Alaska Satellite Facility
News & Notes
spring 2005, volume 2:1

Response to a Freighter Grounding Incident in the Bering Sea

After it lost power and efforts to tow it to safety failed, the freighter *Selendang Ayu* went aground on December 8, 2004, and broke apart off the shore of Unalaska Island near Skan Bay, Alaska.

The ship was carrying approximately 424-thousand gallons of intermediate fuel oil, 18-thousand gallons of marine diesel, and 132-million pounds of soybeans, according to the NOAA Office of Response and Restoration (NOAA/OR&R). Fortunately, only about 40-thousand gallons of oil spilled when the ship broke in two.

Responding to the disaster, the Alaska Satellite Facility immediately submitted RADARSAT-1 acquisition requests for the National Ice Center (NIC) and NOAA's National Environmental Satellite Data and Information System (NOAA/NESDIS). In turn, the NIC supplied the U.S. Coast Guard (USCG) with the RADARSAT-1 data, and Bill Pichel from NOAA/NESDIS interpreted the SAR images for the NOAA/OR&R and for the USCG.

When system incompatibilities prevented the coast guard from ingesting images in the NIC's GeoTIFF format into their ArcGIS software application, ASF bridged the gap by sending the USCG a GeoTIFF product created with ASF's new conversion tool.

When conditions are ideal, an oil slick on the ocean surface will appear as a very dark area on a SAR image—not because the oil is black, but because the oil smooths the ocean surface. This smoothed surface fails to reflect SAR microwave pulses back to the satellite and returns a very low backscatter value which shows as black on a SAR image. Usually, the open ocean is slightly rough due to the presence of small waves, called Bragg waves, which will reflect some of the radar pulses back to the satellite. Therefore, open ocean normally shows as a variety of grey values in a processed SAR image.

Since conditions other than oil slicks may cause low backscatter from ocean water, a black splotch on a SAR image does not necessarily indicate an oil spill. Sea water on the verge of freezing shows as flat, dark black due to splinter ice on the surface dampening the small Bragg waves.

The ocean surface will also be smooth if a nearby mountain onshore is sheltering the ocean surface from wind. Conversely, an oil slick can be hard to detect with SAR data if the ocean waves are too large.

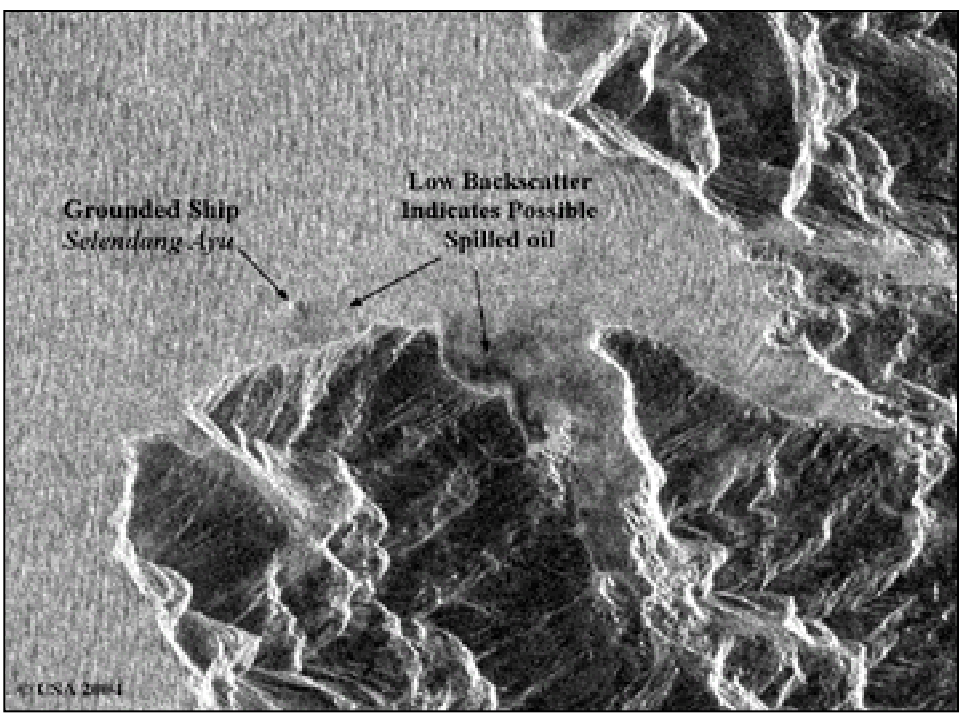
"The best that can be done for coastal spills is to use the SAR data along with in situ data to provide a synoptic overview of potential areas of oil extent and movement," said Pichel. "SAR observations must be confirmed by observer reports, or by subsequent SAR images that show consistency."

