

ILTER Post-doctoral Project Final Report for Award Year 2012

Title

Development and analysis of a database of Landsat Thematic Mapper imagery to support cross-site research

Principal Investigators

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Additional Participants

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Summary

The Landsat data archive represents the most-extensive, longest running record of publically available satellite imagery. Landsat Thematic Mapper (TM) has collected images of each LTER site since 1982. Past LTER technology committees and recent Spatial Data and Analysis Committees have recognized the value of Landsat data for cross-site research and have repeatedly advocated for a consistent remote sensing data archive easily accessible by all LTER sites. During this postdoctoral project we built this archive database, conducted a workshop to initiate the development of cross-site Landsat-derived biomass data products, and helped develop a project to atmospherically correct the LTER Landsat archive.

We created a cross-site database of Landsat 5 TM imagery and made it available via the LTER NIS. We coordinated with representatives from each site to determine the number of Landsat scenes needed to adequately cover each site and acquired every image with <50% cloud cover. The final dataset consisted of 10,643 data packages (each data package contains a Landsat image: 7 GeoTIFFs, one for each band) and was ~2 Tb. We also separately acquired a jpeg quicklook for each Landsat image. These jpegs will be used as browse images so that researchers can identify cloud cover patterns before they download a full image package.

As part of this project we conducted a workshop at the 2012 LTER All Scientists Meeting to demonstrate the utility of the Landsat database and initiate the development of standardized, higher-level cross-site data products. The working group was entitled "Using remote sensing tools to calculate biomass consistently across LTER sites". In addition to providing background on the Landsat database, we also gave a presentation describing newly developed methods to integrate LiDAR and Landsat to produce accurate long-term estimates of biomass changes at regional scales. During the workshop we initiated a collaboration with John Schalles from the Georgia Coastal Ecosystems LTER. This ongoing project involves mapping salt marsh biomass at GCE using the Landsat database. During the ASM we also met with the LTER Information Management

team and developed a standardized EML package for Landsat datasets such as the one we have developed for this postdoc. Based on recommendations from the IM team, we created an EML package for each of the 10,643 data packages. We have also drafted a detailed data management plan for this project that describes the steps required to import and maintain this collection in the LTER network catalog. This document will serve as a template for other remote-sensing projects that generate large amounts of data for the catalog (see below).

One of the primary conclusions from our ASM workshop was that correcting the Landsat imagery for atmospheric effects was a critical step before any higher-level data products (e.g. maps of land cover change, biomass, NDVI) could be created. Developing accurate atmospheric correction algorithms is a complex and time-consuming process and the work required to achieve this extended beyond the time frame of this project. However, we helped develop a follow-up postdoctoral proposal to be led by Tom Spies and Theresa Valentine that will build off of our work and complete the atmospheric corrections to the LTER Landsat catalog. We have delivered a hard copy of the catalog to Tom Spies and Theresa Valentine and will continue to collaborate with them as their project moves forward.