



Using NASA's Giovanni Web Portal to Access and Visualize Satellite-Based Earth Science Data in the Classroom

American Geophysical Union
Fall Meeting
San Francisco, CA
17 December 2008



Steven Lloyd^{1,2}, James G. Acker^{1,2}, Ana I. Prados^{2,3} and Gregory G. Leptoukh²

¹Wyle Information Systems, Inc., McLean, VA

²NASA GSFC Earth Sciences (GES) Data and Information Services Center (DISC), Code 610.2, Greenbelt, MD

³Joint Center for Earth Systems Technology (JCET), University of Maryland, Baltimore County, Baltimore, MD



NASA Goddard Earth Sciences (GES)
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Poster ED31A-0593

The Issues

One of the biggest obstacles for the average Earth science student today is locating and obtaining satellite-based remote sensing datasets in a format that is accessible and optimal for their data analysis needs. At the Goddard Earth Sciences Data and Information Services Center (GES-DISC) alone, on the order of hundreds of Terabytes of data are available for distribution to scientists, students and the general public. The single biggest and time-consuming hurdle for most students when they begin their study of the various datasets is how to slog through this mountain of data to arrive at a properly sub-setted and manageable dataset to answer their science question(s). The GES DISC provides a number of tools for data access and visualization, including the Google-like Mirador search engine and the powerful GES-DISC Interactive Online Visualization ANd aNalysis Infrastructure (Giovanni) web interface.

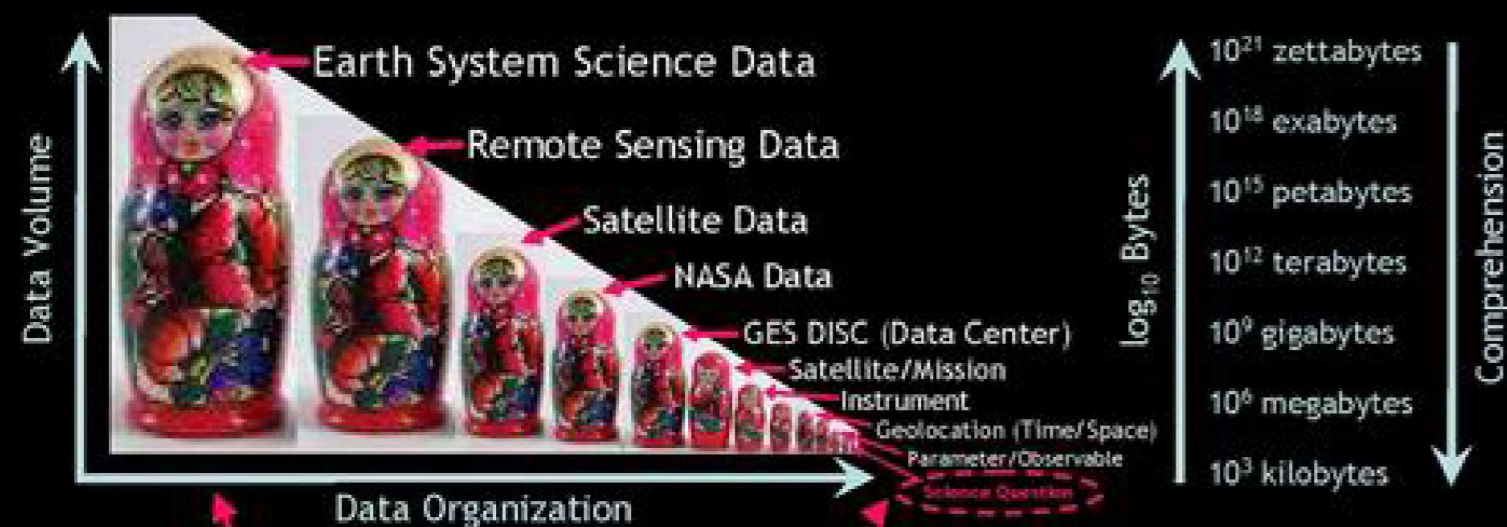
Giovanni
Online Visualization
and Analysis

