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RADARSAT-1 IPY Legacy Datasets Available

by Rebecca Sanches, Alaska Satellite Facility

In 1952, a scientist named Lloyd Berkner recognized that the upcoming maximum in the sunspot cycle could prove to be significant to earth sciences. As a result, he proposed the first International Geophysical Year (IGY), a systematic study of the Earth, from pole to pole, that began in 1957. Modeled after the previous International Polar Years (IPY), the IGY was highly successful due to both dedicated researchers and advancements in technology.

Our understanding of the Earth and its processes was improved because researchers collaboratively focused their research. While the work was carried out globally, there was increased interest in the poles, especially in the Antarctic region. Research opportunities drew people to Antarctica and they arrived in numbers like never seen before. IGY was a clear-cut success, and paved the way for scientists who look to the poles to understand global and regional geophysical changes.

The current IPY (2007-2009) celebrates the 50th anniversary of the IGY by continuing the interdisciplinary science and the spirit of international cooperation that characterized past IPY and IGY efforts. Today, with more than 60 countries participating and over 200 research projects underway, the current IPY is moving forward in its effort to facilitate our understanding of changes at the poles and how those changes affect the rest of the world.

The Alaska Satellite Facility (ASF), in a joint effort with the Canadian Space Agency (CSA), National Air and Space Agency (NASA), and the University of Alaska Fairbanks, has identified

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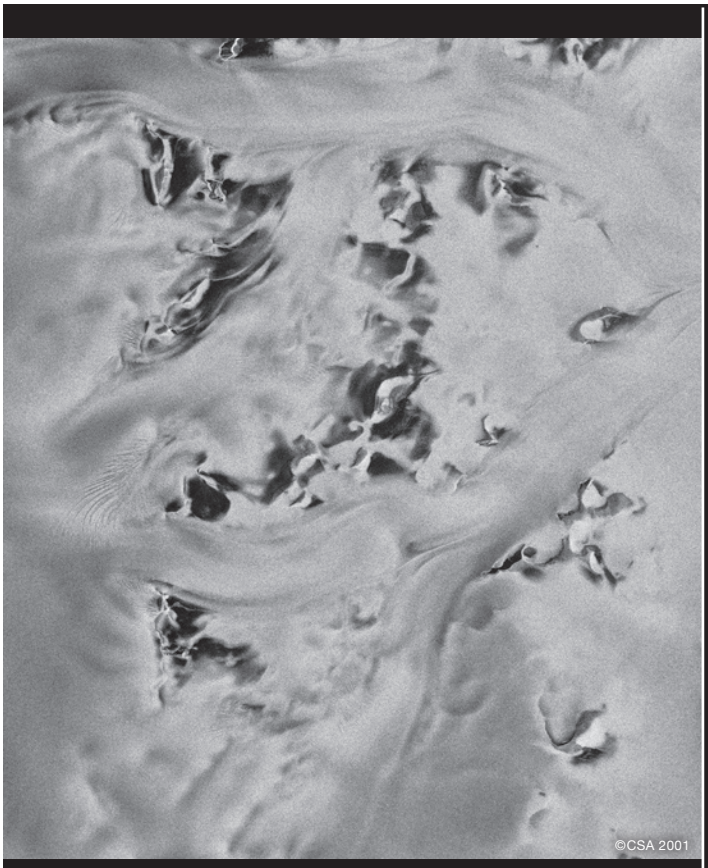

Figure 1a: RADARSAT-1 fine-beam image of windswept glaciers in eastern Greenland (December 22, 2000)