An additional complicating factor in the *Selendang Ayu* incident was that spilled oil mixed with the spilled soy beans, creating a foam on the ocean surface instead of a classic smooth oil slick.

All factors considered, the first image of the grounded ship showed low backscatter in the area of the spilled oil.

To increase imaging opportunities, ASF extended the RADARSAT-1 acquisition plan and added imaging from ERS-2 in January 2005 to provide SAR imagery of the incident site. Using this data, NOAA/NESDIS and the NIC continue to monitor the position of the two pieces of the stranded vessel for the USCG and the Unified Command, as well as watch for additional oil spilling. ♦

by Melanie Engram, ASF User Services



Low backscatter on this Standard Beam 2 image corresponds to oil on the water as observed and mapped during an overflight on December 12, 2004 (the same day that the SAR image was acquired). The incident map can be viewed at http://www.state.ak.us/dec/spar/perp/response/sum_fy05/041207201/maps/041207201_flt_01.pdf.

Summer Interns Receive Hands-on Experience at ASF

WADE ALBRIGHT

Jeremy Nicoll (ASF Engineering Center Manager) and Noel and Robert Strick (ASF summer interns, 2004) stand before a corner reflector in the field. Robert worked with the data quality group building a portable corner reflector.

As winter in Alaska's interior begins dissipating, the ASF Data Quality team starts planning for another summer of research, design and maintenance in the field. In addition, ASF recruits interns annually for specific work and training opportunities.

Drawing from the university system, the national and international science communities and the community of Alaska, ASF seeks interns who will introduce a fresh perspective to ongoing projects. "It's a hands-on experience for those involved," says Wade Albright, the ASF Data Quality lead.

Last year, Albright worked closely with intern Robert Strick to construct a new device for data calibration. Using ASF resources, Strick created a unique, currently operational piece of equipment—the transportable corner reflector.

A major advantage of Strick's slimmed-down reflector design is its collapsible frame. When deployed, it can be carried in the field using a customized backpack frame.

In terms of manufacturing customized hardware, projects such as Strick's require large-scale adaptability, given the unconventional materials and designs required for seasonally extreme Alaska fieldwork conditions. Strick worked with Geophysical Institute machine shop staff to build his portable corner reflector.

"The tools in the machine shop are things you probably won't see in smaller towns" says Strick, a Native Alaskan who has spent the majority of his life in the 48-square-mile village of McGrath, adjacent to the Kuskokwim River.

The combination of resources offered by ASF and the university provides a dynamic atmosphere for work experience and education. "There is a great deal of satisfaction having a hand in creating projects like these," says Albright. "One of the best ways to learn is on the job, in a working environment."

ASF is adding an international element to the internship program this year. In April, an engineering student, Ernst Weissbrodt, from Karlsruhr University in Germany begins working with the Data Quality group. He will support field work and assist with developing improvements for stationary corner reflectors.

"We are happy to establish ties with our European colleagues, who have a wealth of experience with SAR through the ERS and Envisat missions," says Remote Sensing Support Center Manager, Dr. Don Atwood. "Student interns serve as the bridge in sharing technical ideas and creating new opportunities for data access."

ASF is working to create a similar internship opportunity with the Japanese Aerospace Exploration Agency (JAXA), which plans to launch the Advanced Land Observation Satellite (ALOS) SAR mission this fall. While involving international elements in ASF's calibration efforts, ASF hopes to strengthen ties with national programs and scientists to promote the ongoing development of SAR expertise.

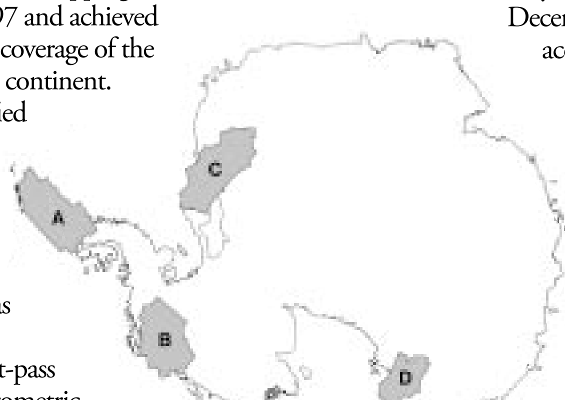
To read more information about the various experiences and accomplishments of ASF interns, including papers, project outlines and journals; and to discover how to become part of the intern program, go to http://www.asf.alaska.edu/3_6_5.html.

