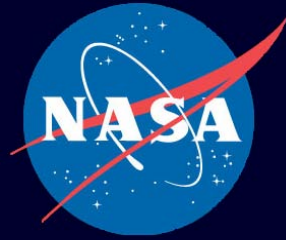


# Namibia Dashboard Enhancements

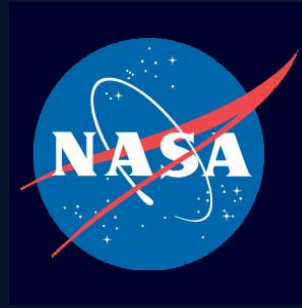


Daniel Mandl  
Matthew Handy

NASA/Goddard Space Flight Center  
Software Engineering Division

for Technical Interchange Meeting with Namibia  
Hydrological Services (NHS) in Namibia 2/20/14

# Overview



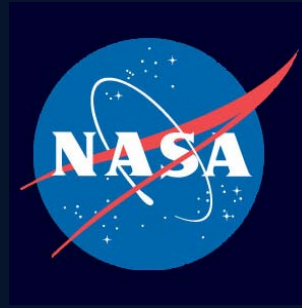
- Motivation / Objectives
- Tool Overview
- Tool Capabilities
- New Features
- Future Plans
- Wrap Up

# Motivation / Objectives



- Aggregate information sources → better situational awareness and decision making
- Integrate and compare data feeds → enhanced analysis capability
- Disseminate information → wider availability of data products and analysis
- Rapid configuration and deployment → software can be rapidly applied to diverse situations
- Enable crowd sourcing and OpenStreetMap standards to enhance interoperability and improved data gathering methods
- Train Namibia Hydrological Services (NHS) and related government departments in capacity building effort

# Tool Overview



- Bulletin System (current and archive)
- Google Maps/Earth powered geospatial data display
- River gauge station graphing and comparison (with upload)

# Main Page



## Namibia Flood Dashboard

SensorWeb enabled for early flood warning

[Daily Report](#)

Janua  
31

Daily Bulletin:

### HYDROLOGICAL SERVICES NAMIBIA – DAILY FLOOD BULLETIN 30 JANUARY 2013

Rains returned to central northern Namibia. NMS reported 25.4 mm for Okahao and 15.4 mm for Oshikango, and Ms Nancy Robson gave 7 mm for Odibo. Satellite images showed also good rains in the headwater of Kavango and Kunene rivers, and higher flows may be building up to reach Namibia next week. The Zambezi River is further rising at Katima Mulilo, but more slowly now. The forecast is still for 5.50 m by 10 February, which would be the normal seasonal floodlevel that is usually reached by the beginning of April.

[View Complete Current Bulletin](#)

[View Bulletin Records](#)

[Search Bulletin Records](#)

[New Bulletin](#)

[Configure Layers](#)  
[Upload Layer](#)

▼ River Stations

▼ SensorWeb Layers

▼ Water Lines and Areas

Google Maps

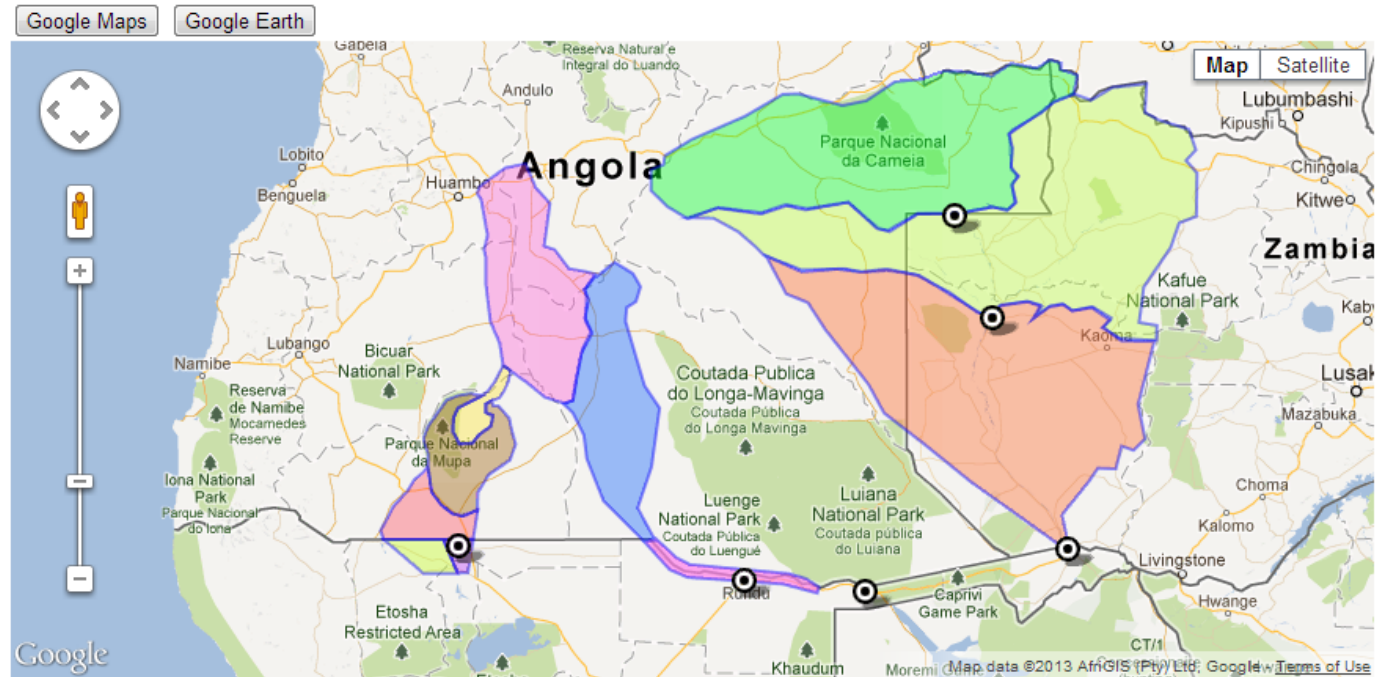
Google Earth



# Geospatial Display (The Big Map)



- River Stations
- SensorWeb Layers
- Water Lines and Areas
- Satellite Overlays
- Ground Pics
- Kavango Radarsat Data
- Cuvelai Radarsat Data
- TRMM Rainfall Accumulation and Flood Forecast
- Global Scene Counts
- MODIS Floodmaps
- Infrastructure
- ALI Flood Classification



**Legend:**

ALI Flood Classification	Class 1 - Background:	Class 2 - Opaque Clouds:	Class 3 - Cloud Shadow:	Class 4 - Haze and Thin Clouds:	Class 5 - Clear Water:	Class 6 - Turbid Water:	Class 7 - Dry Land:

# Tool Capabilities



- Bulletin system
- Historical river level display & graphing
- Tropical Rainfall Measuring Mission (TRMM) rainfall history/projections
- Moderate Resolution Imaging Spectroradiometer (MODIS) flood classification
- Web Coverage Processing Service (WCPS) image retrieval / Earth Observing 1 (EO-1) Advanced Land Imager (ALI) Flood Classification
- Infrastructure mapping / correlation
- Global Disaster and Coordination System (GDACS) triggering

# Bulletins



## Current Bulletin

### HYDROLOGICAL SERVICES NAMIBIA – DAILY FLOOD BULLETIN 30 JANUARY 2013

Rains returned to central northern Namibia. NMS reported 25.4 mm for Okahao and 15.4 mm for Oshikango, and Ms Nancy Robson gave 7 mm for Odibo. Satellite images showed also good rains in the headwater of Kavango and Kunene rivers, and higher flows may be building up to reach Namibia next week. The Zambezi River is further rising at Katima Mulilo, but more slowly now. The forecast is still for 5.50 m by 10 February, which would be the normal seasonal floodlevel that is usually reached by the beginning of April.

