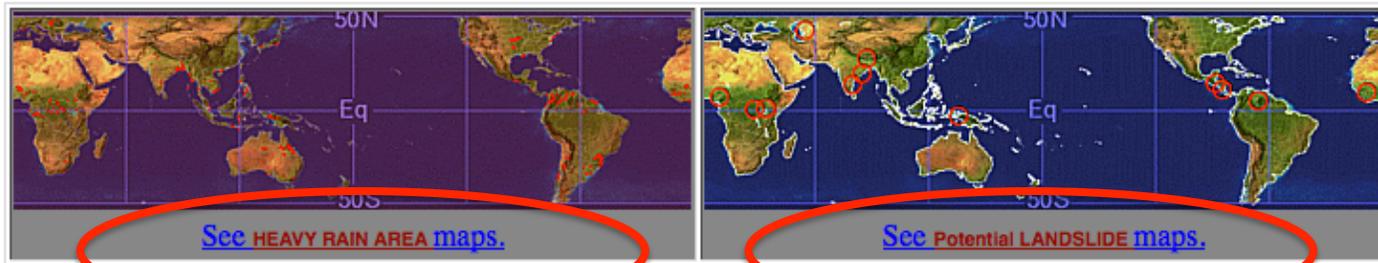
+ ABOUT TRMM + NEWS + PUBLICATIONS + SEARCH + CONTACTS + DATA + IMAGE POLICY

Current Heavy Rain, Flood and Landslide Estimates

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

22 NOV 2013 1800 UTC

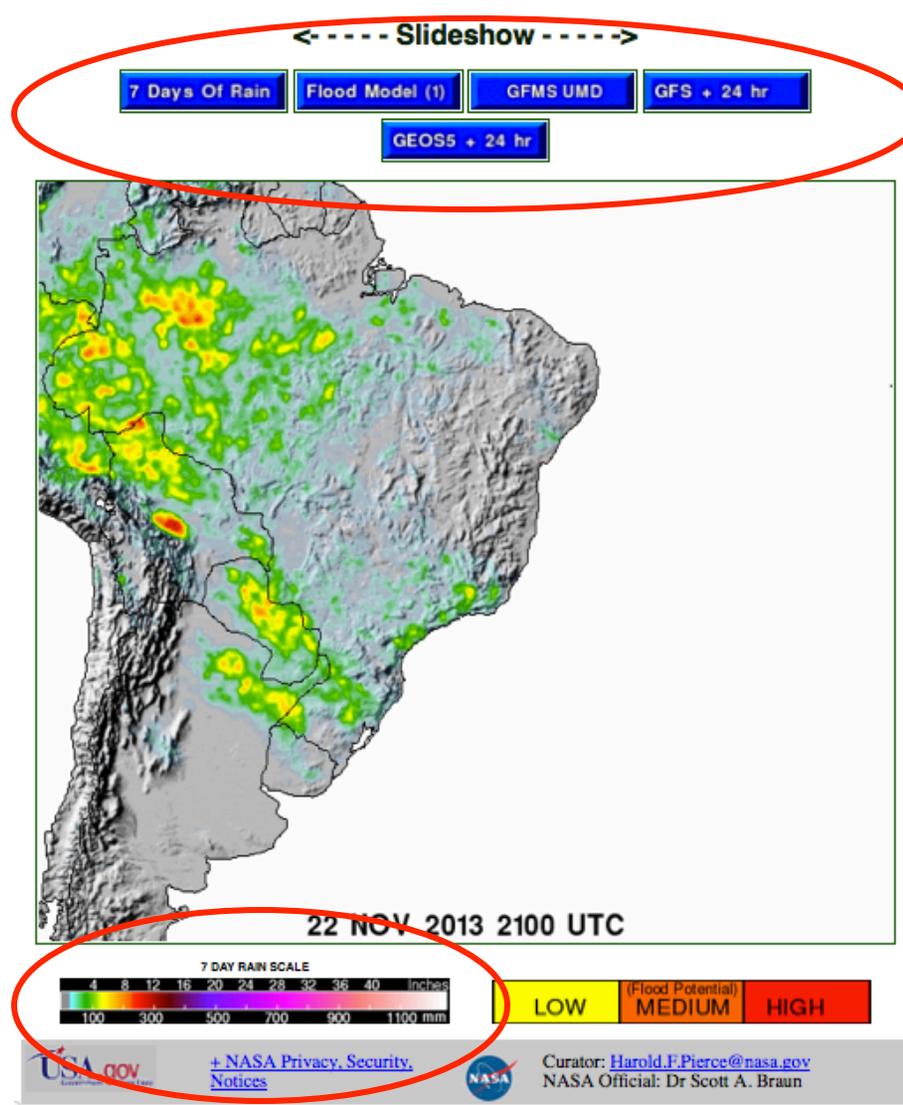
(Observation Time of Last Data Processed)



