From Big Data to Small Transportable Products for Decision Support for Floods in Namibia

Daniel Mandl[1], Stuart Frye[2], Patrice Cappelaere[3], Matthew Handy[1], Frederick Policelli[1], Robert Sohlberg[5], Robert Grossman[4]

1 NASA/GSFC, Greenbelt, Md U.S. 2 SGT Inc., Greenbelt, Md U.S. 3 Vightel Inc., Ellicott City, Md U.S. 4 University of Chicago, Chicago, Il U.S. 5 University of Maryland, College Park, Md U.S.

Abstract

During the past four years, a team from NASA, Oklahoma University, University of Maryland, University of Chicago and Open Cloud Consortium (OCC) in collaboration with the Namibia Hydrological Services (NHS) has explored ways to provide decision support products for floods. The products include a variety of data including a hydrological model, ground measurements such as river gauges, and earth remote sensing data. This poster highlights the lessons learned in acquiring, storing, managing big data on the cloud and turning it into relevant products for GEOSS users.

Technology that has been explored includes the use of Hadoop/ MapReduce and Accumulo to process and manage the large data sets. OpenStreetMap standards were explored for use in cataloging water boundaries and enabling collaborative mapping of the reference water masks and flood extents. A Flood Dashboard was created
to customize displays of various data products. Finally, a higher level Geo-Social Application Processing Interface (API) and architecture concept was developed to enable users to discover, generate and share products dynamically with their Community of Practice over social networks. Results of this experiment have included 100x reduction in size of some flood products, making it possible to distribute these products to mobile platforms and/or bandwidth-limited users.

Detection, Observation, Data Processing and Modeling Approach

Figure 1: Functional approach to linking satellite data, models and detection /alerts for flood decision support

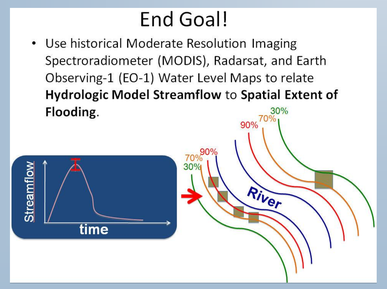

Figure 2: The end goal is to provide a statistical metric for the probability of inundation for selected areas based on streamflow and thus provide decision support for Namibia government officials before, during and after flooding events.

Matsu & Joyent Clouds

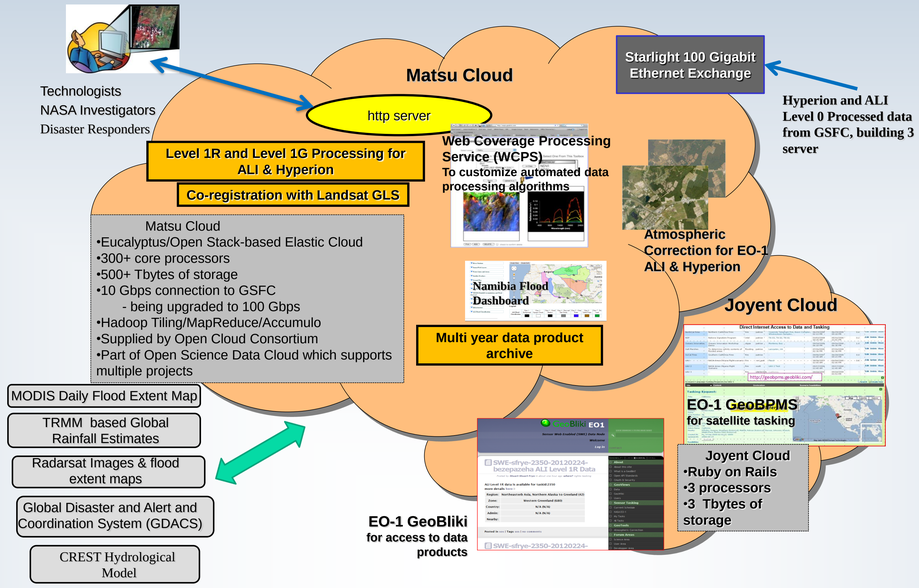

Figure 3: Two clouds house key functionality for flood information derived from satellite and ground data