This morning's river flow readings:

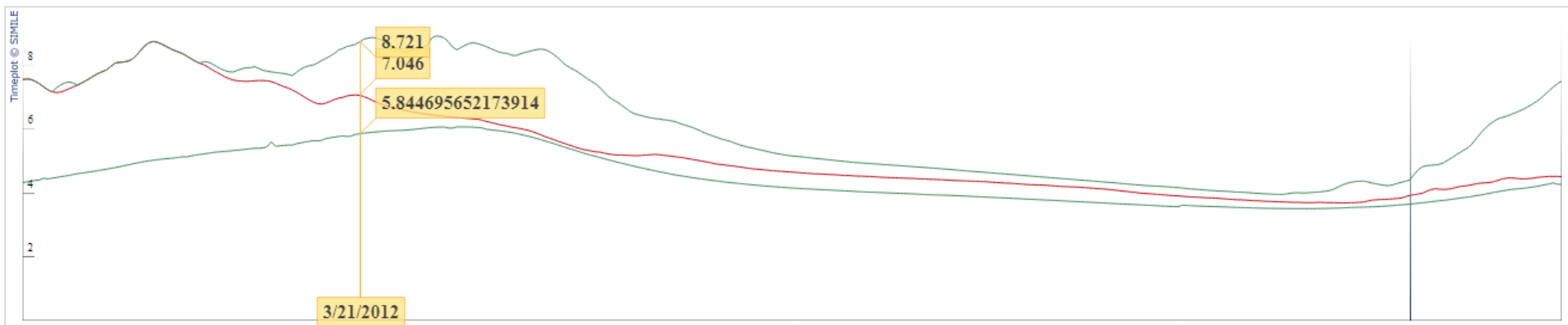
River	Site	One week ago (23 Jan 2013)	Yesterday (30 Jan 2013)	Today (30 Jan 2013)	One year ago (30 Jan 2012)	Normal for 30 Jan
Zambezi	Katima Mulilo	2.86 m	4.55 m	4.73 m	2.43 m	1.52 m
Kwando		estimated:	estimated:	Estimated:	3.23 m	2.39 m
	Kongola	3.09 m	3.03 m	2.99 m		
	Camp Kwando (+)	-	0.65 m	9.64 m	-	-
Linyanti Swamps	Nkasa Luapala Camp (++)	1.95 m	1.85 m (note correction)	-	-	-
Kavango	Nkurenkuru	1.71 m	1.52 m	1.51 m	3.14 m	-
Rundu	5.72 m	5.40 m	5.36 m	6.81 m	4.87 m	
Andara	1.80 m	1.80 m	1.79 m	1.99 m	1.44 m	





# River Gauge Stations

## Rundu



Select Station: Rundu Select Year: 1969 Select Series Color: Red

Select Station: Rundu Select Year: Select Select Series Color: Blue

Select Station: Rundu Select Year: Select Select Series Color: Green

Select Station: Rundu Select Year: Select Select Series Color: Gold

Select Station: Rundu Select Year: Select Select Series Color: Light Green

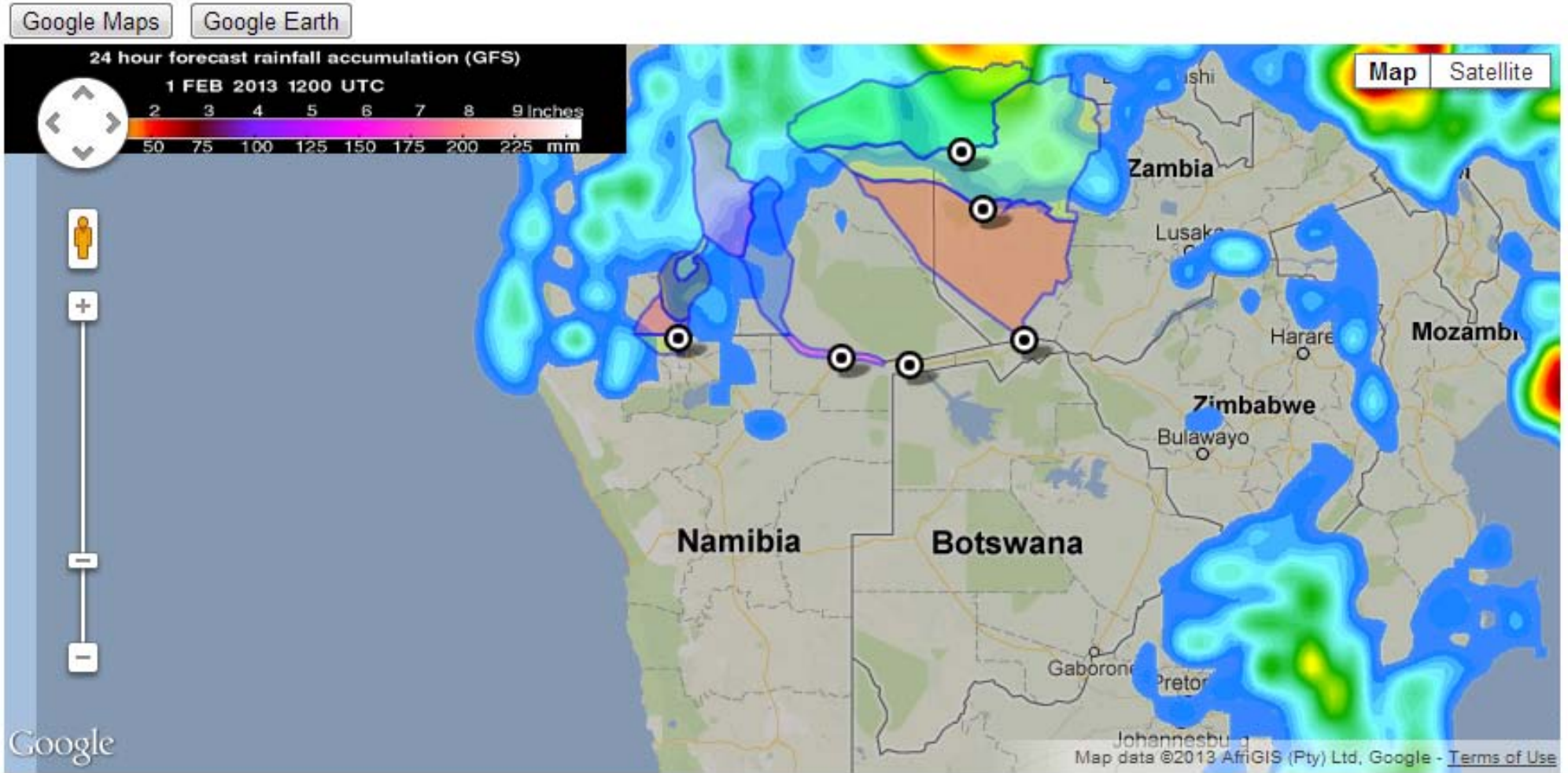
Display Average:  Select Average Color: Green