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



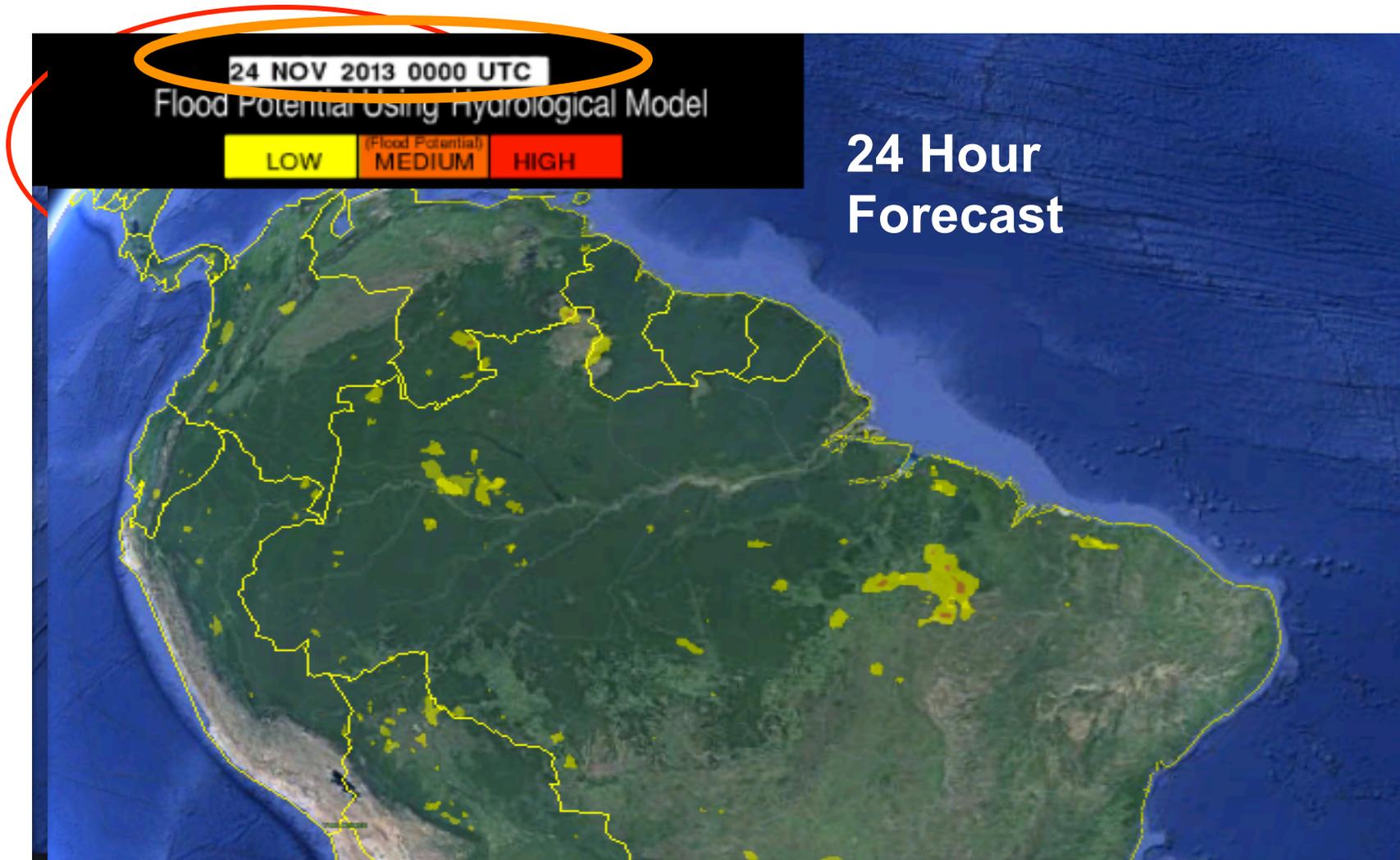
http://trmm.gsfc.nasa.gov/publications_dir/potential_flood_hydro.html



