The NASA/JPL Airborne Synthetic Aperture Radar

By David A. Imel <imel@jpl.nasa.gov>
Jet Propulsion Laboratory 300-243
Pasadena, CA 91109-8099

Abstract

The NASA/JPL Airborne Synthetic Aperture Radar (AIRSAR) has been NASA's SAR science and technology testbed for the past two decades, and has been used to develop radar technologies such as multi-frequency radar polarimetry, bistatic SAR, cross-track interferometry, along-track interferometry, repeat-pass and polarimetric interferometry, as well as signal-processing techniques such as phase-unwrapping, motion-compensation, pulse-alignment and geo-location. AIRSAR was used in support of the Shuttle Imaging Radar (SIR) missions, as well as the Shuttle Radar Topography Mission (SRTM), to demonstrate the feasibility of the technology, to acquire simulated spaceborne data used to develop SAR processors for those data, and to validate the data once the radars were flown in space. AIRSAR has acquired calibrated science data sites in support of several kinds of science and commercial applications, some of which could not be easily acquired from space.

During the three-month deployment of the Pacific Rim 2000 mission, AIRSAR acquired data over 201 sites in 18 countries for a total of over one-half of a million square kilometers of SAR data. In 2002, AIRSAR conducted the longest domestic data collection campaign yet, including data sets acquired in support of the Cold Land Processes Experiment (CLPX'02), the Great Lakes Winter Experiment (GLAWEX), search and rescue, mesoscale eddies, fire hazards, planetary analogues, fire hazards, forest structure and classification, soil moisture, earth surface change and validation of the SRTM global data set. We survey some of the data sets acquired in these missions which are available to scientists.

Meanwhile, AIRSAR is continuing to demonstrate new radar processing techniques. An along-track interferometry processor was introduced in 2001, allowing the delivery of calibrated along-track interferograms. We are currently developing a repeat-pass interferometry processor to be used both for polarimetric interferometry and surface-change detection.

In the next few years, AIRSAR will evolve into a more versatile Airborne Radar Testbed. This presentation concludes with a description of that evolution and some of the near-term plans both for technology development and data acquisition campaigns.