<http://Giovanni.gsfc.nasa.gov>

Giovanni provides a simple way to visualize, analyze and access vast amounts of satellite-based Earth science data. Giovanni is actually a series of twenty-one similar web-based data interfaces, each of which covers a single satellite dataset (such as TRMM, TOMS, OMI, AIRS, MLS, HALOE, etc.) or a group of related datasets (such as MODIS and MISR for aerosols, SeaWiFS and MODIS for ocean color, and the suite of A-Train observations co-located along the CloudSat orbital path). Recently, ground-based datasets have been included in Giovanni, including the Northern Eurasian Earth Science Partnership Initiative (NEESPI) and EPA fine particulate matter (PM_{2.5}) for air quality (US only). Model data, such as the Goddard GOCART model and MERRA meteorological reanalyses, are being incorporated into Giovanni to facilitate model-data intercomparison. A full suite of data analysis and visualization tools is also available within Giovanni.

Solutions

1. Dr. James Acker and Dr. Steven Lloyd of the GES DISC have conducted a variety of **educational workshops** on Giovanni, NEO and Earth science data systems. The audience has been teachers, university professors, students, and educators involved in preparing Earth science curricula and "teaching the teachers."
 - ① "Giovanni and LOCUS: Innovative Ways for Teachers and Students to Conduct Online Learning and Research with Oceanographic Remote Sensing Data." 2006 National Marine Educator's Association Annual Meeting, Brooklyn, NY, 17 July 2006
 - ② "Exploiting the Capabilities of NASA's Giovanni System for Oceanographic Education," 2007 EARSeI Symposium, Bolzano, Italy, 6 June 2007
 - ③ "Giovanni Facilitates Investigations of Coastal Environmental Processes with NASA Remote-Sensing Data," Coastal GeoTools '07 Conference, Myrtle Beach, SC, 5-8 March 2007
 - ④ "Using NASA's Giovanni Web Portal to Access and Visualize Satellite-Based Earth Science Data in the Classroom," National Science Foundation (NSF)/Science Education Resource Center (SERC) Workshop *New Tools for Geoscience: Visualizations, Models and Online Data* Amherst, MA, 11-12 February 2008
 - ⑤ "The Giovanni-NEO Oceanographic Instructional Cookbook," 2008 AGU/ASLO/TOS Ocean Sciences Meeting, Orlando, FL, 5 March 2008
 - ⑥ "Using the Goddard Hurricane Portal and the Giovanni Web Portal in the Classroom," Geophysical Information for Teachers (GIFT) Workshop, Spring 2008 American Geophysical Union (AGU) Joint Assembly, Ft. Lauderdale, FL, 29 May 2008
 - ⑦ "Using NASA's Giovanni Web Portal to Access and Visualize Satellite-Based Earth Science Data in the Classroom," Earth System Science Education Alliance (ESSEA) Annual Conference, Charleston, SC, 18 June 2008
2. In collaboration with Daniel Zalles of SRI, International, the GES DISC has proposed to develop a version of "Giovanni for Students." This interface will allow students to jump *directly* from their science questions to the relevant satellite and related datasets.
3. In collaboration with Prof. Sundar Christopher of University of Alabama at Huntsville (UAH) and Richard Kleidman of the GSFC MODIS team, the GES DISC is currently developing a systematic series of **training modules** for Earth science satellite data. Training modules will include an overview of the Earth science datasets archived at Goddard, an overview of terms and techniques associated with satellite remote sensing, applications to air pollution, dataset-specific issues, an overview of Giovanni and other NASA data portal functionality, and a series of examples of how data can be readily accessed and visualized. Each training module will be "tagged" for use by scientists, grad students, undergraduates, high school students or the general public. Funding for the development of these training modules is provided by the Office of Applied Science (Lawrence Friedl, Program Manager), NASA Headquarters.



How does the student, who *starts* with a science question, get from here to here??

SAMPLE SCIENCE QUESTION:

How can we find out how rainfall has changed over the Eastern US over the past decade?

NASA's Tropical Rainfall Measuring Mission (TRMM) satellite makes regular observations of total rainfall and rainfall rates. After a severe drought in US Mid-Atlantic region ended in the Fall of 2002, record-breaking rainfall totals were observed. Satellite observations of the monthly rainfall anomaly in 2003 over the US Mid-Atlantic region was over two inches above normal.

Please help yourself to a Giovanni brochure.

Place pocket with Giovanni brochures here.

Feel free to leave your card if you would like to receive updates on the Giovanni training modules.

Place pocket for cards here.