Provides global maps (50°S-50°N) of:

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

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



Maps available on Google Earth

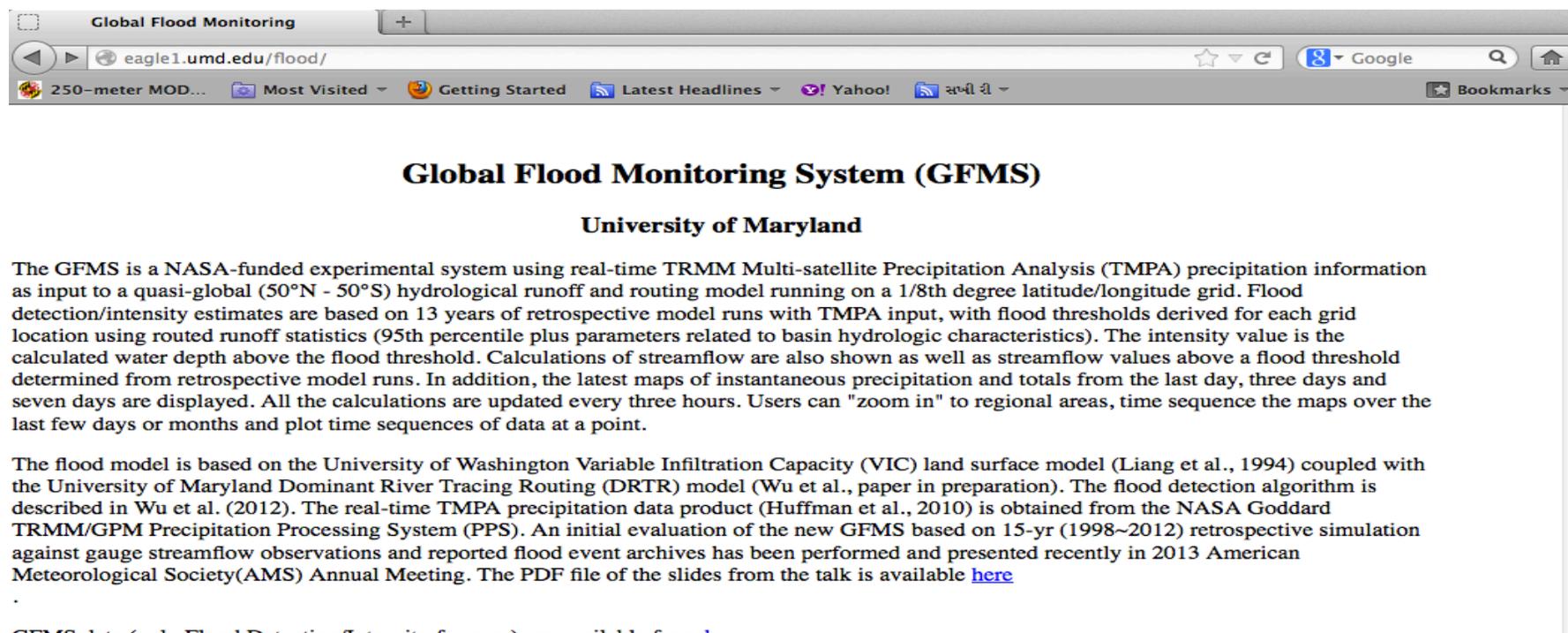
Global Flood Monitoring System (GFMS)

<http://flood.umd.edu>

From: Robert Adler, Huan Wu, Martina Ricko
University of Maryland

Global Flood Monitoring System (GFMS)

