**NASA DEVELOP National Program**

****Wise County and City of Norton Clerk of Court’s Office

**Fall 2015**

**Short Title: African Great Lakes Weather**

**Subtitle:** Utilizing NASA Earth Observations to Identify Indicators to Help Predict Deadly Storms over African Great Lakes

**VPS Title:** Victoria’s Secrets – Divulging weather patterns over the East African Great Lakes

**Project Team & Partners**

**Project Team:**

Will Wilson (Project Lead), [will.h.wilson@gmail.com](mailto:will.h.wilson@gmail.com)

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Grant Bloomer

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**Advisors & Mentors:**

Dr. Kenton Ross (NASA DEVELOP National Program)

Kristopher Bedka (NASA Langley Research Center – Climate Science Branch)

Dr. Dwayne Cecil (Global Science Technology, Inc.)

Professor Robert VanGundy (UVA – Wise)

Melanie Salyer (NASA DEVELOP WC)

**Partner Organizations:**

Kenya Meteorological Department (End-User / Boundary Organization), POC: Jon Mungai

**Project Details**

**Applied Sciences National Applications Addressed:** Weather, Disasters, Ecological Forecasting

**Study Area:** Regions of Kenya, Tanzania, and Uganda bordering Lake Victoria and Lake Tanganyika

**Study Period:** 20 specific storm events taken from 2005 - 2013

**Earth Observations & Parameters:**

MERRA products (short names): MAI6NPANA, MAT1NXSLV

TRMM, LIS – lightning detection

TRMM, PR – rainfall measurements

Terra, MODIS - aerosol optical depth

Meteosat, SEVIRI – infra red monitor

**Ancillary Datasets Utilized:**

* NASA Langley Research Center - Hazardous Storm Event Database

**Software Utilized:**

MATLAB R2015a – processing of data within Hazardous Storm Event Database

ArcMap 10.1 – NetCDF data import and image visualization

Python – conversion of data types/formats, batch processing in ArcGIS

**Project Overview**

**80-100 Word Objectives Overview:**

This project assists research at the NASA Langley Research Center Climate Science Branch with regards to storm origination and development over the East African Great Lakes, especially Lake Victoria. From a database of pixels that represented detection of the ‘overshooting tops’ convective phenomenon, certain storm events were chosen as temporal study areas. Using these events, measurements of certain environmental aspects were studied preceding and through an event’s duration and relationships between events were assessed in an effort to narrow down strong indicators that may be used in forecasting efforts.

**Abstract:**

The African Great Lakes lie along the East African rift valleys and play an important role in the economy and culture of the millions of people in the region. The regional governance of the lakes’ climate and weather, while less understood, is just as profound. Intense storms occur around the lakes with little warning and can create life-threatening hazards to unsuspecting fisherman, causing their fishing vessels to capsize or wreck. Finding correlations between climatic indicators that precede the onset of these storm events will aid the Kenya Meteorological Department in their ability to improve the forecasting efforts of local and regional authorities. Utilizing the overshooting top (OT) detections within the Hazardous Storm Event Database (derived from the SEVIRI sensor on the METEOSAT satellite), certain times of heightened detection were used as temporal study areas around which an assortment of meteorological data was compiled.

**Community Concerns:**

* The storms along the African Great Lakes can bring torrential rainfall, lightning, hail, and/or high winds, producing hazards which pose a major threat to the population and infrastructure of the surrounding countries.
* The areas affected by these storms have the highest population density in all of Africa due to the fact that the lakes provide vital economic opportunities in the fields of fishing, tourism, and agriculture, for millions of people.
* Families in nearby countries depend on the African Great Lakes as a major food source. Fish caught in the lakes can account for up to 70% of the protein consumed by families in some areas.
* Approximately 5,000 people are killed every year by storms on Lake Victoria alone. Most of the victims are fishermen who depend on the lakes for their livelihood.
* No early warning system is in place to inform the public of storm events. This prevents fisherman and others from being able to adequately prepare for the dangers associated with the storms.

**Current Management Practices & Policies**:

Atmospheric monitoring practices in the East African Great Lakes are a collaborative effort between meteorological agencies from Kenya, Uganda, and Tanzania. Most of their work revolves around the forecasting of weather patterns from a series of ground-based meteorological observation sites. Recording temperature, pressure, relative humidity, and precipitation amounts, these sites forward information (at 15 minute to 1 hour intervals) to central forecasting offices in near real-time so that surface conditions can be assessed and mapped. Based on this information, the prospects of severe thunderstorms are included in both 24 hour and 4-day forecasts. Daily forecasts are also obtained from regional meso-scale models adapted from more global forecasting systems. These models do not take into account aforementioned surface data and are often uniform over large areas.

Forecast information is often circulated over a patchwork system of television reports, radio, and print media. A mobile text message alert system pilot program established in 2011 provided daily forecasts and other hazard information, but at that time did not cover the whole extent of the lake.

**Decision Support Tools & Benefits:**

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| --- | --- | --- |
| **End-Product** | **Earth Observations Used** | **Benefit & Impact** |
| Statistical document highlighting correlations and ranges in values | TRMM – LIS  Aqua – AIRS  MODIS Atmosphere Products  MERRA – satellites used for derived data base ? (will have for final) | Creates a foundation for future terms of this project, highlights significances in data |

**Project Imagery**

**[Insert image here]**

**Caption:** [Insert Caption Here. Max of 25 words.] Image Credit: [Insert project short title] Team.

**Image:** File Name (Please submit your image as a separate .jpeg as well as inserting it in this document)

**Software Release Requirements**

What category do the tools your project is creating fall within? Category II