

Mapping Surface Water Bodies from EO Data for Vector Borne Diseases

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1. Why this project?

Public health is a major concern in Africa where Vector-borne diseases such as Malaria, Rift Valley Fever, *Leishmaniasis*, *Trypanosomiasis* and *Shistosomiasis* epidemics are a recurring problem. Specific factors supporting these diseases include (1) **environmental conditions leading to surface water for reproduction of mosquitos**, which are vectors that commonly carry the infectious microbes, (2) humidity for adult mosquito or fly survival, and (3) specific air temperature to sustain development rates of both the vector and parasite populations.

Approach/Project Activities

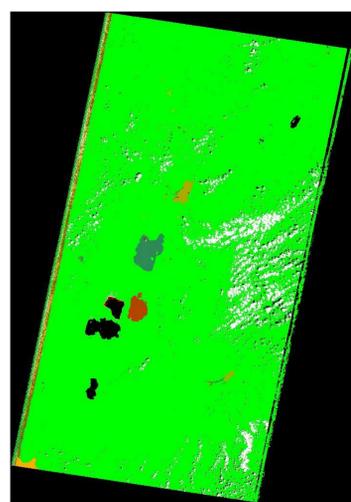
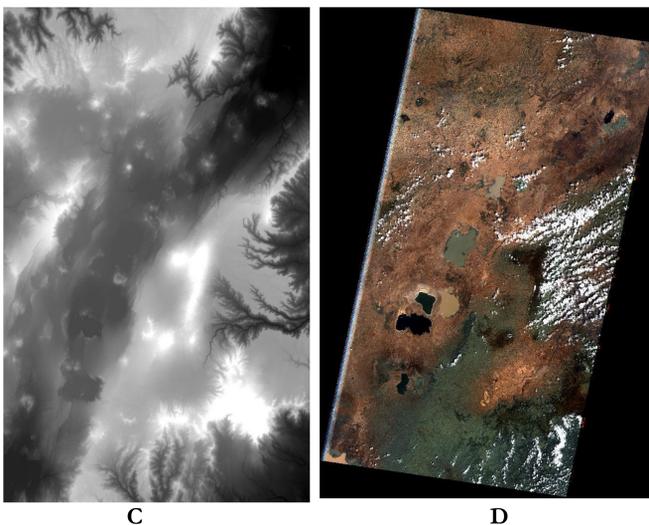
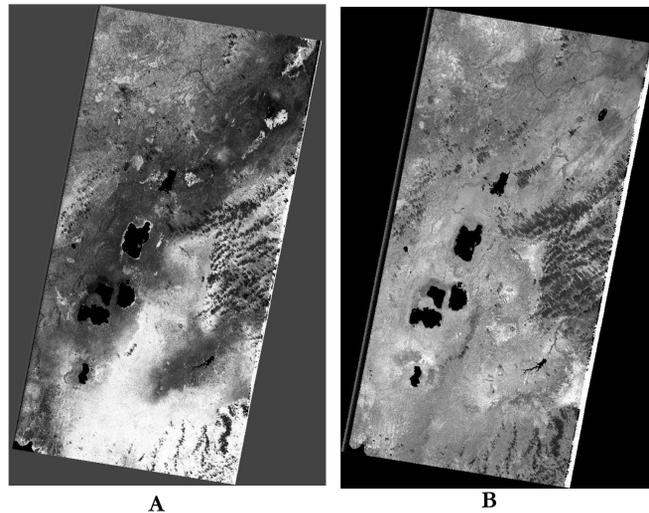
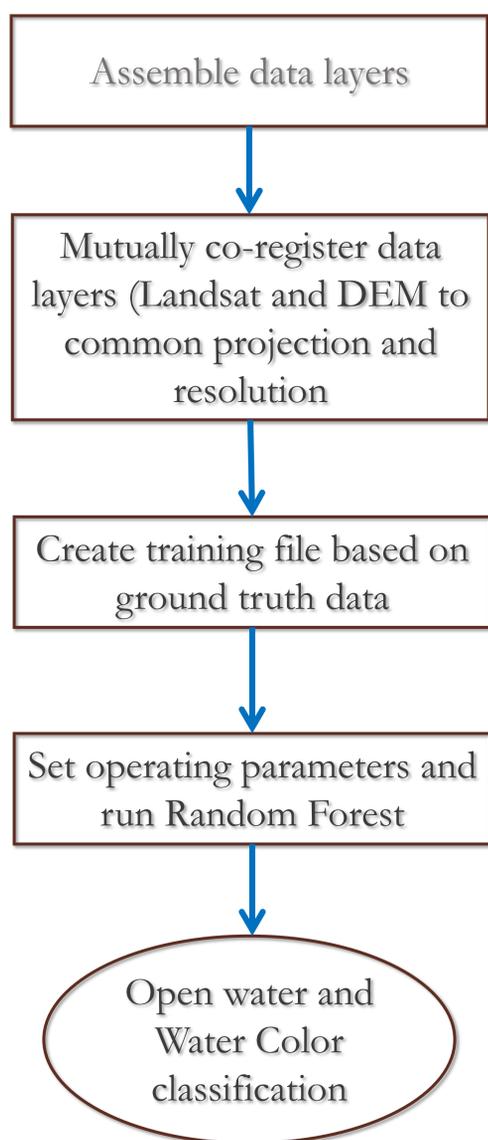