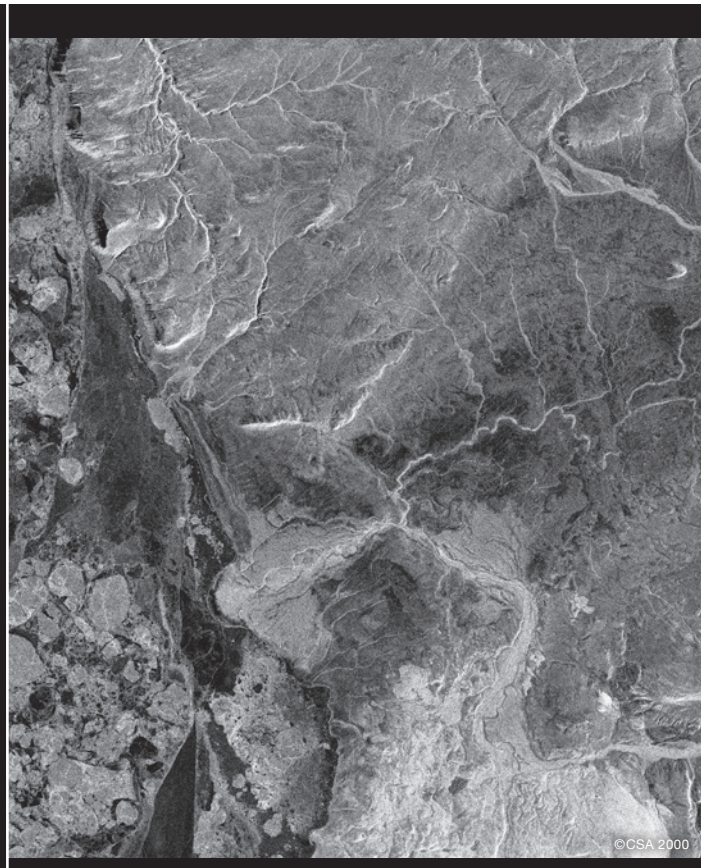

Figure 1b: RADARSAT-1 fine-beam image of Northwest Greenland, Robeson Channel (January 19, 2001)

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datasets that will be useful to researchers. These data will be made available to the international research community on an unrestricted basis. ASF has been collecting Synthetic Aperture Radar (SAR) data for more than 15 years, giving United States' (U.S.) researchers access to the data through agreements between NASA and the European Space Agency, the CSA, and the Japan Aerospace Exploration Agency.

Researchers are discovering new ways to use SAR for their projects. While ASF is currently providing datasets acquired on RADARSAT-1 for IPY distribution, it offers other valuable datasets from the Japanese Earth Resources Satellite (JERS), European Remote Sensing Satellites 182 (ERS-1, ERS-2), Airborne Synthetic Aperture Radar (AIRSAR) and Advanced Land Observing Satellite (ALOS) (SAR and optical). The unique capability of SAR to image through any weather, day or night, makes these datasets especially valuable for polar studies. The data enables researchers to access information regarding dangerous or inaccessible areas and gives them the capability to see the effects of climate change in Arctic and Antarctic regions, without costly expeditions, and without taking unnecessary risks.

ASF's goal is to continue to make these data available beyond the current IPY to a new generation of researchers interested in studying the Arctic or Antarctic. The RADARSAT-1 data was previously only available with permission from NASA and only to U.S. researchers. However, well-defined datasets will now be available to researchers during the IPY.

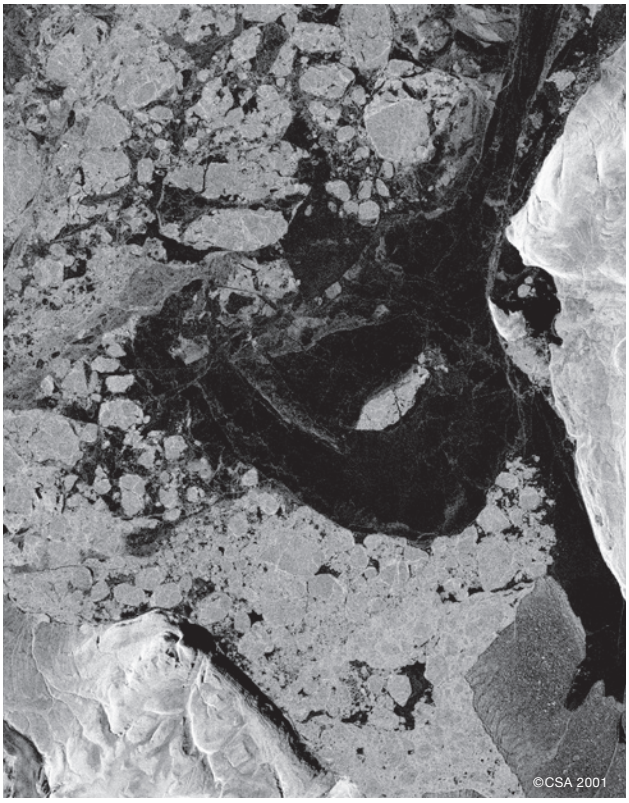

Figure 2: RADARSAT-1 fine-beam image of sea ice off the West Coast of Greenland, Nares Strait, Terminus of Retermann Glacier (January 19, 2001)