To see what corner reflectors look like and learn the role corner reflectors play in data referencing, please visit the data calibration page on the ASF Web site at http://www.asf.alaska.edu/3_6_2.html. ♦

by Steve Balistreri, ASF User Services

Additional Antarctic Acquisition Opportunities

Under the auspices of the RADARSAT Antarctic Mapping Project (RAMP), multiple mapping missions of Antarctica, using RADARSAT-1, have been accomplished. The first Antarctic Mapping Mission (AMM) occurred in 1997 and achieved complete radar coverage of the entire Antarctic continent.



The Modified Antarctic Mapping Mission (MAMM) occurred in 2000 and was dedicated to acquiring repeat-pass data for interferometric analysis of areas of Antarctica from 80-degrees south to the coast.

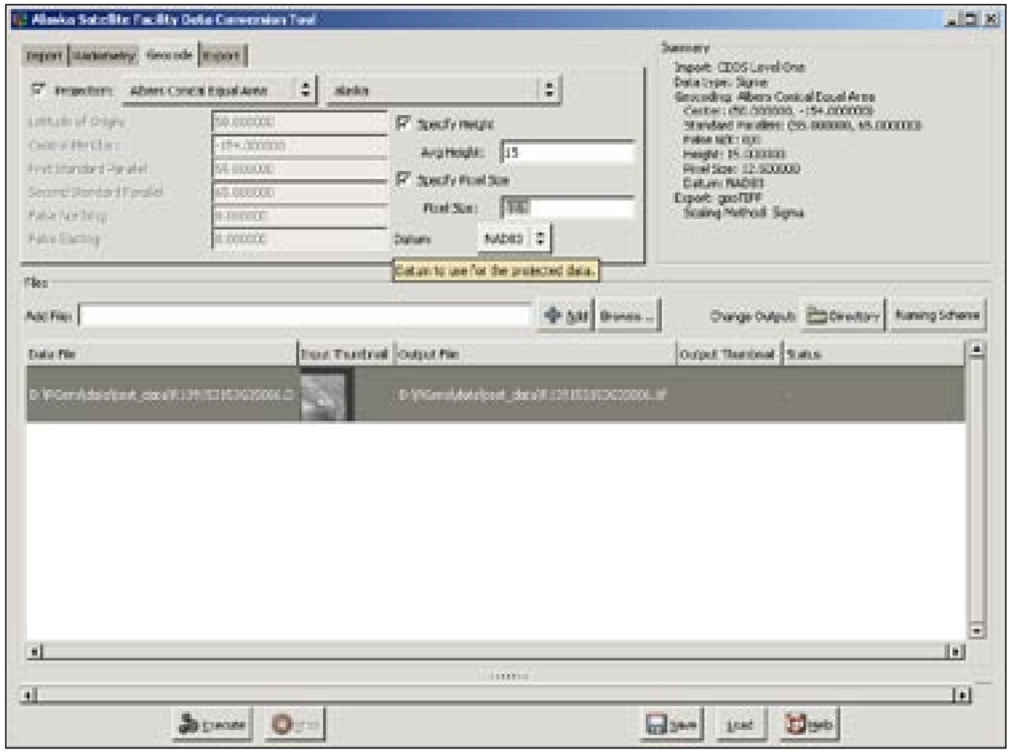
A third limited mapping mission, MiniMAMM, was performed during the austral spring of 2004. The objectives of this limited mission were to measure velocities of fast glaciers and glaciers known to be changing; remeasure selected ice margin locations; and investigate changes in the surface morphology of Antarctic Peninsula ice shelves and other coastal regions.

The acquisition plan of the MiniMAMM collection replicated MAMM for selected areas. Repeat-pass data along the same orbits as MAMM were acquired for three RADARSAT-1 cycles from September to December 2004. Data were acquired using the Fine 1; the Standard 1, 2, and 6; and the Extended Low beam modes in both ascending and descending orbits. The areas selected for data acquisition, as shown in the figure to the left, included the Antarctic Peninsula (A), Pine Island Glacier (B), Filchner Ice Streams (C), and David Glacier (D). ASF is producing the initial processed MiniMAMM data and distributing it to the Byrd Polar Research Center at The Ohio State University for further processing.

Planned data products from the MiniMAMM data set will include calibrated mosaics, coherence maps, velocity maps and coastline estimates. ♦

by Michelle Harbin, ASF User Services

New Data Conversion Tool Simplifies Data Projection



The screen shot above is of the GUI for the new conversion tool that ASF released this spring.

ASF announces the availability of a new GUI (graphical user interface) that guides the user through the process of ingesting, geocoding and exporting ASF SAR data products; translating them into a variety of formats.

ASF distributes most of its data in the Committee for Earth Observing Systems (CEOS) standard format. Although this format represents a serious effort to completely characterize the data available from remote sensing platforms, it is difficult for many users to handle.

