The DCAM data and data products originate from a number of different sources, including the Mexican National Weather Service, Mexican National Institute of Statistics and Geography, U.S. National Oceanic and Atmospheric Administration, NASA, the WorldClim database, the General Bathymetric Chart of the Oceans (GEBCO), and IPCC. For each variable, the best available information has been chosen, with corresponding references described in the atlas's documentation.

DCAM was developed using open-source software (GeoServer) for the map server and can incorporate other environmental, geographical, or socioeconomic information. DCAM code is portable and can be implemented for other regions of the world.

For more information, visit http://uniatmos.atmosfera.unam.mx.

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Satellite Observations From the International Polar Year

PAGES 125–126

To realize the benefit of the growing number of international satellites to the scientific objectives of the 2007–2008 International Polar Year (IPY), the Global Interagency IPY Polar Snapshot Year (GIIPSY) was established in November 2005 to develop a consensus on polar science requirements and objectives for IPY that could best and perhaps only be met using the Earth-observing satellites. Requirements focused on all aspects of the cryosphere and ranged from sea ice and ice sheets to permafrost and snow cover. Individual topics included how best to develop high-resolution digital elevation models of outlet glaciers using stereo-optical systems, measure ice sheet surface velocity using interferometric synthetic aperture radar (InSAR), and repeatedly measure sea ice motion using optical and microwave imaging instruments.

Because of this foresight, several IPY science objectives were well met using satellite observations, allowing a wealth of valuable data to be collected on cryospheric processes (Figure 1). Further, the framework for coordinating these remote sensing efforts serves as a valuable model for future coordinated efforts to monitor cryospheric dynamics.

IPY Space Task Group: Mission and Acquisition Objectives

Linking the GIIPSY science community to the international space agencies was facilitated through the IPY Space Task Group (STG). Although the IPY has ended, the STG has been continuing its activities. As of today, STG membership includes representatives from the national space agencies of Brazil, Canada, China, France, Germany, Italy, Japan, Russian Federation, United Kingdom, United States, and both the European Space Agency (ESA) and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), the latter two of which alone represent 26 nations.

The STG was established for the purpose of space agency planning, processing, and archiving of IPY Earth observation legacy data sets. The operating strategy for the group has been to satisfy IPY science requirements in a fashion that distributes the acquisition burden across the space agencies while recognizing the operational mandates that guide the activities of each agency.

The STG has met in full session five times. The first meeting was held in January 2007 at World Meteorological Organization headquarters, where based on GIIPSY recommendations [*Drinkwater et al.*, 2008], the group adopted four primary data acquisition objectives for its contribution to the IPY. These are (1) pole-to-coast multifrequency InSAR measurements for ice sheet surface velocity, (2) repeated fine-resolution synthetic aperture radar (SAR) mapping of the entire Southern Ocean sea ice cover for sea ice motion, (3) one complete high-resolution visible and thermal infrared snapshot of circumpolar permafrost, and (4) pan-Arctic high- and moderate-resolution snapshots of freshwater (lake and river) freeze-up and breakup in the visible and infrared spectrums.

STG Projects

The STG has made substantial progress toward these acquisition objectives. A high-resolution radar image of South Pole was