Current datasets include:

- Greenland using RADARSAT-1, Fine-beam Level-0 products (Sept. 2000 – Jan. 2001)
- Greenland using RADARSAT-1, Fine-beam Level-1 products (Sept. 2000 – Jan. 2001)
- Antarctica RADARSAT-1 Antarctic Mapping Project (RAMP) data using Level-1 products (Sept.1, 1997 – Oct. 31, 1997)
- Toolik Station, AK, using RADARSAT-1 Standard Beams 1-7, Level-1 products (Oct. 2004 – Dec. 2006)
- Kamchatka Peninsula using RADARSAT-1 Standard Beams 1-7, Level-1 products (Dec.1999 – Jan. 2000)
- Bering Sea using RADARSAT-1, ScanSAR Wide-B Level-1 products (Sept./Mar. 2006, 2007)

Future IPY datasets from the Canadian RADARSAT-1 archive may include:

- Arctic Sea Ice using RADARSAT-1, ScanSAR Wide-B, Level-1 products (Sept.– Mar. 2003 – 2007)
- Sea Ice Min. and Max. mosaics using RADARSAT-1, ScanSAR Wide A&B (Sept – Mar. 2003 – 2007)
- Arctic Super Sites using RADARSAT-1, ScanSAR Wide A&B (1996 – current)
- Great Slave Lake using RADARSAT-1, ScanSAR Wide A&B (1996 – current)
- Great Bear in Level-1, ScanSAR Wide A&B (1996 – current)
- Northwest Territories using RADARSAT-1, Standard Beams 1-7 (1996 – current)
- Mackenzie Delta using RADARSAT-1 Fine, Wide, and ScanSAR Level-1 products (1996 – current)
- Axel Heiberg using RADARSAT-1, Fine beam Level-0 products (Sept. 2000 – Feb. 2001)

These datasets allow researchers and educators to see global changes, both historic and current. They give us glimpses of human impact on the environment. They allow us to observe natural phenomena such as glacier and ice-shelf motions, wind effects on ocean surfaces, and regional flooding.

ASF has made access to the data fast and simple. Access can be found at: http://www.asf.alaska.edu/ipy/. For questions, please contact the ASF User Services Office via e-mail at uso@asf.alaska.edu or by phone at (907) 474-6166.

Faraday-Rotation Prediction Values on URSA

by Franz Meyer, Alaska Satellite Facility

WHAT IS FARADAY ROTATION?

SAR signals that propagate through the ionosphere undergo Faraday rotation (FR), i.e., a rotation of its polarization vector. After traversing the ionosphere, vertically polarized signals exhibit both vertical and horizontal components, and received SAR data will contain cross-pol terms.

FR is frequency dependent and increases with decreasing signal frequency. Therefore, data from X- and C-band SARs are practically unaffected, while effects on L-band SARs (e.g., ALOS Phased Array type L-band Synthetic Aperture Radar (PALSAR) can be significant. Besides the frequency dependence, the magnitude of FR depends primarily on the following two parameters:

1. The free-electron density of the ionosphere (cf. Figure 1) during acquisition; mainly influenced by the solar activity, the geographic location, and the time of day;
2. the magnitude and orientation of the Earth's magnetic field.

FR generally reduces the image quality of SAR images acquired in L-band and will impact ALOS PALSAR imagery. While FR angles of less than 5° were established as acceptable for a number of common SAR applications, higher FR levels may cause significant errors in SAR image interpretation and data analysis, especially decompositions relying on channel ratios.

FR PREDICTION

FR angles can be predicted if information about satellite orbit, ionospheric conditions, and the magnetic field are available. On the User Remote Sensing. Access (URSA) order interface, we provide customers with a listing of predicted FRs for PALSAR acquisitions in the ASF ALOS archive. This is intended to aid data selection for researchers wishing to avoid FR effects, or for those scientists deliberately targeting these effects.

