Expanding Earth Science Data Access for Public Health Research and Applications

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Introduction

The use of satellite remote sensing data to develop disease maps and forecasts can inform the decisions of public health officials and improve disease control and epidemic response. However, potential users in the health sciences fields face a variety of barriers to accessing earth science datasets, including a lack of remote sensing expertise, limited time and resources to acquire the needed skills, and limited access to necessary software.

The Epidemiological Applications of Spatial Technologies (EASTWeb) software was developed to automate the retrieval, processing, and storage of satellite remote sensing data for public health research and applications. In order to expand the use of earth observation data in the health science, the goal of this project is to extend the EASTWeb software so that it can be used much more broadly in a wide range of geospatial health applications.

Objectives

- Extend the capabilities for processing multimission, multiinstrument earth science data by developing a plug-in framework for integrating current and new data streams
- Enhance the user interface to facilitate customized data screening and processing into a format useful to the public health community and other end users

EASTWeb System

As shown in Figure 1, the four major processing steps involved in EASTWeb are (1) downloading data from online earth observation archives, (2) processing remote sensing data, by reprojecting, mosaicking, and compositing data from different time periods, (3) computing environmental indices, such as vegetation and moisture indices NDVI, EVI and NDWI, and (4) summarizing data using techniques such as zonal statistics. Summaries are stored in a PostgreSQL database from which table can be queried and imported into a geographic information system (GIS) for further geospatial analysis.

EASTWeb is programmed using JAVA for overall system control. Spatial analyses are carried out using the GDAL open source geospatial library.

EASTWeb Framework

The EASTWeb framework, shown in Figure 2, is a plugin framework to allow users to more easily tailor the software for different earth science data streams. Each plugin will implement the four major categories of data processing described previously, including downloading, remote sensing data processing, computing environmental indices, and summarizing data. For example, an IMERG plugin would take process GPM IMERG data from the Goddard DISC and generate rainfall summaries.

The new EASTWeb system, which is extended from the EASTWeb framework, includes plugins for IMERG rainfall, MODIS LST, MODIS nadir-BRDF adjusted reflectance, TRMM rainfall, NLDAS forcings and NLDAS NOAH.

Figure 3 shows the design of the graphical user interface for the new EASTWeb.

Figure 4 is an example of using the MODIS LST and TRMM plugins in the new EASTWeb system to forecast the malaria cases in the Amhara Region of Ethiopia.

Future Work

- Migrate EASTWeb into a cloud environment to improve the performance of the execution
- Develop web services for users to access processed results

Acknowledgement

This work is supported by NASA ACCESS grant NASA ACCESS grant NNX14AI37A "Expanding Earth Science Data Access for Public Health Research and Applications".

Figure 1. The Major Processing Steps in EASTWeb System

Figure 2. EASTWeb Framework

Figure 3. EASTWeb Plugin Framework Architecture

Figure 4. Malaria early detection and early warning

Figure 3. Graphical User Interfaces