<http://flood.umd.edu>

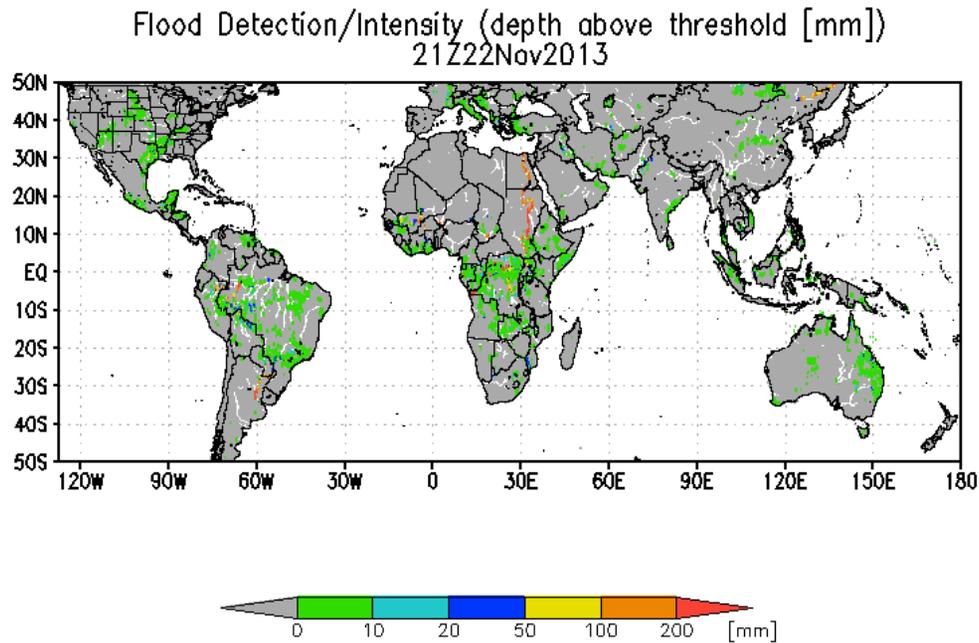


Provides global maps, time series, animation (50°S-50°N) of:

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

Global Flood Monitoring System (GFMS)

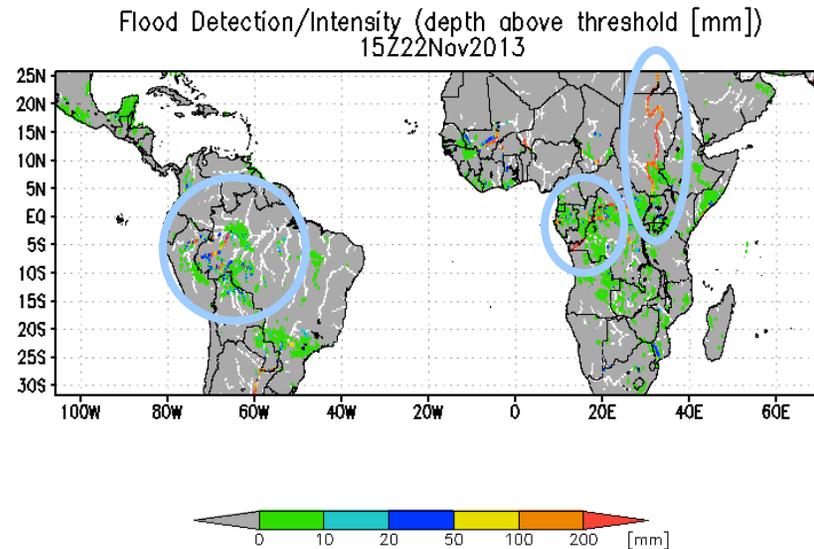
<http://flood.umd.edu>



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

Global Flood Monitoring System (GFMS)