Display Minimum:  Select Minimum Color: Blue

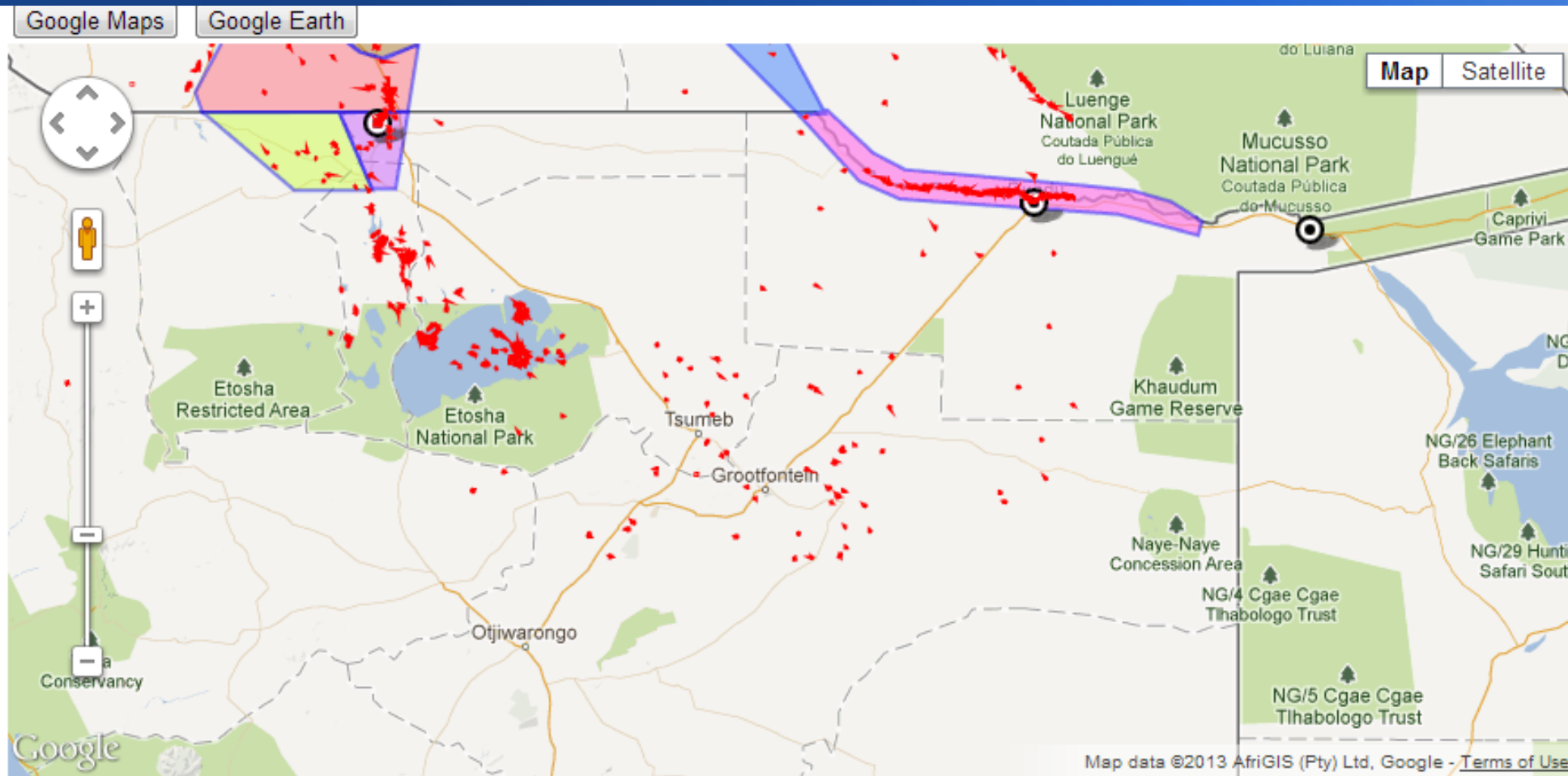
Display Maximum:  Select Maximum Color: Green