Flood Dashboard and Tools

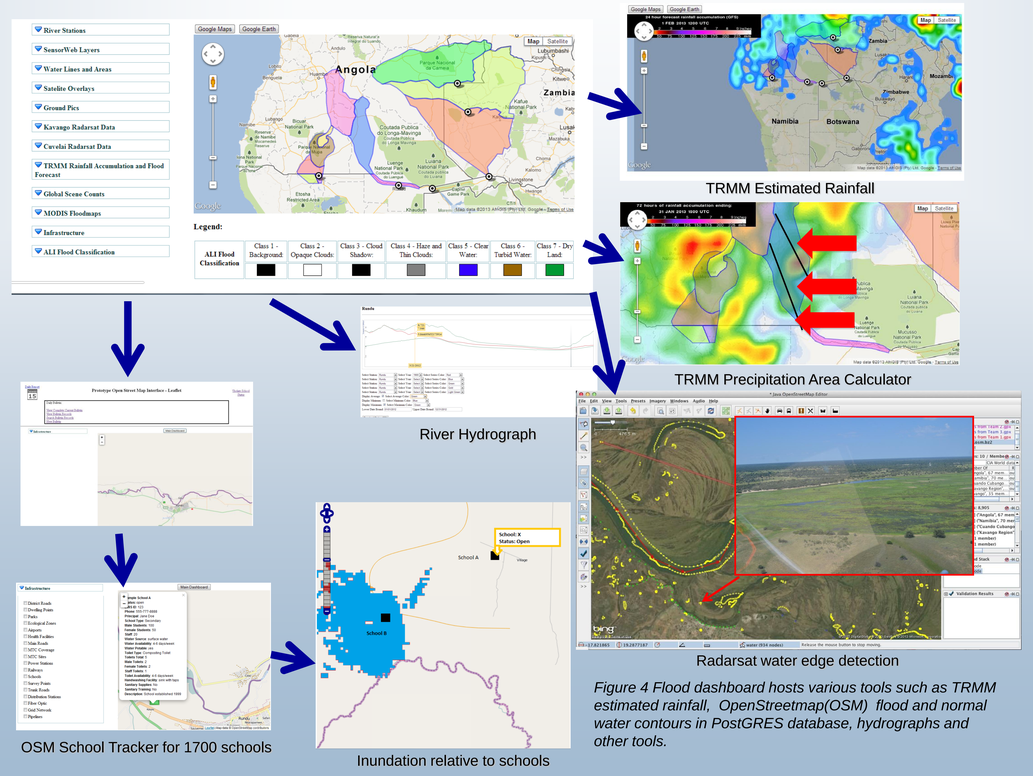

Figure 4 Flood dashboard hosts various tools such as TRMM estimated rainfall, OpenStreetmap(OSM) flood and normal water contours in PostGRES database, hydrographs and other tools.

GeoSocial Application Programming Interface (API)

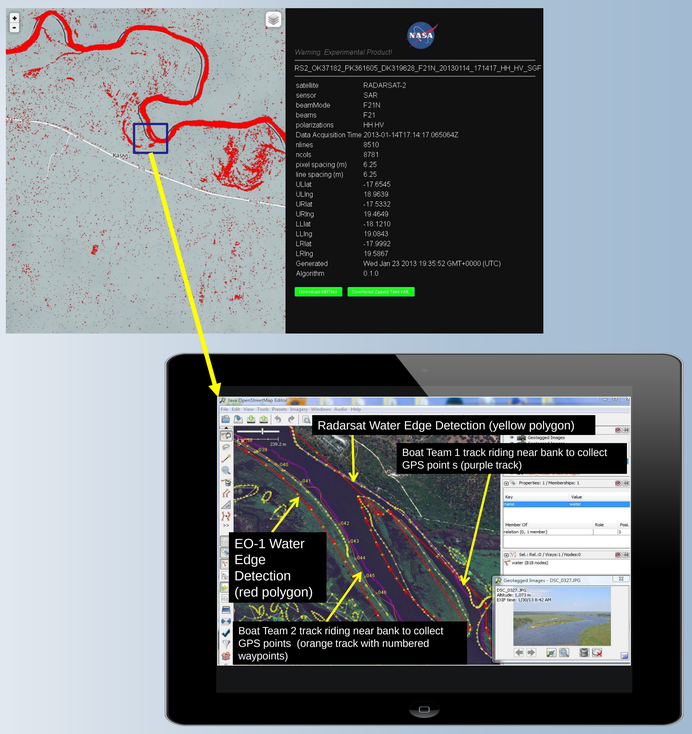

Figure 5: geobliki.radarsat.com generated a KML based TIFF which was a tiled water classification product of the Kavango area in Namibia. File size was about 15 Mbytes. The Radarsat-2 vectorized water contour (yellow) is displayed on lower right and has a file size of about 900 Kbytes which is easy to display on a mobile device and is easily converted to OpenStreetMap format. This exercise was run as a simulated calibration exercise.

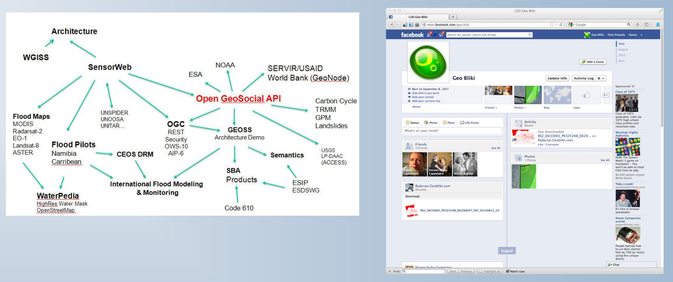

Figure 6: Open GeoSocial API is the front end to the disaster architecture which stores "recipes" to create products across multiple domains and can share the "recipes" over social media so that others can obtain copy for their mobile device. An OpenStreetMap (OSM)server has been developed that stores various OSM features or the "recipes" via a PostGRES open source database and serves them out to users. Future functionality for the GeoSocial API will include enabling users to copy the "recipe" for creating products and apply the "recipe" for different areas of interest.

Key work occurring now is how best to deploy the GeoSocial API. Key to acceptance of the API will be the ability to communicate the "error bar" for these products which includes geolocation error, classification error, data fusion capability and data provenance.

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