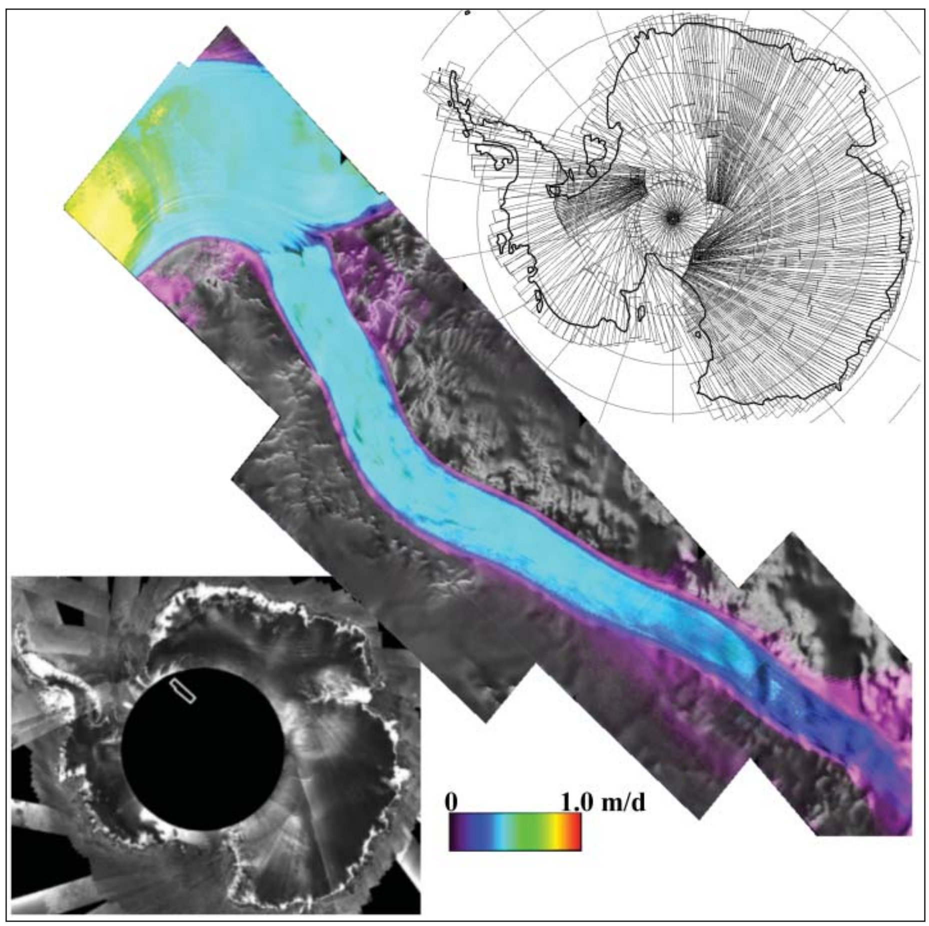

Fig. 1. (middle) The first complete ice velocity map along the entire 250-kilometer length of Antarctica's Recovery Glacier tributary (taken in 2008–2009 using TerraSAR-X). Velocities are measured in meters per day. (bottom left) Location of the ice velocity map, shown by the white box within the Japanese Phased Array Type L-band Synthetic Aperture Radar (PALSAR) 2009 image mosaic. (top right) Additional coverage using the Canadian RADARSAT 2. This coverage, along with data from the European Space Agency advanced synthetic aperture radar, completed observations of Antarctica during the IPY. Images courtesy of Canadian Space Agency, German Aerospace Center, and Japan Aerospace Exploration Agency.

captured for the first time since 1997 as part of the Canadian RADARSAT 2 campaign to image all of Antarctica, complementing activities by Germany, Italy, Japan, and ESA to acquire SAR image composites at multiple frequencies of both of the great polar ice sheets. The STG also worked to plan and acquire the first pole-to-coast InSAR data sets for measuring surface velocity on both ice sheets (Figure 1). Velocity data are essential for estimating the ice flux from the ice sheets into the oceans and understanding controls on ice stream motion.

The Constellation of small Satellites for the Mediterranean basin Observation (COSMO-SkyMed), an Italian SAR constellation, contributed to observations of the Wilkins Ice Shelf by monitoring disintegration events and ice movement. ESA and Canada have cooperated on coordinated SAR campaigns to fill gaps in Arctic and Antarctic sea ice cover where either station masks or onboard recorder times have usually precluded routine coverage. Using Satellite Pour l'Observation de la Terre (SPOT) stereo data, the French IPY SPIRIT project (SPOT 5 Stereoscopic Survey of Polar Ice: Reference Images and Topographies) is creating optically derived, high-resolution digital elevation models (DEMs) of the perimeter regions of ice caps and ice sheets. These highly detailed DEMs are the most extensive, high-precision DEMs of polar ice caps and the margins of the polar ice sheets yet acquired.