Lower Date Bound: 01/01/2012 Upper Date Bound: 12/31/2012

# TRMM Rainfall

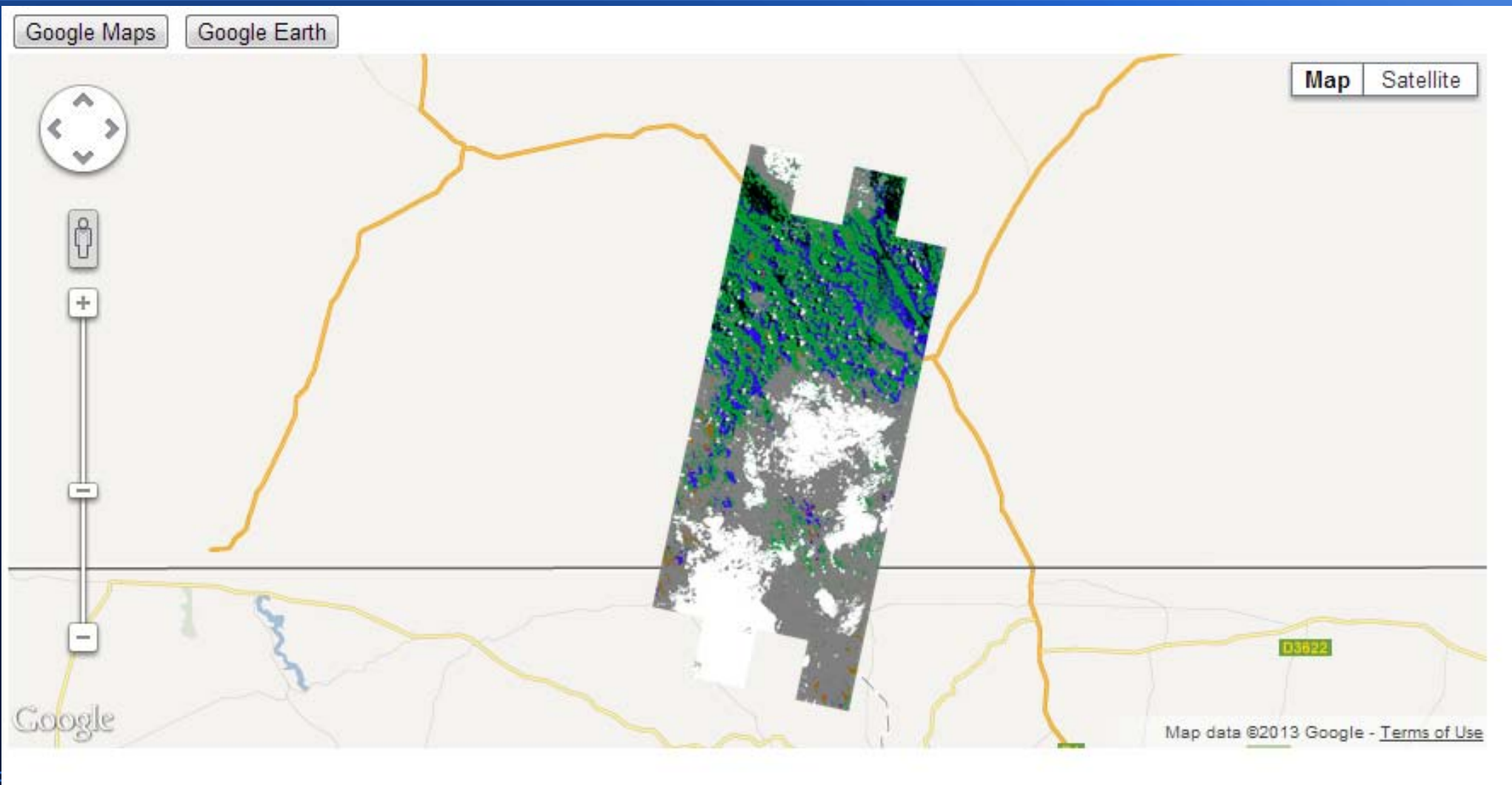


# MODIS Flood Classification

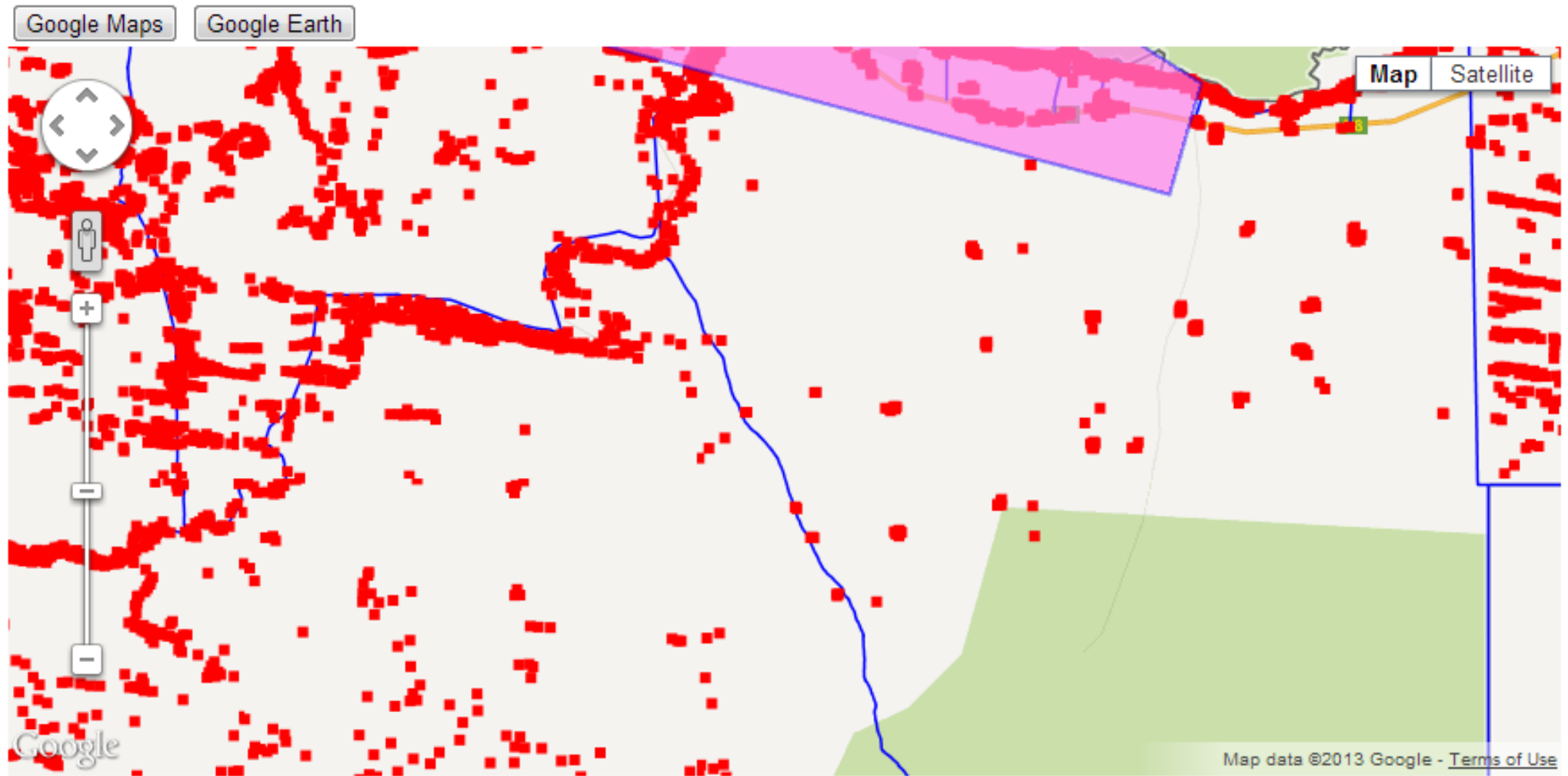
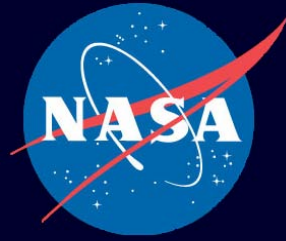


Legend:

