Advanced Land Imager Assessment System

An integrated system provides radiometric and geometric calibration and validation data processing for a multispectral pushbroom instrument.

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The Advanced Land Imager Assessment System (ALIAS) supports radiometric and geometric image processing for the Advanced Land Imager (ALI) instrument onboard NASA's Earth Observing-1 (EO-1) satellite. ALIAS consists of two processing subsystems for radiometric and geometric processing of the ALI's multispectral imagery. The radiometric processing subsystem characterizes and corrects, where possible, radiometric qualities including: coherent, impulse; and random noise; signal-to-noise ratios (SNRs); detector operability; gain; bias; saturation levels; striping and banding; and the stability of detector performance.

The geometric processing subsystem and analysis capabilities support sensor alignment calibrations, sensor chip assembly (SCA)-to-SCA alignments and band-to-band alignment; and perform geodetic accuracy assessments, modulation transfer function (MTF) characterizations, and image-to-image characterizations. ALIAS also characterizes and corrects band-to-band registration, and performs systematic precision and terrain correction of ALI images. This system can geometrically correct, and automatically mosaic, the SCA image strips into a seamless, map-projected image.

This system provides a large database, which enables bulk trending for all ALI image data and significant instrument telemetry. Bulk trending consists of two functions: Housekeeping Processing and Bulk Radiometric Processing. The Housekeeping function pulls telemetry and temperature information from the instrument housekeeping files and writes this information to a database for trending. The Bulk Radiometric Processing function writes statistical information from the dark data acquired before and after the Earth imagery and the lamp data to the database for trending. This allows for multi-scene statistical analyses.

An important aspect of this is the partitioning and indexing of data within the database, which enables efficient storage and retrieval of data as well as extremely rapid calibration assessments. The ALIAS team processed the entire ALI archive (over 20,000 scenes) and populated this trending database, approaching one terabyte in size. This database has opened doors for long-term trending, data analyses, and algorithm development not previously possible with the Landsat 7 Image Assessment System (IAS). One area where this bulk trending database appears particularly useful is in the normalization of the detector's responses within a band, so called flat-fielding. On the assumption that, over a period of several months to a whole mission, all detectors in a band see statistically the same distribution of the Earth radiance, these statistics can be used to match the detector's responses.

ALIAS is built upon previous software used in the Landsat 7 IAS, and by the ALI Science Validation Team (SVT). This innovation takes advantage of open source software, in that it references open source external libraries. This means no software licenses are required. However, no open source code is integrated directly in the ALIAS software.

ALIAS was a joint effort between NASA and the United States Geological Survey (USGS). The work was done by Tim Beckmann, Gyanesh Chander, Mike Choate, Jon Christopherson, Doug Hollaren, Ron Morfitt, Jim Nelson, Shar Nelson, and James Storey of SAIC@USGS/Earth Resources Observation and Science (EROS); Dennis Helder and Tim Ruggles of South Dakota State University; Ed Kaita, Raviv Levy, and Lawrence Ong of SSAI@NASA/Goddard Space Flight Center(GSFC); and Brian Markham and Robert Schweiss of Goddard Space Flight Center. Further information is contained in a TSP (see page 1).

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