

38th ASTER Science Team Meeting Report

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The 38th Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Science Team Meeting was held December 6-9, 2010, in Pasadena, 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 50 U.S. and Japanese Science Team Members and interested participants to the 38th ASTER Science Team Meeting.

M. Abrams summarized news from NASA Headquarters and reviewed the U.S. ASTER budget. Terra is currently funded through September 2011, with a new proposal due March 2011 for the upcoming NASA Senior Review. Selections from the Earth Observing System (EOS)/Science of Terra and Aqua recompetes were discussed, pending release later in the week. Abrams presented highly visible science activities, including rapid response imaging of the Gulf oil spill, along with recent publications, highlighting the just-released Springer book *Land Remote Sensing and Global Environmental Change: NASA's Earth Observing System and the Science of ASTER and Moderate Resolution Imaging Spectroradiometer (MODIS)*, co-edited by B. Ramachandran, C. Justice, and M. Abrams. The presentation concluded with an update of Terra's fuel consumption.

S. Hook [JPL] provided an update on the Hyperspectral Infrared Imager (HypIRI), 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. Hook ended the presentation with an introduction to his Instrument Incubator Program (IIP) proposal for HypIRI TIR risk reduction, *The Prototype HypIRI Thermal Infrared Radiometer (PHyTIR) for Earth Science*.

T. Matsunaga [National Institute for Environmental Studies (NIES)] introduced the Hyperspectral Imager Suite (HISUI), a spaceborne instrument developed by the Japanese Ministry of Economy, Trade, and Industry (METI). HISUI, consisting of both hyperspectral and multispectral imagers, will be one of the instruments onboard the Japan Aerospace Exploration Agency's (JAXA) Advanced Land Observing Satellite-3 (ALOS-3).

B. Eng [JPL] discussed the status of the Landsat Data Continuity Mission (LDCM), the eighth instrument in the Landsat series. The launch readiness date is slated for December 2012.

M. Kikuchi [Japan Resources Observation System and Space Utilization Organization (JAROS)] reported on ASTER instrument status. All systems, aside from the SWIR detector, continue to operate normally.

M. Hato [ERSDAC] reported on ERSDAC Ground Data System (GDS) status, providing updates on observation scheduling, processing, and distribution. Hato summarized the ASTER Global Digital Elevation Model (GDEM) distribution statistics and gave an overview of the Science Data Processing System (SDPS) replacement schedule.

D. Meyer [U.S. Geological Survey Land Processes Distributed Active Archive Center (USGS LP DAAC)] presented LP DAAC ASTER product distribution statistics, including GDEM metrics. Additional topics included the successful transition to an online archive, Level 1A (L1A) backup capabilities, and plans for the ASTER data long-term archive (LTA).

M. Fujita [ERSDAC] presented the Science Scheduling Support Group/Operations and Mission Planning (SSSG/OMP) report. Fujita reviewed the status of major Science Team Acquisition Requests (STARs), such as Global Mapping (GM), nighttime TIR GM (TGM), and the Underserved Area (UA) and Gap-Filler STARs.

The opening plenary concluded with **M. Abrams** and **Y. Yamaguchi** [Nagoya University] proposing a list of issues for further discussion in the working groups: 1) data acquisition monitoring status; 2) GDEM updates; 3) TIR-only mode geolocation error; and 4) orbit drift after 2017.

Geology Working Group

M. Willis [Cornell University] presented ongoing work conducted with M. Pritchard [Cornell University] analyzing glacier velocities and elevation changes in Patagonian icefields. Glacier retreat and thinning at lower elevations were observed in both Northern and Southern Patagonian icefields. Mass loss acceleration continues to be monitored as additional data are acquired. Willis then updated the audience on the Cornell Andes Project. Principal Investigator M. Pritchard and team combined ASTER TIR data with Interferometric Synthetic Aperture Radar (InSAR) data and seismic observations to identify background activity at 2500 volcanoes in the Southern and Central Andes region.

B. Sneed [University of Maine] reported on glaciology research projects utilizing ASTER imagery undertaken by himself, G. Hamilton [University of Maine], and colleagues at the Climate Change Institute.

J. Kargel [University of Arizona] presented results of his work, combining ASTER data and field studies, on glacier-fed landslide-dammed Lake Gojal in Pakistan and ice-cored moraine-dammed Imja Lake in Nepal. ASTER time series data have aided in tracking the development and stability of landslide-, moraine-, and glacier-dammed lakes.

R. Wessels [USGS] reported on the use of high-resolution remote sensing data for hazard assessment and risk mitigation in the 2010 eruption of Merapi Volcano. Indonesia's Center for Volcanic and Geologic Hazard Mitigation (CVGHM) correctly anticipated a large, explosive eruption and called for the evacuation of affected areas, potentially saving thousands of lives. The USGS Volcanic Disaster Assistance Program (VDAP) facilitated activation of the International Charter for Space and Major Disasters, allowing for the acquisition of near real-time multiple remote sensing resources, including ASTER.

M. Ramsey [University of Pittsburgh] provided an update on the ASTER Urgent Request Protocol (URP) program, a rapid response volcano alert system. Ramsey then reported on research conducted with S. Rose [University of Pittsburgh], using ASTER TIR emissivity data and a linear spectral deconvolution algorithm to create compositional maps of the basalt flows at Cerro Negro Volcano in Nicaragua. Lastly, Ramsey presented C. Hughes' [University of Pittsburgh] work using super-resolved ASTER and Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) data to analyze compositional variations at Lunar Lake Playa.

J. Mars [USGS] discussed the use of ASTER data for spectral analysis and lithologic mapping of the Khaneshin carbonatite volcano in southern Afghanistan. Research and fieldwork were conducted with the late L. Rowan [USGS].