<http://flood.umd.edu>

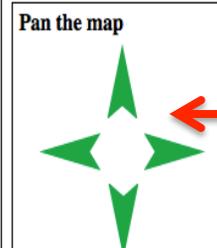
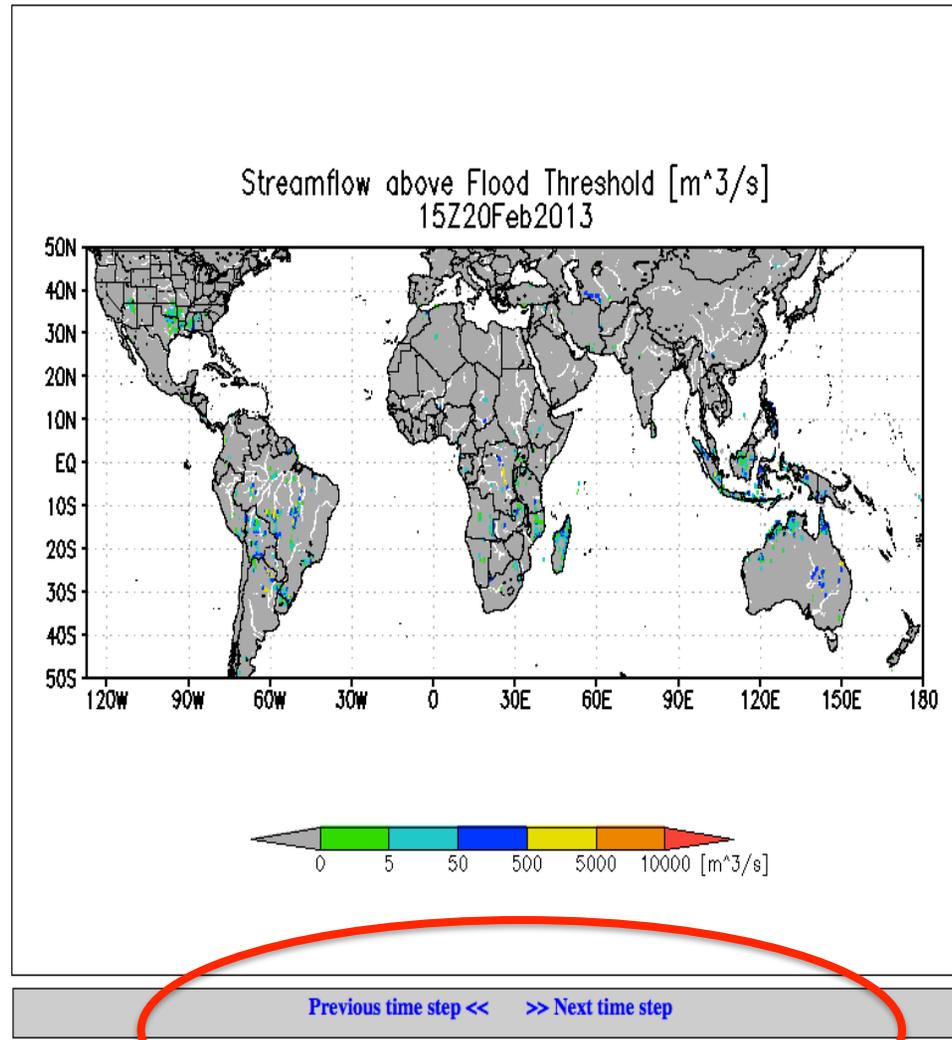


FLOOD IDENTIFICATION uses the calculated water depth (mm) relative to the Reference Level at each grid (1/8th degree)

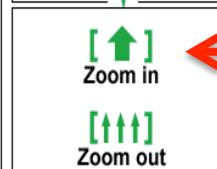
REFERENCE LEVEL at each grid calculated from 12-year global hydrology model run using satellite rainfall data. Reference Level is 95th percentile of Routed Runoff (water depth) + factors related to basin size

Global Flood Monitoring System (GFMS)

<http://flood.umd.edu>



- Map navigation



- Zoom in/out

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

- Select individual grid point for data for time sequence

Plot different variable:

