

36th ASTER Science Team Meeting Report

Nina Cole, NASA/Jet Propulsion Laboratory/California Institute of Technology, Nina.L.Cole@jpl.nasa.gov

The 36th Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Science Team Meeting was held December 8-11, 2009 in San Francisco, CA.

Opening Plenary Session

H. Tsu [Earth Remote Sensing Data and Analysis Center (ERSDAC)—*Japan ASTER Science Team Lead*] and **M. Abrams** [NASA/Jet Propulsion Laboratory (JPL)—*U.S. ASTER Science Team Lead*] welcomed approximately 43 U.S. and Japanese Science Team Members and other interested participants to the 36th ASTER Science Team Meeting.

M. Abrams reviewed the U.S. ASTER budget and presented science highlights. Terra received two additional years of funding (FY2010 and 2011) following the 2009 NASA Senior Review. The release of the Global Digital Elevation Model (GDEM) was highly visible in the media, with over 500 stories published and more than 3.5M tiles distributed to users.

S. Hook [JPL] provided an update on the Hyperspectral Infrared Imager (HypSIRI), a National Research Council (NRC) Decadal Survey *Tier II* mission containing a Visible Shortwave Infrared (VSWIR) imaging spectrometer and a multispectral Thermal Infrared (TIR) scanner. Subsequently, Hook introduced the Hyperspectral Thermal Emission Spectrometer (HyTES) instrument, which will be mounted on an airborne platform.

B. Eng [JPL] discussed the status of the Landsat Data Continuity Mission (LDCM). The eighth instrument in the Landsat series will provide continuing moderate resolution multispectral imagery of the Earth's surface with seven heritage reflective bands, two new reflective bands, and two thermal bands. LDCM expects to launch in December 2012, with a five-year design life.

N. Ohgi [Japan Resources Observation System and Space Utilization Organization (JAROS)] reported on ASTER instrument status. Ohgi reviewed lifetime management of the instrument and, aside from the SWIR detector temperature, reported nominal performance of all systems.

B. Macomber [Lockheed Martin/NASA Goddard Space Flight Center (GSFC)] informed the audience of a battery anomaly onboard the Terra spacecraft. Despite a failed battery cell, Terra can continue nominal operations with little modification to power management.

M. Hato [ERSDAC] reported on ERSDAC Ground Data System (GDS) status, providing updates on observation scheduling, processing, and distribution. Additionally, he presented ASTER GDEM distribution statistics.

D. Meyer [U.S. Geological Survey Land Processes Distributed Active Archive Center (USGS LPDAAC)] reported on the distribution status of ASTER products at the LPDAAC, including GDEM metrics. Meyer also discussed transitioning to an online archive, implementing new cloud cover metadata, and routing all billable ASTER product orders through Japan.

T. Narita [ERSDAC] discussed the replacement of servers and workstations in the Science Data Processing Segment (SDPS) and the Communications and System Management Segment (CSMS) with a new system that will be fully operational by 2011. Certain functions will be discontinued after the switch: archiving Level 0, 1B, and 3A01 data; producing Level 2 data products; and processing Expedited Data Sets (EDS). Narita confirmed the modification of ASTER GDS cloud metadata in the search catalog.

M. Fujita [ERSDAC] presented the Scientific Scheduling Support Group (SSSG) and Operations Mission Planning (OMP) report. He reviewed the status of Global Mapping (GM), nighttime TIR GM (TGM), GDEM, and the Underserved Area Science Team Acquisition Request (UA STAR). Furthermore, Fujita reported that an update to the Acquisition Window (AW) scheduling parameter was successful.

K. Iwao [Group on Earth Observations (GEO) Secretariat] gave a detailed presentation on the Global Earth Observation System of Systems (GEOSS). GEOSS facilitates the exchange of data through the linkage of coordinated and sustained EOS platforms with free or low-cost open access for interested research and education users. A data sharing scheme is under development for the ASTER GDEM.

Geology Working Group

A. Mushkin [Geological Survey of Israel (GSI)] gave a talk on employing ASTER stereoscopic imaging to determine surface roughness and date alluvial surfaces in arid environments.