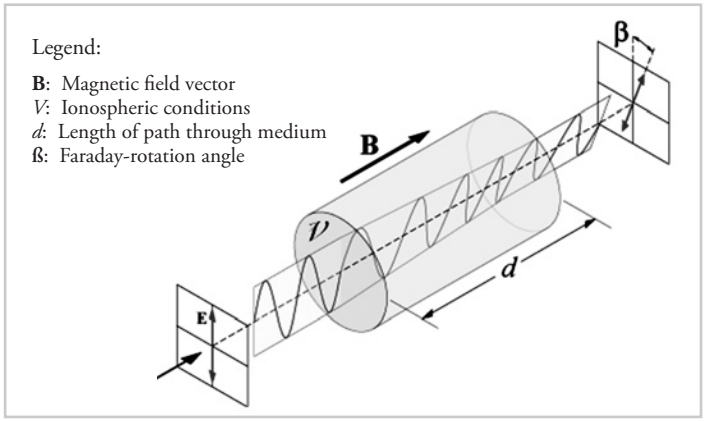

Figure 1: A schematic representation of FR effects and its dependence on the aforementioned parameters. [en.wikipedia.org/wiki/Faraday_rotation]

As is true for every predicted parameter, a given FR prediction is only an approximation of its true value. An analysis of the prediction quality yields an accuracy of about 1°. Inaccuracies stem from uncertainties and, low spatial and temporal resolution of the input data required by the model.

When searching for data on the URSA order interface, customers can specify the acceptable range of FR and will be provided with a selection of datasets that optimally meet their requirements.

EDG to WIST Transition

by Andy Mitchell, ECHO Operations, ESDIS

As part of the Earth Observing System (EOS) evolution initiative, the remaining installations of the EOS Data Gateway (EDG) client used by EOS Data Centers will be decommissioned this year and will be replaced by the Warehouse Inventory Search Tool, or WIST, created by the EOSDIS Clearing HOuse (ECHO) team. There are currently five active EDG sites: 1) ASF, 2) GSFC (Goddard Space Flight Center), 3) LaRC (Langley Research Center), 4) LPDAAC (Land Processes DAAC), and 5) NSIDC (National Snow and Ice Data Center). Users may use any EDG instance to search for and order data; however, it is assumed that very few EDG users perform orders that include data from more than one Data Center. During this transition, EDG users will have an opportunity to migrate their user accounts to WIST.

User migration from EDG to WIST will occur in phases, by Data Center, beginning with Data Centers with smaller numbers of customers using the EDG as their search and order tool. In order to take advantage of ECHO performance and user-profile enhancements, the migration of each Data Center's users from the EDG client to the WIST client will begin after ECHO 10 / WIST 10 is released in April 2008 and after each Data Center has both exported and reconciled its data holdings in ECHO. This controlled phasing allows ECHO and WIST performance to be measured and tuned, and allows ECHO to respond to usability feedback after each phase.

User-account migration will be handled via a self-service tool that will be available on each EDG instance once the migration phase begins. This tool will automatically copy a user's EDG profile into WIST and will allow the user to verify or correct their account

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information. The user will also be prompted to choose a new password, using WIST/ECHO password rules. Due to the difficulty in transitioning and the infrequency of usage, users will lose saved EDG searches and results when they migrate to WIST.

A schedule, by Data-Center, will be published to notify users when their data access through the EDG clients will be removed. Current EDG users will need to create their WIST accounts and, hopefully, become familiar with using the WIST client before access is removed from the EDG. Ample time will be provided for users to perform this migration. Users also have the option of using the Data-Center specific search and order tool, which for ASF is the URSA interface.

Because EDG users typically register at a single EDG instance, are not automatically registered at all EDG instances, and are not required to register at a particular Data-Center, the EDG clients will continue to be operational until each Data Center has removed access to their data from the EDG. The EDG clients will be disabled once the users are migrated to ECHO/WIST and the data access has been removed from the EDG. Data-Center acceptance criteria for this transition will be based on WIST functionality and response time, ECHO ingest and search/order performance, ECHO data-holdings integrity, user-profile migration completion, and user satisfaction.

If you have questions or concerns about this transition or about data access, please contact the ASF User Services Office at uso@asf.alaska.edu, 907-474-6166.

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.

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Submissions to the *ASF 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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