Streamflow above Threshold

Plot

- Plot different variables

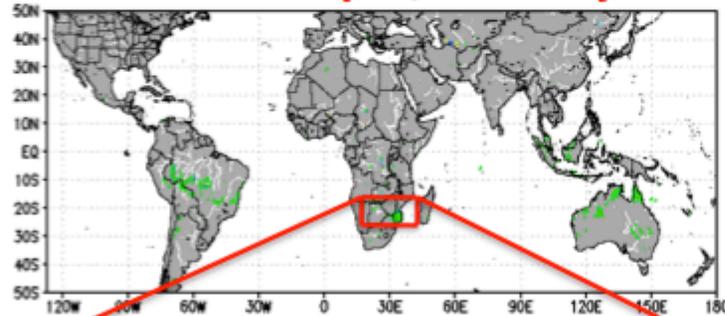
Reset

- 3-hourly output

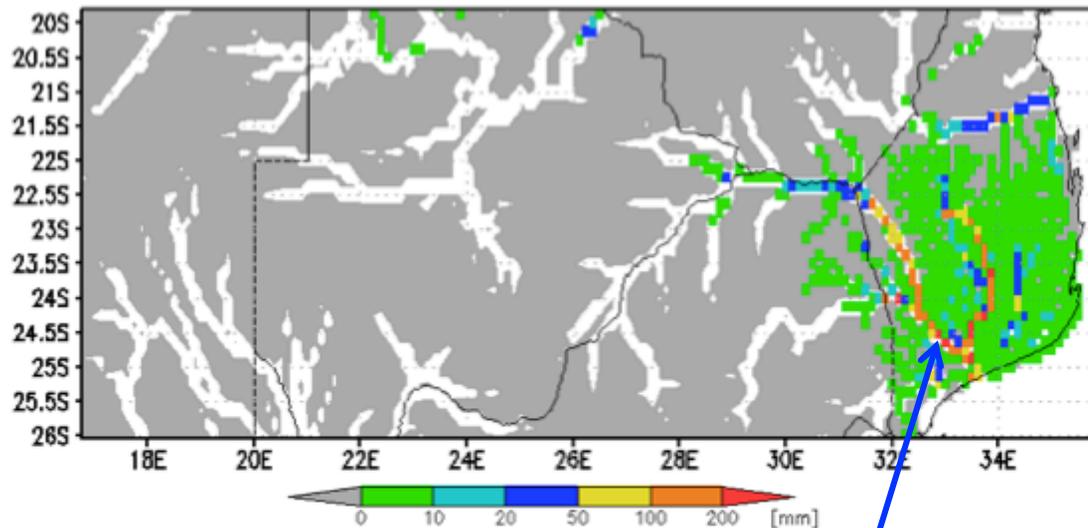
Global Flood Monitoring System (GFMS)

<http://flood.umd.edu/>

Mozambique, January 2013



Flood Detection/Intensity (Depth above Threshold [mm])