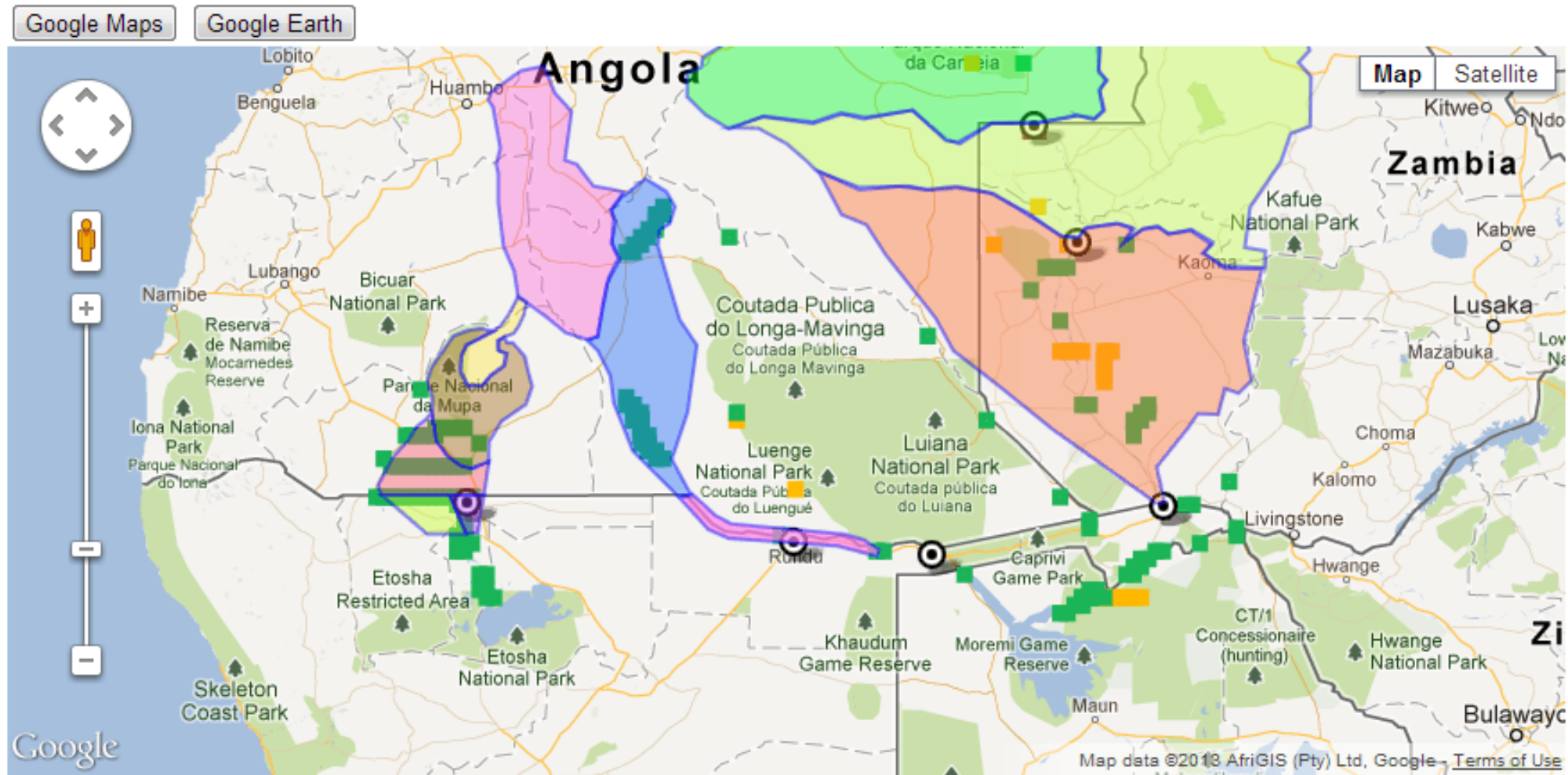
# ALI Flood Classification



# Infrastructure Mapping (using Dwelling Unit Database)



# GDACS Triggering

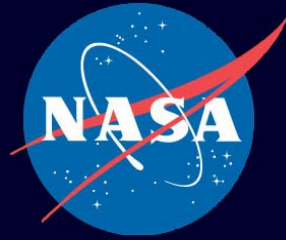




# New Features

- Upload form for Excel files containing river gauge data
- Prototype OpenStreetMap (OSM) infrastructure information (school tracker)
- Co-registration of EO-1 satellite data with Landsat Global Land Survey
- New collaboration with National Oceanic and Atmosphere Administration (NOAA) (Flash Floods)

# OSM Prototype (Infrastructure – School Tracker)

A screenshot of a web-based map interface. The map shows a location labeled "Rundu" with a red pin. A popup window is open over the pin, displaying detailed information for "Sample School A". The popup includes fields for status, ID, phone, principal, school type, student counts, staff, water source, availability, potability, toilet types and counts, availability, handwashing facilities, sanitary supplies, and training. The map background shows roads, a river, and a building labeled "Rundu Airport".

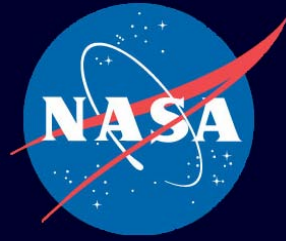
**Sample School A**  
Status: open  
EMIS ID: 123  
Phone: 555-777-8888  
Principal: Jane Doe  
School Type: Secondary  
Male Students: 100  
Female Students: 50  
Staff: 20  
Water Source: surface water  
Water Availability: 4-6 days/week  
Water Potable: yes  
Toilet Type: Composting Toilet  
Toilets Total: 5  
Male Toilets: 2  
Female Toilets: 2  
Staff Toilets: 1  
Toilet Availability: 4-6 days/week  
Handwashing Facility: sink with taps  
Sanitary Supplies: No  
Sanitary Training: No  
Description: School established 1999

Rundu  
Rundu Airport  
B10  
B8

Leaflet | Map data © OpenStreetMap contributors



# OSM Prototype (Science Data)



# NOAA Collaboration



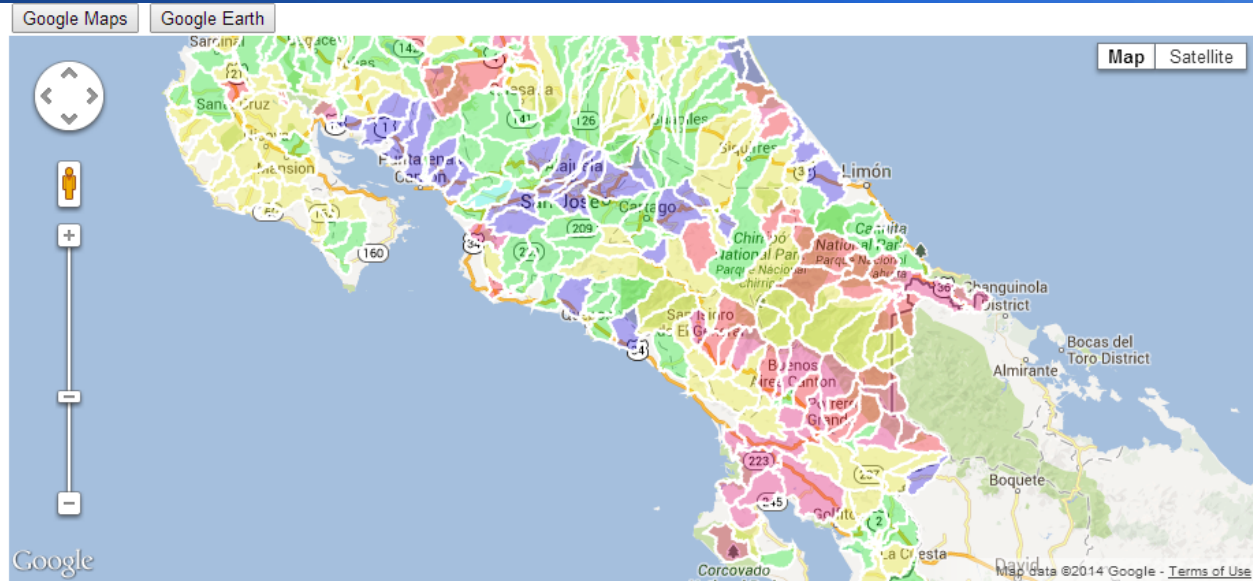
## TRMM Rainfall Accumulation and Flood Forecast