J. Kargel [University of Arizona] discussed the use of ASTER in comparing and contrasting Himalayan and Alaskan glacier dynamics. Time series differencing and

various classification schemes were used to analyze glaciers in each study area.

M. Pritchard [Cornell University] presented his research on measuring glacier velocities using ASTER and Synthetic Aperture Radar data. Pritchard applied pixel tracking and DEM differencing to his areas of study, Patagonia and Juneau, Alaska, which both contribute to current sea level rise.

B. Sneed [University of Maine] reported on glaciology work done with colleagues at the Climate Change Institute. Studies include mapping the velocity, elevation, and terminus changes of Greenland outlet glaciers using ASTER and other data sources, and deriving depths of melt ponds and surface water using ASTER Visible and Near Infrared (VNIR) Bands 1 and 3.

J. Mars [USGS] discussed regional alteration mapping of porphyry copper deposits using ASTER data. Potential deposits are ranked by physical characteristics derived from ASTER alteration maps.

M. Ramsey [University of Pittsburgh] updated the audience on volcano monitoring using the ASTER rapid response program designed for urgent acquisitions and the new Forward-Looking Infrared (FLIR) camera received in August 2009. Ramsey discussed the filter specifications and also showed some preliminary field test results.

M. Urai [Geological Survey of Japan (GSJ), National Institute of Advanced Industrial Science and Technology (AIST)] presented his work on the 2009 Sarychev Peak eruption. Urai demonstrated how to estimate the volume of discharged deposits by combining the stereoscopic capabilities of ASTER and the Panchromatic Remote-Sensing Instrument for Stereo Mapping (PRISM) with ASTER's broad spectral coverage.

M. Pritchard introduced his Andean volcano project, which combines thermal [ASTER and Moderate Resolution Imaging Spectroradiometer (MODIS)], radar, and field seismic data to characterize background activity at 2500 volcanoes in the region.

D. Pieri [JPL] discussed the current status of the JPL ASTER Volcano Archive (AVA), featuring public access to full resolution *jpgw* files. Pieri also discussed the UAV-borne *in-situ* Compact Mass Spectrometer (ICAMS) (used for calibration and validation of ash/gas transport and retrieval models), a new low thermal anomaly algorithm, and volcano DEM challenges.

Operations and Mission Planning Working Group

A. Miura [ERSDAC] opened the session with a presentation on mission-related topics. Working time of

mission operations was reduced from 24-hour shifts to 12-hour shifts with no adverse results. The AW scheduling parameter was modified to correctly reflect seasonal input variables. Pointing control parameters were updated, improving scheduler efficiency and increasing daily scene acquisitions.

M. Fujita provided an update on ASTER observation status. GM3 successfully achieved 83% coverage worldwide. GM4 was submitted October 1, 2009 and will continue until April 1, 2015. TGM3 and TGM4 are acquiring approximately 70 scenes per day, with future requirements determined by the Temperature-Emissivity Separation (TES) Working Group (WG). The UA STAR and Gap-Filler STAR are effectively collecting data. The success rate of Urgent STARs was reviewed, as well as the status of the Global Land Ice Measurements from Space (GLIMS) STAR. Lastly, Fujita presented a graph summarizing the distribution of observation resources.

L. Maldonado [JPL] confirmed that no relevant changes had occurred to the Data Acquisition Request (DAR) User Survey results since the last team meeting.

D. Meyer updated attendees regarding the modification of cloud cover metadata at the LPDAAC. The new values will be implemented in March 2010 to mirror the revised values used at ERSDAC.

A. Hall [Earth Science Data and Information System (ESDIS) DAAC] presented preliminary plans for long-term ASTER data retention. The science team will decide in the near future what data to archive, which services to offer, and the necessary documentation needed.

The session concluded with a discussion of EDS changes. EDS processing will halt at GDS in 2011. The LPDAAC will process all EDS and post the data on an *ftp* site for both Japan and U.S. requestors.

Level 1/DEM Working Group

H. Fujisada [Sensor Information Laboratory Corporation (SILC)] reported no changes to the Level 1 algorithm, and that both inter- and intra-telescope registration are satisfactory. The geolocation accuracy of nighttime TIR data in the east-west direction is off between 100–400 m, depending on look angle. The TES WG will investigate this issue. Next, Fujisada presented the new GDEM algorithm developed by SILC, with a 5 x 5 kernel size and enhanced water body detection. GDEM Version 2 will incorporate the new algorithm and additional source data, with release planned for June 2011.

