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Data Made Easy [1]

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Tools developed at the Alaska Satellite Facility help users work with data.

Scientific data are only as valuable as their interpretation. Thus, when interpretation of satellite data is difficult, tools become essential to making the job easier.

The Alaska Synthetic Aperture Radar (SAR) Facility (ASF) is charged with a particularly daunting task, given the complexity of SAR data. Over the years, ASF has developed general tape readers, metadata handlers, radiometric calibration tools, and automatic geocoding and terrain correction tools. In fall 1994, the Polar DAAC Advisory Group (PoDAG) selected ASF's Science Division to develop and support tools for the SAR user community.

Software development is essential for making SAR data sets user friendly, said Frank Carsey, head of the Science Division. "The SAR image is 64 megabytes." Quite a bit of ancillary information goes along with the data sets, including the time, the place, the illumination source, and the instrument status, he said. "So when you wrap all of that up, it makes a sizable data set."

"The tools developed by ASF are particularly useful for the novice user," said Harry Stern at the Applied Physics Laboratory, University of Washington. Stern, a veteran SAR data user, has used ASF's tools as a base from which to advance his software designs. "On one or two occasions, I have taken the source code from the ASF tools and modified it a little bit to do something slightly different. The code is fairly well documented, so that makes it easier than starting from scratch."

Joseph Jacob, a programmer at the Jet Propulsion Laboratory (JPL) in Pasadena, California, modified some of ASF's software when adapting Spaceborne Imaging Radar-C band SAR data for inclusion in JPL's Real-Time Interactive Visualization and Analysis (RIVA) system. He used the source code from ASF's terrain correction tool to modify SAR data to match the existing digital elevation model of Death Valley, California.

On the international scene, ASF has participated in a cooperative attempt to develop a globally standardized magnetic reader for each country with an Earth Observing Program. According to Carsey, there were some complications in the program that resulted in creating a nearly similar format for each program. Thus was born the Committee on Earth Observing Systems (CEOS) reader that accompanies each data set.

According to Carsey, ASF is in the process of taking the current CEOS reader and updating it to recognize key variables among the international versions of the CEOS reader. "Key specifics, such as kilometers versus meters versus arc seconds will be universally recognized by the up-and-coming CEOS reader," said Carsey. "This will allow the user looking at a German CEOS to find the image easily because the software will treat it properly by making the needed adjustments automatically."

ASF's software team is also developing processing capabilities for SAR interferometry, which is used to detect surface changes, such as sea ice movement or seismologic activity or to generate digital elevation maps. By comparing different satellite passes, interferometry uses SAR data to observe an object over time. If the backscatter of the signal phase differs between passes, movement of the viewed object is implied. In spring 1996, ASF released a prototype of SAR interferograms (interferometric images), which was followed by a release of a prototype for the automated production of a digital elevation model.

ASF maintains the effort to keep up with users' demands and needs, said Carsey. They are responsible for continually updating software, verifying that it is compatible with a variety of satellites and operating systems.

Resource(s)

To enhance user application of data, JPL developed the Real-Time Interactive Visualization and Analysis (RIVA) system. This allows NASA data users to work with multiple satellite data sets, such as LANDSAT visible spectrum images in concert with Synthetic Aperature Radar (SAR) images in a three dimensional perspective.

RIVA overlays images on a base map. Remote sensing images can be mosaicked with a digital elevation model, offering a data package which provides a realistic, three dimensional view, incorporating multiple data set information. Easily manipulating varied formats and resolutions, RIVA renders global projections by compiling data onto spherical models, matching data lines of latitude and longitude. To create a realistic polar projection of data near the polar regions, longitude lines are scaled, being greatest at the equator, least at the poles.

We overlaid SIR-C SAR imagery of Death Valley on top of existing LANDSAT imagery of the same area, said Jacob. We needed to co-register the SAR image to the same digital elevation model (a process called terrain correction) so that the SAR and LANDSAT images match up. ASF provided us with the source code for implementation of the terrain correction algorithm for the SAR images in exchange for some of our SAR preprocessing software.

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