Operational satellite data were used during IPY to study continuously the dynamics and chemistry of the polar atmosphere, known to be highly sensitive to anthropogenic impacts and thus to climate change. The acquired data permit information retrieval from all layers of the Earth's atmosphere, from the troposphere at the surface up to the mesosphere (about 50 kilometers in altitude). For example, real-time systems to monitor polar winds have been implemented at sites in both polar regions that receive direct broadcasts of satellite data to meet numerical weather prediction needs for timeliness. It is equally important to generate long-term products for studies of recent climate change. In this regard, historical advanced very high resolution radiometer data have been reprocessed to generate a 25-year record of wind, cloud and surface properties, and radiation. Regarding atmospheric chemistry, polar ozone depletion, a phenomenon stirring public concern and emphasizing the vulnerability of the polar stratosphere, is studied in detail using atmospheric sensors on the fleet of Earth-observing platforms, e.g., Envisat and Meteorological Operational satellite programme (MetOp) MetOp-A.

Developing Coordinated Products

The STG sought to identify key IPY-era science objectives addressable with satellite instruments and then to acquire the data sets needed to meet those objectives. Because a major international campaign of coordinated Earth observations from space had not been previously attempted, participants agreed that developing and then executing plans for acquisitions was a challenge.

The wealth of data collected is a testament to the success of the STG framework. Consequently, in February 2009 the STG chose to step beyond data acquisition and investigate coordinated product development. These efforts are devoted to producing SAR polarization image mosaics of Antarctica, SAR image mosaics of Greenland, interferometrically derived velocity fields at various frequencies for Greenland and Antarctica, and the distribution of high-resolution SPOT DEMs. The approach is similar to the acquisition phase where the burden of geophysical product development will be distributed among different partners.

The STG has been a unique mechanism for informing the space agencies about GIIPSY science requirements. In turn, the STG has been an important venue for coordinating acquisition and processing of important amounts of satellite data while distributing the data acquisition load among the participating agencies. Continuing an STG activity can be of service by linking the broader cryospheric science community to space agency offices responsible for mission planning, data acquisition, and product development.

Eventually, a key future goal is to secure collections of spaceborne "snapshots" of the polar regions through the development of a virtual Polar Satellite Constellation [*Drinkwater et al.,* 2008]. A natural vehicle for adopting lessons learned from GIIPSY/STG into a more encompassing international effort is the Global Cryosphere Watch, recently proposed by the World Meteorological Organization to support the science goals specified in the Integrated Global Observing Strategy Cryosphere Theme [*World Meteorological Organization,* 2007].

Space agency IPY data portfolios and a complete list of contributors to this paper can be found at http://bprc.osu.edu/rsl/GIIPSY/index_files/STGDATA.htm.

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NEWS

Hubble 3D: A Science and Hollywood Collaboration Made (Nearly) in Heaven

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Just 2 days after the 2010 Academy Awards® ceremony in early March bestowed Oscars® for motion picture achievements, NASA deputy administrator Lori Garver touted a new film about the Hubble Space Telescope, *Hubble 3D*, for best drama, special effects, screenplay, actors and actress, and director and producer. The 43-minute IMAX and Warner Brothers Pictures production, which opened in theaters on 19 March, is an example of the ability of Hollywood and the science community to partner in providing a dynamic educational and entertaining product, according to a number of people associated with the film.

Sharing the red carpet at the Smithsonian National Air and Space Museum in Washington, D. C., with astronauts and others to mark the world premiere, Garver said the film shows the drama of the astronauts' efforts to repair the telescope while traveling 17,000 miles per hour and performing grueling space walks (see Figure 1). "We have literally opened our eyes on the universe through this telescope," she said. "This is a taxpayer-funded agency, and we are giving back to the public the very story that they paid for."

The film, narrated by actor Leonardo DiCaprio, tells the story of the nearly 20-year life of the Hubble Space Telescope. *Hubble 3D* includes jaw-dropping three-dimensional (3-D) computer models based on Hubble imagery, and it focuses on the dramatic May 2009 STS-125 space shuttle crew servicing mission, which increased the telescope's capacity by more than 70 times and extended its usefulness out to 2017. STS-125 was the final planned space shuttle mission to Hubble, though several astronauts at the premiere expressed hope that perhaps a future visit to help with Hubble's safe deorbit also might be an opportunity to further extend the life of the telescope.

Hubble 3D incorporates astronaut training shots, tense moments repairing Hubble, humorous snapshots of everyday life on board the shuttle, and technically