### FFG Basins

- Belize FFG Basin 1hr
- Belize FFG Basin 3hr
- Belize FFG Basin 6hr
- Costa Rica FFG Basin 1hr
- Costa Rica FFG Basin 3hr
- Costa Rica FFG Basin 6hr
- El Salvador FFG Basin 1hr
- El Salvador FFG Basin 3hr
- El Salvador FFG Basin 6hr
- Guatemala FFG Basin 1hr
- Guatemala FFG Basin 3hr
- Guatemala FFG Basin 6hr
- Honduras FFG Basin 1hr
- Honduras FFG Basin 3hr
- Honduras FFG Basin 6hr
- Nicaragua FFG Basin 1hr
- Nicaragua FFG Basin 3hr
- Nicaragua FFG Basin 6hr
- Panama FFG Basin 1hr
- Panama FFG Basin 3hr
- Panama FFG Basin 6hr

### MODIS Floodmaps

### Central America Shapefiles



### Legend:

	0 - 25.0:	25.1 - 35.0:	35.1 - 50.0:	50.1 - 70.0:	70.1 - 100.0:	> 100.1:
<b>FFG Color Coding - 1 hr</b>						
<b>FFG Color Coding - 3 hr</b>	0 - 30.0:	30.1 - 45.0:	45.1 - 60.0:	60.1 - 80.0:	80.1 - 140.0:	> 140.1:
<b>FFG Color Coding - 6 hr</b>	0 - 45.0:	45.1 - 65.0:	65.1 - 85.0:	85.1 - 110.0:	110.1 - 150.0:	> 250.1:



# Future Plans

- Evolve Dashboard into “Disaster Node” with GeoSocial Application Program Interface (API)
- Add hydrograph to satellite cross-indexing of data products
- Formalize implementation of OpenStreetMap (OSM) layer display to supplement Google Maps / Earth
- Add TRMM Precipitation data products (WABBIT)
- Add per-layer access control

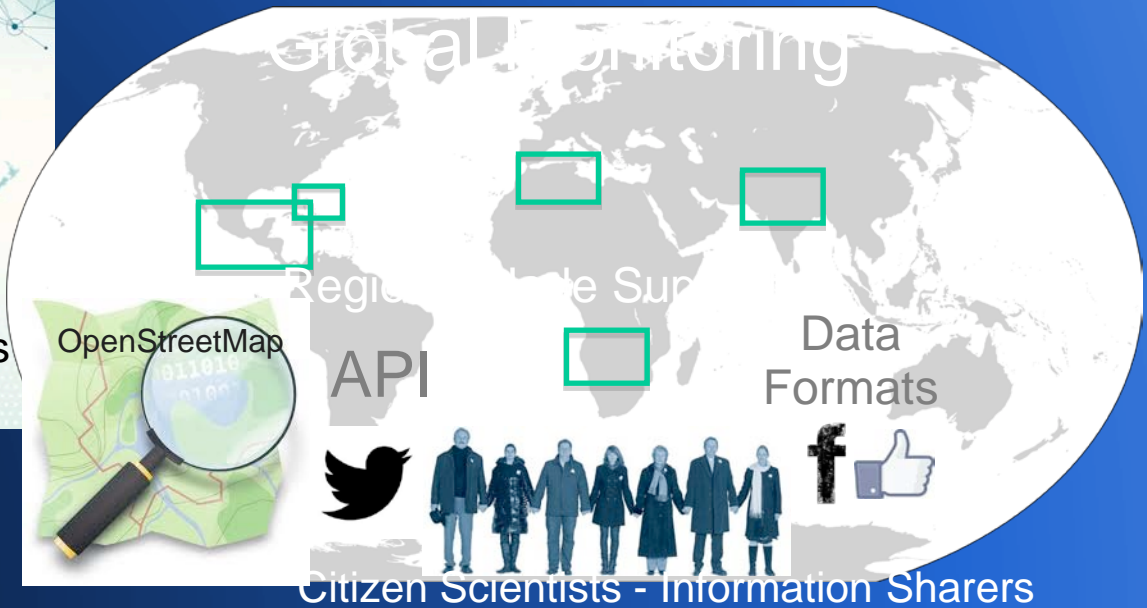
# OSM, Disaster Node, GeoSocial API Concept



