**NASA DEVELOP National Program**

****Langley Research Center

**Fall 2014**

**Technology Team**

**Colombia Flood Vulnerability Assessment Application**

*Utilizing NASA Earth Observations to Combine Topography and Near Real-time Precipitation Data to Support IDEAM’s Hazardous Weather Notification System*

**Team Lead:** Logan Kendle, Logan.J.Kendle@nasa.gov

**Team Members:**

Gennifer Anderson

Rick Farmer

Carolyn Lynch

Timothy Stelter

Luke Thompson

Adam White

**Advisors & Mentors:**

Jamie Favors (NASA DEVELOP International Lead)

**Past or Other Contributors:**

Jason Rogers (GIS Professional)

Stephanie Rushley

Charles Chiou

Matthew Carter

Kevin Haywood

Rick Farmer

Anthony Pototzky

Adam White

Daniel Winker

Lauren Childs-Gleason (NASA DEVELOP Operations Lead)

**Applied Sciences National Applications Addressed:**

Cross-Cutting & Disasters

**Study Area:** La Mosca Watershed, Antioquia Department, Colombia

**Study Period:** Real Time Application

**Partners/Collaborators**

National Oceanic and Atmospheric Administration (NOAA): Dr. Angelica Gutierrez

Institute of Hydrology, Meteorology, and Environmental Studies (IDEAM): Pilar Galindo, Ricardo Quiroga

**80-100 Word Blurb**

IDEAM is the program that supports scientific agencies by providing accurate weather knowledge, data and information to users. IDEAM’s mission is to forecast and provide warnings of inclement weather that will affect Columbia’s population. IDEAM created a user friendly web application called the Information System of Water Resources (SIRH). This applications goal is to provide precipitation warnings to users in real time. DEVELOP is working to build the web application to utilize real time precipitation data in conjunction with past flood statistics to predict future flash flood events using the JDeveloper software.

**Community Concerns**

* Columbia’s location being in the tropics combined with the presence of the Andes Mountains and the passage of the Intertropical Convergence Zone (ITCZ cause precipitation to be highly variable across Colombia. The spatially inconsistent and often heavy precipitation, together with complex topography, consisting of valleys, plateaus, and mountains, places regions of Colombia at a higher risk for flooding.
* This creates the need for IDEAM to show via a web application each sub basin’s flood vulnerability
* 82% of Colombians are affected by flooding, more than any other natural disaster.

**Current Management Practices & Policies**

Currently, the Environmental Information System of Colombia (SIAC) has a website called the Information System of Water Resources that provides alerts based on weather forecasts. However, the current system is not capable of categorizing the severity of alert.

**Abstract**

Flooding presents a natural threat to public safety in Colombia. Through the use of flow duration diagrams, elevation models, and precipitation data; easy to use tables and maps were created for the Information System of Water Resources Website (SIRH). This addition to the website provides an interface for users to determine if their current location is within a flood risk area and how severe the risk of flooding is. By incorporating data from NASA Earth observations into the current IDEAM decision making process, the impacts of floods on the general public can be mitigated. The application was created using raster layers in ArcGIS combined with data from the Advance Spaceborne Thermal Emission and Reflection Radiometer (ASTER) onboard Terra and near real-time precipitation data from the Tropical Rainfall Measuring Mission (TRMM), as well as in situ stream flow data from IDEAM. The risk assessment maps focused on the La Mosca River Basin in the Antioquia Department east of Medellin, Colombia as the primary area of study.

**Decision Support Tools**

Information System of Water Resources (SIRH)

1. Interactive web-accessible map showing near-real time precipitation information
2. Torrential event vulnerability risk assessment via tables and maps

**Benefit to End-User:**

* Ability of local population in Colombia to view flood risk locations on web and mobile devices
* Lead users to safe refuge in the event of a flash flood

**Earth Observations & Parameters**

TRMM Precipitation Radar (PR) – Historical precipitation data

GPM - Near real-time precipitation data

ASTER – 1arc second Digital Elevation Model (DEM) 30 Meter Resolution

**Models Utilized**

ArcSWAT

Arc Hydro Toolkit

**Provider & Dataset - Parameter**

*In situ* stream and meteorological station data from IDEAM

Historical rain data from TRMM Satellite

**Software Utilized**

ArcGIS - Raster analysis and map creation for web application using ASTER and TRMM

JDeveloper – Using this program the SIRH website will display the information created in ArcGIS