Most commercial GIS and image processing applications provide minimal support for CEOS formatted data, and CEOS is complicated enough that writing programs to interpret it can be challenging. To use a Level-1 image, you must usually resample it into a common coordinate system, or map projection, and translate it to a form understood by other applications. The convert tool can do this.

The tool can ingest ASF CEOS data and interpret image samples in the usual methods: sigma, beta, or gamma normalized values, or amplitude or power. The image can then be geocoded (i.e., map projected) into one of the following common formats: universal transverse Mercator (UTM), polar stereographic, Albers conical equal area or Lambert azimuthal equal area. We can easily add other projections, if users have other specific needs.

Users can set an average height for their image within the GUI of the conversion tool to improve geolocation accuracy. The interpolation method used to resample the image is also adjustable. The resulting geocoded image can then be exported from the GUI in JPEG, PPM, TIFF or GeoTIFF format as either a byte or floating point image.

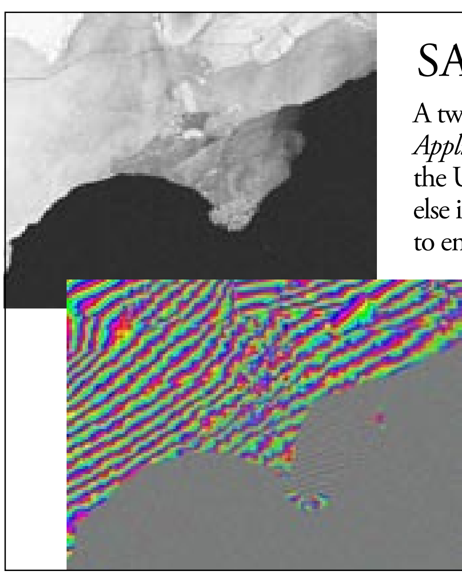
The GUI also supports batch processing of multiple images, so most users will not need to write scripts. However, a command line interface to the tool is available. The ASF User Tools Development group is currently developing geometric terrain correction from reference digital elevation models. This technique will remove geolocation errors that are a normal result of variable terrain height in SAR imagery.

ASF user tool developers are also interested in supporting any particular user input and output format requirements. In general, the more a given format improves the usability of ASF data, the more interested we are in supporting that format.

A user forum dedicated to the ASF tools can be found at https://forum.asf.alaska.edu/.

To download the tools go to the URL at https://www.asf.alaska.edu/software/. ♦

by Britton Kerin
ASF User Tools Development



SAR Course Offered During UAF Summer Session

A two-week course, *SAR and InSAR: Principles and Applications*, will be offered for credit June 20 - July 1 at the University of Alaska Fairbanks. Students and anyone else interested in working with SAR data are encouraged to enroll and gain a better understanding of:

- operational SAR satellites and SAR sensors;
- acquiring, processing and interpreting SAR data;
- ordering data on the EOS data gateway;
- geocoding SAR data;
- generating a Digital Elevation Model;
- processing data sets for their own research application and area of interest;
- using the ASF RADARSAT-1 baseline catalog to determine what datasets would best meet their InSAR processing needs;
- appreciating the variety of applications that SAR and InSAR are used for; and
- understanding the advantages and practical limitations of SAR and InSAR.

Details about the SAR course are available at http://www.uaf.edu/summer/docs/coursefinder.html.

For information about economical housing on campus, go to http://www.uaf.edu/summer/docs/housingfood.html. ♦

by Rudi Gens
ASF Remote Sensing Support Center

Meeting Calendar

- European Geophysical Union Meeting, April 25-29; Vienna, Austria
- Remote Sensing for Marine and Coastal Environments, May 17-19; Halifax, Nova Scotia, Canada
- American Geophysical Union, 2005 Joint Assembly Meeting, May 23-27; New Orleans, LA, United States
- International Geoscience and Remote Sensing Symposium (IGARSS), July 25-29; Seoul, Korea
- Pecora 16 Conference, *Global Priorities in Land Remote Sensing*, October 23-27; Sioux Falls, SD, United States

PHOTOS BY STEVE BALISTRERI

Anthony Paul from the Howard Luke Academy in Fairbanks chose ASF for his job shadowing day. In the photos below, Science Consultant Jeanne Laurencelle in User Services shows him how she uses a database to track orders for Level-0 processing, and Kurt Bunker explains the finer points of working as a Microcomputer Support Specialist.

Submissions and Subscriptions

This newsletter, published by ASF, was created to provide detailed information about special projects and noteworthy developments, as well as science articles highlighting the use of ASF data.

To receive the newsletter by postal mail, please fill out the subscription form linked to the ASF homepage at www.asf.alaska.edu. Current and back issues of the newsletter can be obtained in PDF format through the ASF Web site.

Submissions to the News & Notes and suggestions about content are always welcome. If you are interested in contributing materials, please call or send an email to the editor:

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