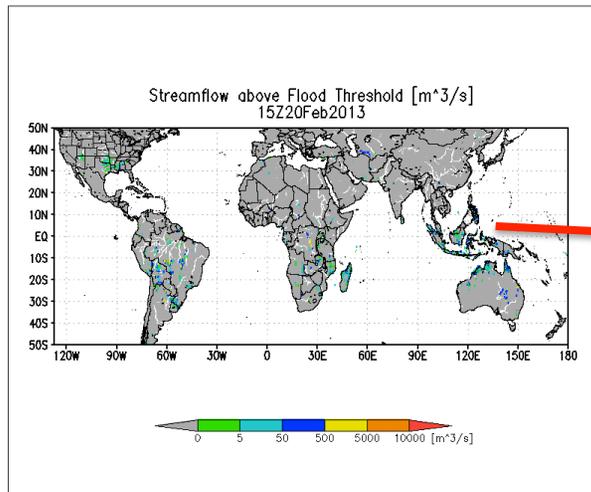
Detection of Flooding
in Mozambique

21 January 2013
12 GMT

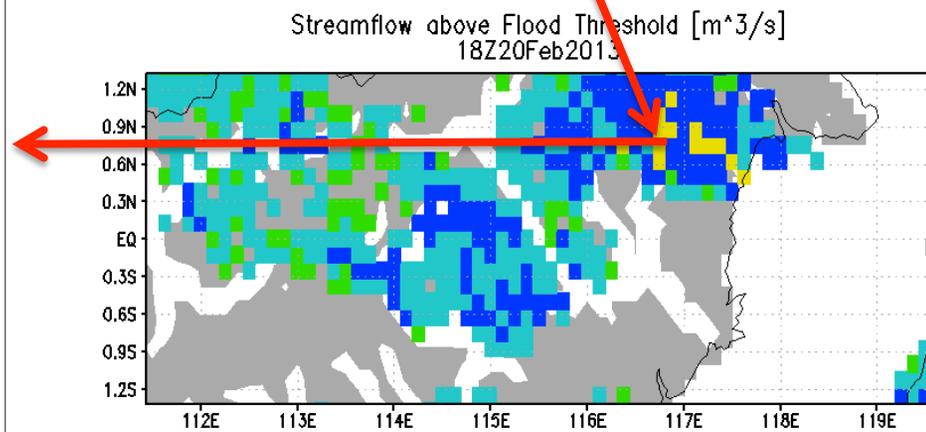
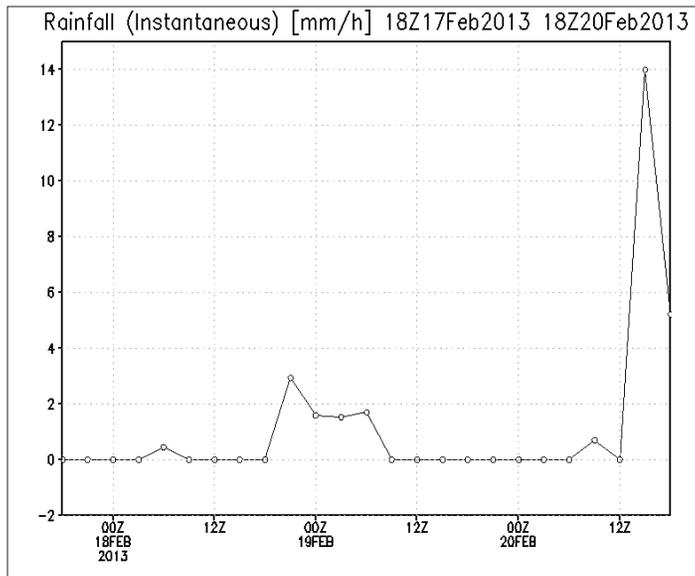
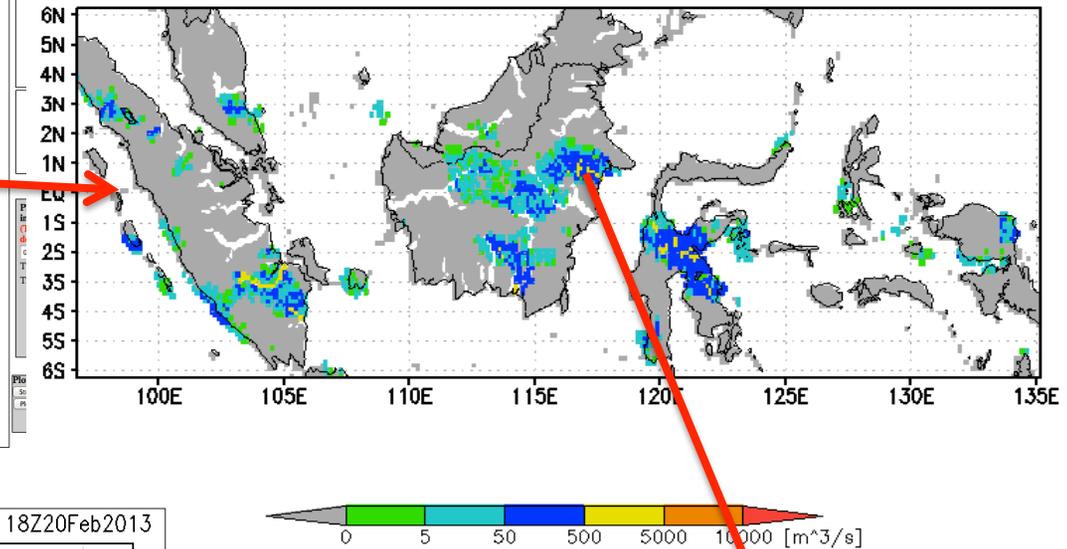
Limpopo River Flooding

Global Flood Monitoring System (GFMS)

Regional Flood Intensity over Indonesia 18 February 2013



Streamflow above Flood Threshold [m^3/s]
18Z20Feb2013

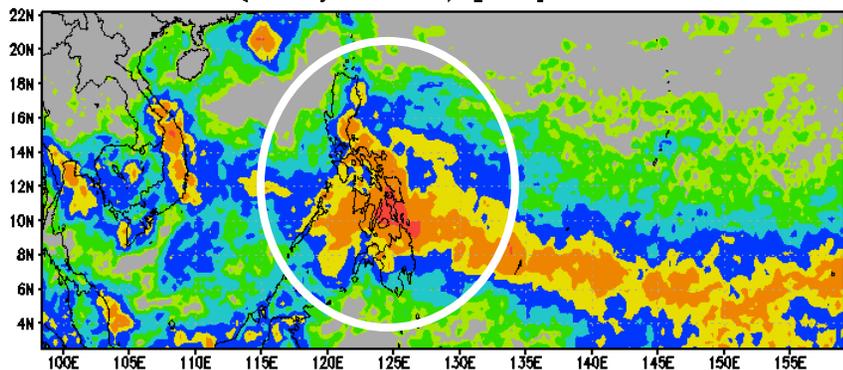


Global Flood Monitoring System (GFMS)