T. Tachikawa [ERSDAC] presented validation results for the new GDEM algorithm, concluding that the updated version is significantly improved.

G. Hulley [JPL/California Institute of Technology (Caltech)] described the North American ASTER Land Surface Emissivity Database (NAALSED) Cloud Mask Algorithm. His hybrid approach enables accurate cloud detection.

R. Crippen [JPL] analyzed ASTER GDEMs and Shuttle Radar Topography Mission (SRTM) DEMs, discovering that DEM data is most reliable when the ASTER scene stacking number is three or greater, with or without SRTM. A scene stack of 1–2 also produces acceptable results when assured by SRTM.

Temperature-Emissivity Separation Working Group

G. Hulley reported on the status of NAALSED, a mean-seasonal emissivity mosaic of North America. The *Version 3.0* release, with increased temporal coverage, an improved cloud mask, and enhanced atmospheric correction, produces superior results.

H. Tonooka [Ibaraki University] presented an update on the East Asia Land Surface Temperature and Land Surface Emissivity mosaic.

S. Kato [National Institute for Environmental Studies (NIES)] discussed using ASTER data for temporal and spatial analyses of surface temperatures in shaded areas. Kato found similar surface temperatures in shaded areas regardless of surface material.

S. Rose [University of Pittsburgh] reviewed a possible method for improving the accuracy of compositional, textural, and heat flux measurements over volcanic surfaces, and assessed ASTER data using a deconvolution algorithm.

R. Lee [University of Pittsburgh] described TIR spectroscopy analysis of quartzofeldspathic glasses using a high temperature micro-furnace. Glasses are prevalent in hazardous locations, such as active volcanoes, yet seldom studied in the TIR.

A. Gillespie [University of Washington] presented an analysis of spatial-temporal variability in the ASTER surface emissivity product (*AST05*). The primary cause of the variability appears to be an incomplete atmospheric correction, and accuracy of *AST05* may be improved by using MODIS profiles.

A. Mushkin discussed the use of roughness data derived from ASTER stereo images to correct the reduction in emissivity spectral contrast caused by cavity radiation.

S. Hook provided an update on in-flight validation of ASTER land surface temperature and emissivity products (*AST08* and *AST05*) using the Lake Tahoe and Salton Sea automated validation sites. Results indicate

a problem over high emissivity targets due to a recent change in the ASTER Temperature-Emissivity algorithm. Consequently, using a split window approach over water targets is recommended.

H. Tonooka introduced Lake Senba, a new site for validation of water temperature retrievals and for monitoring ASTER TIR radiometric calibration. Additionally, Tonooka presented a cloud assessment update. The revised cloud assessment uses MODIS cloud mask (*MOD35*) products. The new cloud cover values are available through GDS, and will be available at the LP-DAAC by March 2010.

M. Fujita summarized current TGM STAR status. TGM3 (Southern Hemisphere) and TGM4 (Northern Hemisphere) do not overlap temporally. There is interest in the user community in gathering summer-winter pairs to study emissivity values. The SSSG will investigate the possibility of additional nighttime collects.

Radiometric Calibration/Atmospheric Correction Working Group

B. Eng reviewed the U.S. ASTER Level 2 software status.

M. Moriyama [Nagasaki University] presented a detailed analysis of the terrain and atmospheric effect correction algorithm implemented on the AIST/GEO Grid server.

F. Sakuma [AIST] reviewed the ASTER VNIR, SWIR, and TIR instrument status. No changes were made to the VNIR Radiometric Calibration Coefficients (RCC) since the last team meeting. Since May 2008, SWIR data has been saturated, but the detector temperature and telemetry data remain stable. TIR analyses are based on fitting function *Version 3.10*, implemented September 27, 2009. TIR long-term calibration trends continue to be monitored.