## BIG DATA Problem

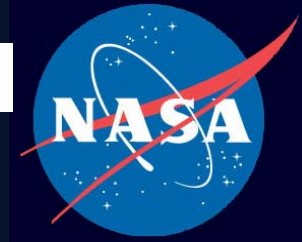


Need For Global Data Provided As  
Localized / Accessible Information Products



## Disaster Architecture Framework

# OSM, Disaster Node, GeoSocial API Concept

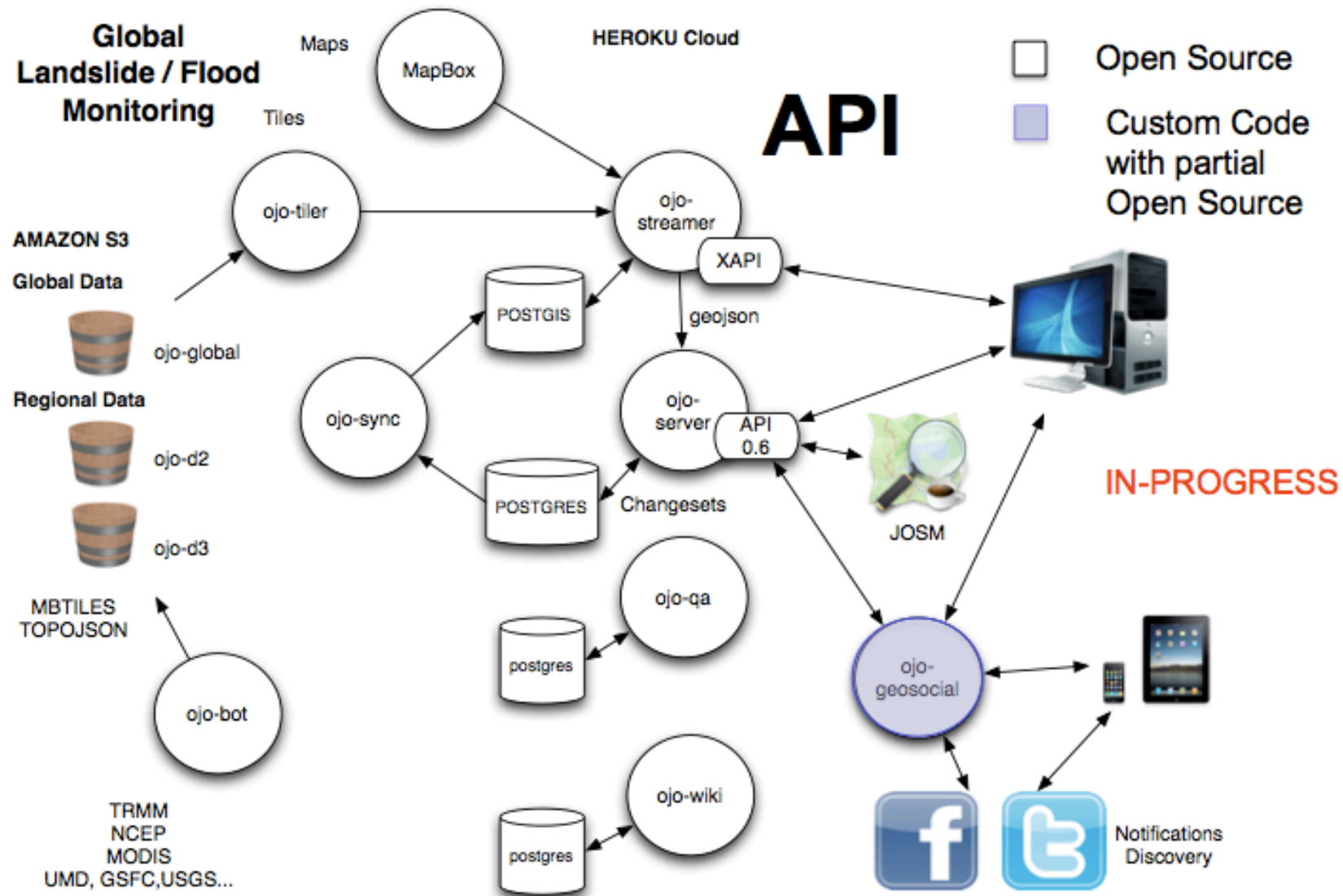
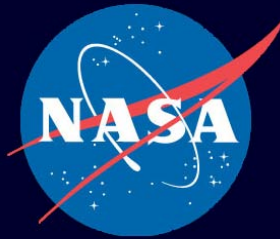


- Distributed OpenStreetMap tools
- Distributed implementations
- Handle different data formats
- Use social networks for story telling, information sharing and discovery
- Leverage existing infrastructure (protocols, database schemas, code etc.)
- Support crowd-sourcing
- Community-based data stewardship
- Common higher level API, including for use on mobile devices
- Tiling and vectorization services to reduce size and enable common database storage with queries
- Editing of Geographic Information System (GIS) data in OpenStreetMap to enable crowd-sourced data to augment and improve satellite data

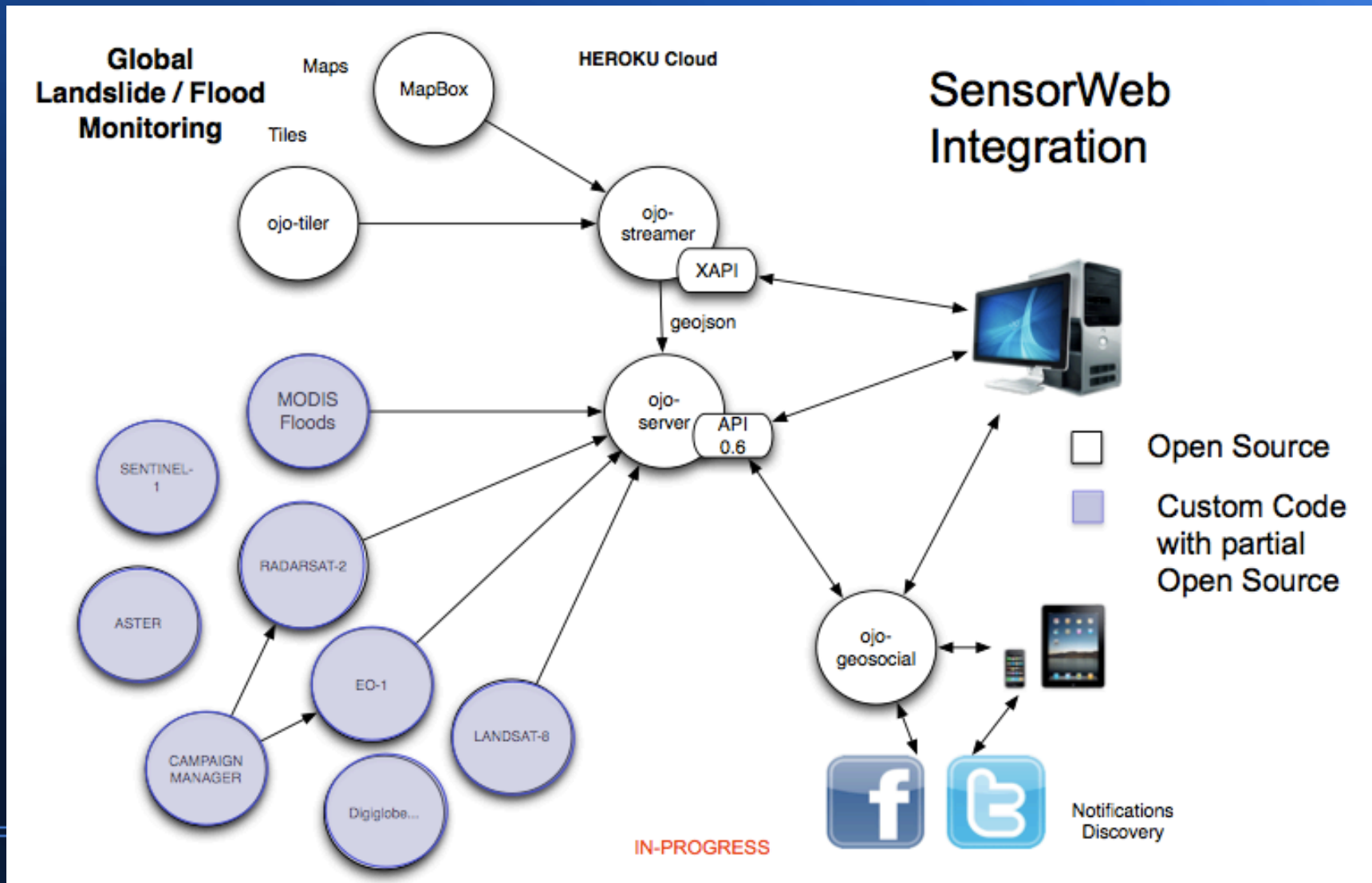
# OSM, Disaster Node, GeoSocial API Concept