Fig 1: Random Forest Classification Result

The Automated system for classifying open water and its color properties applies a decision tree based classification algorithm called Random Forest to generate a classification of open water bodies and their water color. To better detect small water bodies, the algorithm was refined to take in Normalized Difference Vegetation Index (NDVI) (A), Water ratio (B), and SRTM Digital Elevation Model (C) data on top of the six LandsAT bands (D) that have been pan-sharpened to 15m using ENVI's Gram-Schmidt sharpening algorithm.

2. Objectives

- ▶ Build Capacity at RCMRD on the new methodology of mapping surface water at higher resolution of 15 meters
- ▶ Transfer of the processing chain to RCMRD for operationalizing classification and generation of the classification results of open water bodies and their color properties on the fly.
- ▶ Adoption of the methodology to develop surface water maps to inform other decisions like rangeland management and water balance computations

Earth Observations and Other Inputs

- LandSAT 7 or 8 at 30m resolution - Derived Products:
 - NDVI image
 - Water Ratio image
 - Class (training data) image
- Aster/ SRTM Digital Elevation Model Data
- Tools
 - Random Forest – FortRAN
 - ENVI
 - IDL

Outcomes/Anticipated Impacts

- ▶ Developing and delivering new and improved spatio-temporal characterization of surface water products to support the ministries of Health in detecting risk areas of vector-borne disease transmissions.
- ▶ Integrating surface water maps and other ancillary data for decision support in rangeland management
 - Migration patterns of nomadic communities
 - Grazing patterns of wildlife/ livestock
 - Degraded rangelands
 - Conflict areas
- ▶ Climatological analysis/ time series analysis of surface water maps

Project Partners

- International Research Institute for Climate and Society
- CUNY Environmental Crossroads Initiative and CREST Institute
- NASA Jet Propulsion Lab, California Institute of Technology
- Northern Rangeland Trust
- Famine Early Warning Systems Network (FEWSNET).

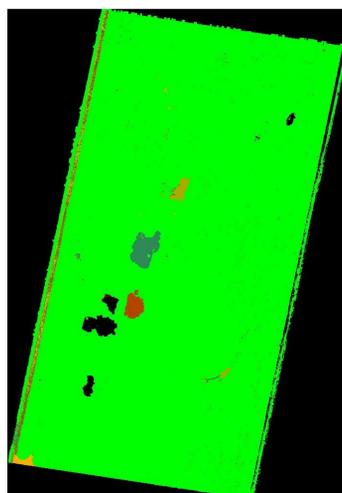
Project End Users

- Northern Rangeland Trust (NRT)
- Famine Early Warning Systems Network (FEWSNET).
- National Drought Management Authority (NDMA)
- Ministry of Health
- Department of Resource Surveys and Remote Sensing
- Academic institutions

Results



- Water Classes
- Black
 - Med. Brown
 - Light Brown
 - Brown Green
 - Emerald Green
- Other Classes
- Land
 - Clouds



A filter, written in IDL, was applied to the classification results in order to remove clouds and their shadows (commonly misclassified as water).

Fig 2: Trained 9 RCMRD staff, 3 university staff, and 3 staff from government organizations related to water issues.