S. Tsuchida [AIST], **K. Arai** [Saga University], **T. Matsunaga** [NIES], and **S. Biggar** [University of Arizona] reported on their respective field campaigns. **S. Hook**, **H. Tonooka**, and **S. Kato** presented TIR field campaign results.

A. Iwasaki [University of Tokyo] discussed correcting stray light in ASTER images with MODIS images.

T. Tachikawa provided a Science Web update. The website—www.science.aster.ersdac.or.jp—provides ASTER project information, science highlights, and other relevant news in both English and Japanese.

A. Gillespie reviewed his presentation given in the TES WG, attributing errors in *AST05* to incomplete atmospheric correction rather than calibration issues.

G. Hulley illustrated how the accuracy of the ASTER surface radiance product (*AST09T*) may be improved using MODTRAN *Version 5.0*.

H. Tonooka provided a TIR recalibration update. Recalibration for ASTER data acquired before October 26, 2009 is available through: tonolab.cis.ibaraki.ac.jp/ASTER/RECAL.

Ecosystem/Oceanography Working Group

A. Mushkin discussed vegetation effects on sub-pixel roughness measurements from ASTER stereo pairs. ASTER 3B/3N corresponds to age for bare surfaces, percent vegetation for scrublands, canopy roughness for fully vegetated areas, and structural stage/stand age in forests.

K. Iwao explained GeoGRID activities associated with the GEO 2010 Baseline Initiative. Global dataset development includes global road and human settlement mapping.

L. Prashad [Arizona State University] provided an update on *JEarth*, an open source Java-based GIS and remote sensing analysis and visualization tool built from the Java Mission-planning and Analysis for Remote Sensing (JMars) application.

M. Ramsey reported on research conducted with **S. Scheidt** [University of Pittsburgh] focusing on Saharan dust emission events. Data collected with a field-based FLIR instrument was analyzed along with orbital mea-

surements from several remote sensing instruments. ASTER [like the Spinning Enhanced Visible and Infrared Imager (SEVIRI) and MODIS] can be used as a dust detection tool.

T. Gubbels [Science Systems and Applications, Inc.] offered an update on **J. Masek's** [GSFC] Landsat Ecosystem Distributive Adaptive Processing System (LEDAPS) that provides forest disturbance mapping and other large area, reflectance-based Landsat analyses. Activities are currently underway to integrate ASTER imagery.

STAR Committee

The STAR committee agreed to run TGM3 and TGM4 simultaneously, allowing the number of nighttime TIR acquisitions to increase to approximately 75 per day. The committee recommended that the TES WG submit a DAR to evaluate the need for a multi-season TGM5. A support STAR will supplement the UA STAR to increase coverage. Gain settings will be changed to Low Low Normal (LLN) for ice-covered areas. The GLIMS STAR will be monitored for three months to determine the need for a support STAR.

Closing Plenary Session

The meeting concluded with summaries from each working group chairperson. The 37th ASTER Science Team Meeting will be held June 8–11, 2010 in Tokyo, Japan. ■

In Memoriam

A giant in the field of Earth Science, Joanne Simpson passed away March 4 at 2:45 a.m. Simpson specialized in tropical meteorology, and in 1949, she became the first woman to earn a Ph.D. in meteorology. She went on to serve on the faculty of the University of Chicago, the University of California at Los Angeles, and the University of Virginia. She also served for a period as the head of the National Oceanic and Atmospheric Administration's (NOAA) Experimental Meteorology Laboratory in Miami, FL. Simpson joined NASA in 1979 as the Chief of NASA's Laboratory for Atmosphere's Severe Storms Branch, and became the inspiration and founding Project Scientist for the Tropical Rainfall Measuring Mission (TRMM). Until her recent retirement, Simpson was Chief Scientist for Meteorology in the Earth Sciences Division. Simpson worked with a science group on cloud and mesoscale modeling and studied hurricanes. She authored or co-authored over 190 scientific articles and won many awards and honors for her research achievements, including the Carl-Gustaf Rossby Award (the highest honor bestowed by the American Meteorological Society). She was a member of the National Academy of Engineering, and served as President of the American Meteorological Society. The world has indeed lost a great scientist and a true inspiration to many generations of researchers. For more information on her career, see: earthobservatory.nasa.gov/Features/Simpson/.