# OSM, Disaster Node, GeoSocial API Concept

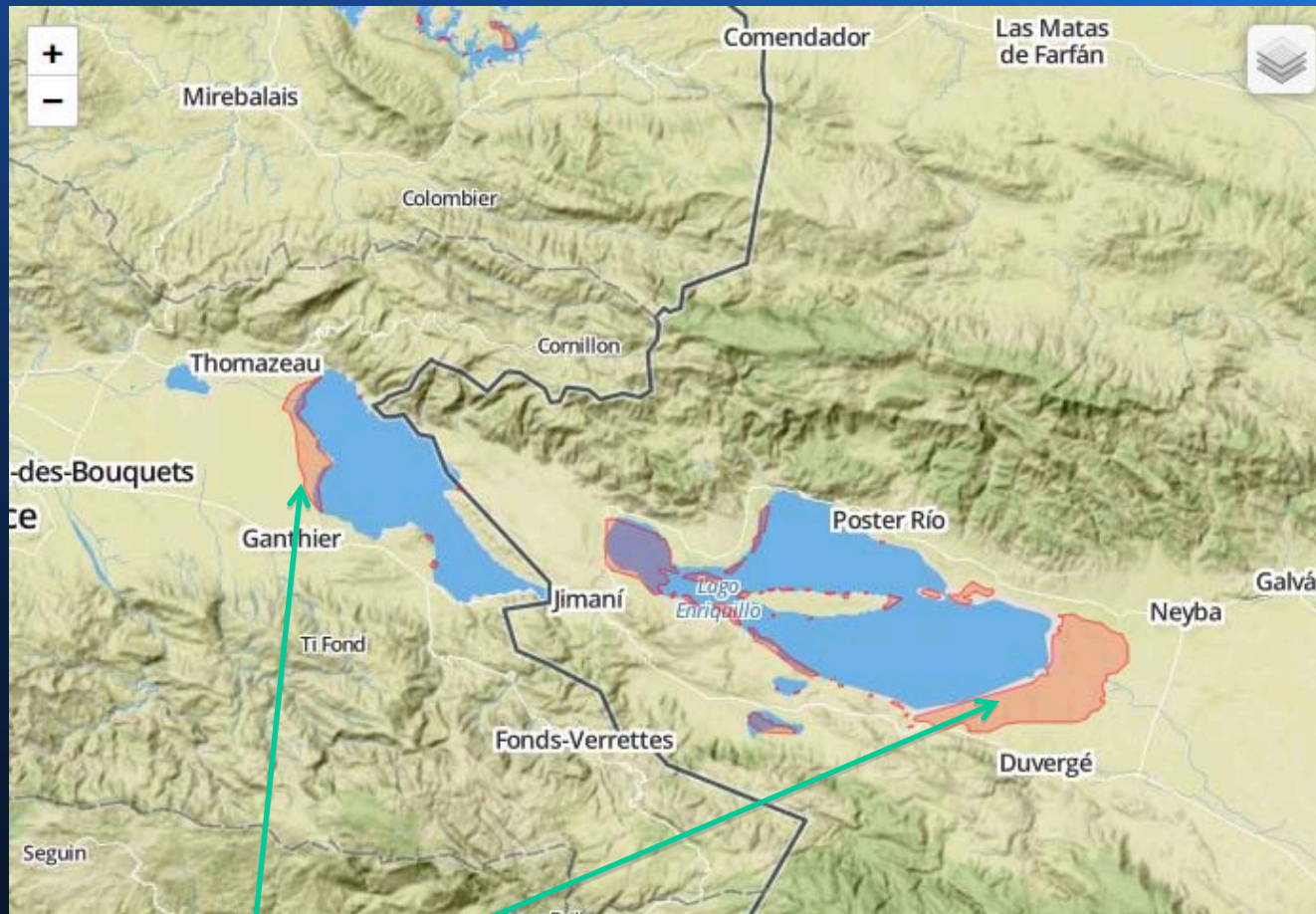
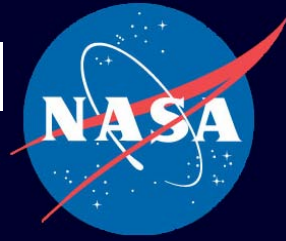


# OSM, Disaster Node, GeoSocial API Concept



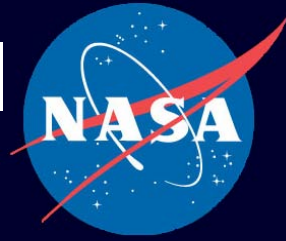


# OSM, Disaster Node, GeoSocial API Concept



GSFC 2-day MODIS Flood Extent  
[Coming soon: EO1, Landsat-8, Radarsat-2 flood extents]

# OSM, Disaster Node, GeoSocial API Concept



localhost:3000/#map=13/18.5516/-72.3220

View Edit History [log in](#) [sign up](#)

**OJO-Server**  
Global Landslide / Flood Map

Search


examples: 'Alkmaar', 'Regent Street, Cambridge', 'CB2 5AQ', or 'post offices near Lünen' [more examples...](#) [Where am I?](#)

OpenStreetMap is a free worldwide map, created by people like you.  
The data is free to [download](#) and use under its [open license](#).  
[Create a user account](#) to improve the map.

**Help**  
[Help Centre](#)  
[Documentation](#)

**Community**  
[Community Blogs](#)  
[Foundation](#)  
[User Diaries](#)

**Data**  
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[Export Data](#)  
[GPS Traces](#)

 **Landslide Id:16367**

Date: 2013-11-04T17:29:51.683Z

Trigger: rain

Fatalities: 2 injured

Location Class: 4

Size Class: 2

Coords: [-72.3225,18.5281]

Link: [here](#)

© OpenStreetMap contributors

OpenStreetMap  
Viewer/Editor for  
Crowd-Sourcing



# Wrap Up

- Rapid delivery of technical information through bulletins
- Access to EO-1 ALI data products
- Access to MODIS flood classification, TRMM prediction
- Correlation with infrastructure details
- Graphing and comparison of river levels
- Plans to allow even more powerful comparisons, such as retrieval of satellite products based on ground data comparison

# Wrap Up



- Future access to more satellite data via mobile devices and OpenStreetMap compatible
- Future crowd-sourced community based data collection and management capability