6.13 AN INTEROPERABLE WEB MAPPING APPLICATION AT THE GES DAAC

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1. INTRODUCTION

The Goddard Space Flight Center Earth Sciences Distributed Active Archive Center (GES DAAC) is a large repository and distribution center for NASA Earth Sciences data, including satellite observations of land, ocean, and atmospheric conditions. Data distributed from the GES DAAC are currently available primarily in the Hierarchical Data Format (HDF) and HDF-EOS (Earth Observing System). While these data formats are suitable for archiving data, they are not compatible with most GIS packages, making data import and analysis difficult for users. Routine conversion of data to GIS-compatible formats would not be a practical solution due to the large volume of data stored at the GES DAAC (hundreds of Terabytes and increasing daily). Interoperability interfaces offer a potential solution that allows the GES DAAC to maintain data holdings in formats suitable for archiving, and allows users to request and receive data in formats they are more familiar with. The GES DAAC is developing a Web-based mapping tool (http://daac.gsfc.nasa.gov/WEBGIS) that implements interoperability standards set by the Open GIS Consortium (OGC). OGC-compliant client-server applications allow users to combine geographic data from multiple sources without the need to convert between data formats.

2 OGC INTEROPERABLE STANDARDS

The GES DAAC, with the goal to enable a wider GIS audience to easily access its data, has chosen to implement the interoperability standards set by the Open GIS Consortium (OGC). The OGC was founded in 1994 as a partnership between public and private companies, government, and education to build spatial interoperability. It currently has over 220 members, including many of the major GIS software vendors.

OGC develops standards that allow spatial data to be seemlessly accessed via the internet. One standards published is for requesting maps from geospatial data (GetMAP). Standards for a Web Map Service (WMS) define the protocol to be used in requesting a map, and the possible formats that a map server can respond with. The OGC is also developing specifications to allow users to request the original raster data (GetCoverage). These standards create a uniform syntax to request data that will allow users to be able to import the data into various GIS packages they have on their local machine. Implementing standards from the OGC allows the GES DAAC to leverage the work done by a group already linked to the GIS community.

3 IMPLEMENTATION

3.1 USER INTERFACE

The GES DAAC has developed a Web-based applet that allows GIS users to preview GES DAAC satellite data files, combine with ancillary data to produce maps and save the data in GIS formats. This applet implements the GetMap specifications. The user can search for data based on environmental parameters and time (see Figure 1).

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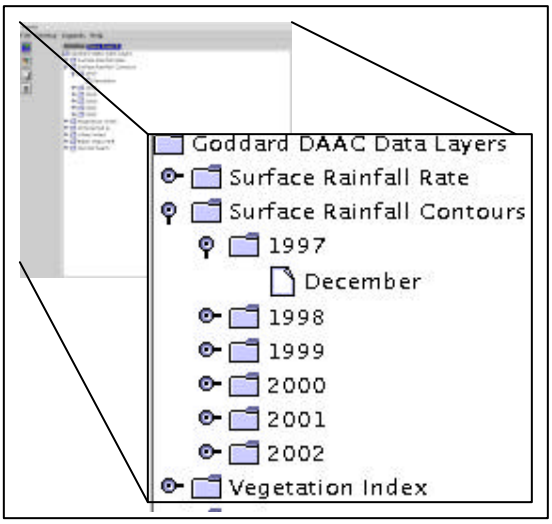

Figure 1. Interface for searching available GES DAAC data and selecting desired date

The user is also offered an interactive map to select a desired geographic subset (see Figure 2).

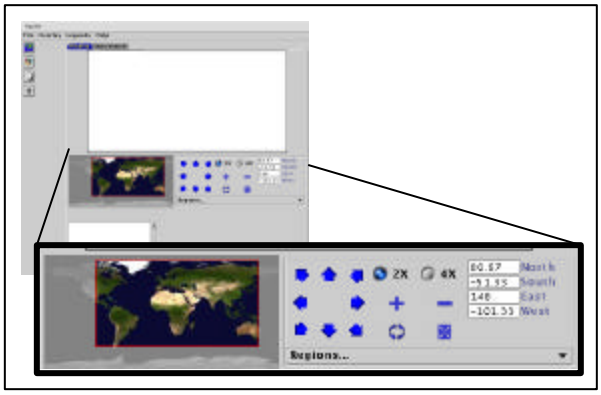

Figure 2. Interactive map for selecting desired geographic subsets.

A GetMAP request consists of a user specified layer, geographic bounding box, time and image dimensions. The applet then calculates the image dimensions and creates the request that is sent to the map server at the GES DAAC.

3.2 OPEN GIS MAP SERVER

The GES DAAC map server parses the incoming request and either sends the parameters off to a local rendering code to generate a map, or forwards the request on to an external map server for the rendering to be done there. The resulting image, either produced at the GES DAAC or elsewhere, is routed back through the map server application to the applet.

3.3 MAP DISPLAY

Once the completed map is ready, it is sent back to the applet for display. The applet is capable of displaying multiple superimposed images. The user can specify the order in which the images are drawn, turn individual layers on/off, and adjust the transparency level of the layers. This allows a feature to be examined from two layers simultaneously. (see Figure 3).

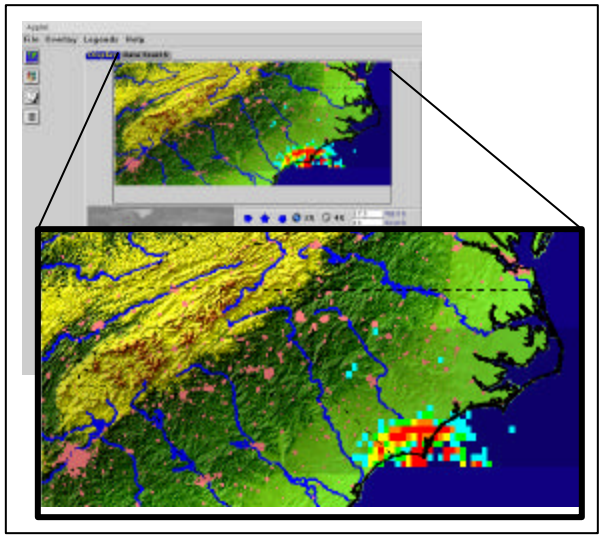

Figure 3. Composite map resulting from a GES DAAC layer (surface rainfall rate) and externally generated layers (elevation, rivers, population centers, political boundaries).

3.4 DATA DOWNLOAD

In addition to being able to see a dynamically generated map from the satellite data, the user, in the future, will be able to requet that the original satellite data be converted on-the-fly to some GIS-compatible format. The applet will send the request of a data layer and parameters (place and time) to the server that will retrieve the desired satellite file, subset it, convert it to a GIS-compatible format, zip or tar the resulting files together, and send them back to the browser. The user will be prompted to save the file once it is ready. The number of GIS-compatible formats available will increase based on feedback from users.

When publically available standards are published by the OGC, for the GetCoverage request, the above data download process will be converted to OGC standards. At this time there are no plans to make the applet able to handle the resulting GIS files; rather, the user will need to make use of an available GIS package.

4 CONCLUSION

The GES DAAC's Web mapping software tool offers users a new, convenient, graphical way to examine GES DAAC and other data holdings. As the tool matures, it is expected to greatly increase the number and variety of users of data and information stored at the GES DAAC. To make this tool as useful as possible to GIS users, usage statistics will be analyzed regularly, and feedback will be sought to determine what features should be enhanced or added.