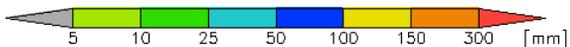
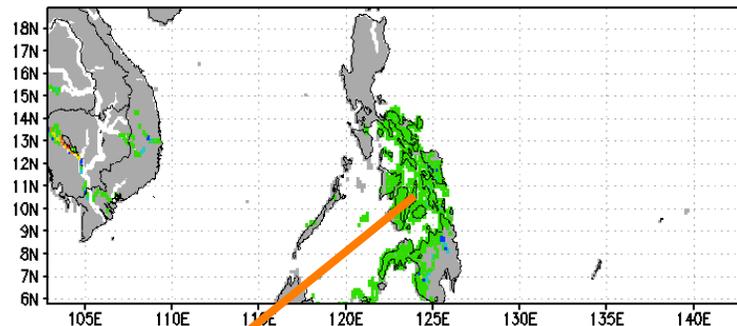
Flooding over Philippines

Typhoon Haiyan

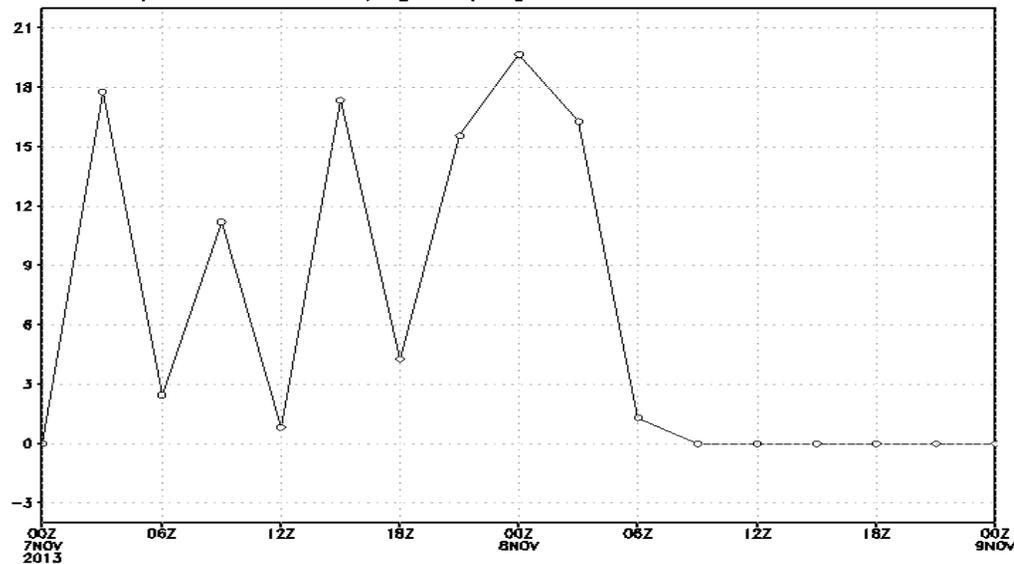
Rainfall (7-day accum.) [mm] 15Z08Nov2013



Flood Detection/Intensity (depth above threshold [mm]) 03Z08Nov2013



Rainfall (Instantaneous) [mm/h] 00Z07Nov2013 00Z09Nov2013



Summary

- Several TRMM-based flood monitoring tools are available with different features
 - * *ERDS has additional GIS layers and information available*
 - * *GFMS has streamflow estimation, flood threshold, past archive available*
 - * *NASA-TRMM Flooding potential can be viewed on Google earth for current and 24-hour forecast*

- Most tools have interactive, near-real time flood mapping capability with flood potential and/or streamflow/run-off

- Regional evaluation by end-users is recommended

Coming Up Next Week-

**Overview and demonstration of
Flooding Tools:**

MODIS Inundation Mapping Tool

Dartmouth Flood Observatory

Thank You!

Amita Mehta

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