M. Urai [Geological Survey of Japan (GSJ)/National Institute of Advanced Industrial Science and Technology (AIST)] discussed the East Asia DEM Dataset Project, a joint undertaking with GSJ/AIST, Ibaraki University, and Nagasaki University. The project, completed in 2009, created time series DEMs and ortho-rectified ASTER images as byproducts of the DEM mosaic. These byproducts can be used to conduct time series data analyses and create image mosaics. The project will be expanded worldwide over the next five years.

D. Pieri [JPL] provided updates on several ASTER related projects. Pieri began with a progress report on *in*

situ gas sampling techniques at Turrialba Volcano in Costa Rica. Field data are combined with satellite measurements for detailed volcano emission analysis. He then discussed ASTER Volcano Archive (AVA) statistics and goals. Future plans include incorporating nighttime data and adding DEMs for all volcanoes. Pieri discussed geologic mapping of Tiede Volcano, a potential sector collapse site, as well as landslide imaging of Poas Volcano. He concluded his presentation with an introduction to S. Baxter's [JPL] work using smoothed particle hydrodynamics to model lava flow and terrain.

Level 1/DEM Working Group

H. Fujisada [Sensor Information Laboratory Corporation (SILC)] reported no changes to the L1 algorithm, and noted 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. L1A software will be modified to remove the offsets. Next, Fujisada provided GDEM *version 2 (v2)* updates. The new version, with enhanced water body detection and additional source data, has a public release date set for mid-August 2011.

T. Tachikawa [ERSDAC] presented validation results for the GDEM *v2* algorithm, concluding that the updated version is significantly improved.

D. Meyer detailed U.S. validation plans for GDEM *v2*, with continuing contributions from the USGS and the National Geospatial-Intelligence Agency (NGA). Additional validation support will be provided by the Ice, Cloud, and land Elevation Satellite (ICESat) and R. Crippen [JPL]. Meyer also presented George Mason University's DEM Explorer, an open geospatial consortium (OGC) web mapping service (WMS) and web coverage service (WCS) for the ASTER GDEM. His final presentation showed the societal benefits of free and open data distribution, using the ASTER GDEM as a case study for the Global Earth Observation System of Systems (GEOSS) data-sharing action plan.

M. Abrams relayed a method developed by the governmental agency Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) to identify GDEM anomalies and to replace bad values through interpolation.

R. Crippen reported on methods to identify bad elevation values in ASTER DEMs using correlation maps developed from ASTER orthoimage stereo pairs. This method could be used to validate non-ASTER DEMs.

M. Kobrick [JPL] summarized NASA's plan to create a new, seamless global DEM. Global Shuttle Radar Topography Mission (SRTM) data would be reprocessed

at one arcsecond resolution, and merged with ASTER GDEM data to fill in voids/holes in GDEM mosaic.

J.-P. Muller [University College London] described his involvement with the Committee on Earth Observing Satellites (CEOS) and the mission of the Terrain Mapping Subgroup (TMSG) in developing universal standards for DEMs. Muller introduced the DEM quality information service (DEMqis), a centralized site for the online analysis of global DEMs. Pre-approved users would have the ability to validate DEMs and share their scientific assessments with other registered users. Validation results would then be accessible to the public.

Operations and Mission Planning Working Group

T. Tachikawa [ERSDAC] proposed updating scheduler parameters to increase the number of ASTER scenes acquired and to improve overall scheduler efficiency.

M. Fujita analyzed ASTER observation resources and provided status updates for various STARS. GM4, UA STAR 2010, and TGM 3 and 4 will continue as originally submitted. The Temperature-Emissivity (TE) WG will discuss TGM progress and future requirements. Gap-Filler STAR 2010, designed to cover GDEM holes, ended in December and will be resubmitted in March 2011. The status of the Global Land Ice Measurements from Space (GLIMS) STAR 2010 was reviewed, with plans for a 2011 resubmission to be discussed in the STAR Committee WG. Fujita's presentation concluded with an evaluation of the success rate of urgent STARS.

D. Meyer reviewed the status of expedited data set (EDS) processing at the LP DAAC, addressing known issues and providing access information to U.S. and Japanese science team members. Subsequently, Meyer presented long-term archive plans for ASTER data following the end of the mission. All L1B and higher-level data products will be processed from the L1A archive, forming a static archive. A draft version will be completed by February 2011.

Temperature-Emissivity Separation Working Group

H. Tonooka [Ibaraki University] began the session with updates on ASTER time series ortho land surface TE products. East Asia maps were completed last year, with future plans for Africa and worldwide products.

G. Hulley [JPL] reported on the status of the North American ASTER Land Surface Emissivity Database (NAALSED) *v3.0* release. The new version has increased temporal coverage, an improved cloud mask, and enhanced atmospheric correction. The expected release date for NAALSED summertime *v3.0* is January 2011. The wintertime NAALSED is undergoing

completion, with future plans to create mean-seasonal emissivity mosaics for northern Africa and the Arabian Peninsula.

M. Ramsey presented work done with R. Lee [University of Pittsburgh] on the emissivity of silicate melts using TIR methods.

G. Hulley summarized research from A. Gillespie [University of Washington] on incomplete TE separation in ASTER standard products caused by residual atmospheric effects and striping. Atmospheric correction can be improved with water vapor scaling, while Fast Fourier Filtering has destriping effects over water.

S. Hook provided an update on in-flight validation of ASTER land surface TE 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 TE algorithm. Consequently, using a split-window approach over water targets is recommended.

M. Fujita summarized current TGM STAR status. TGM3 (southern hemisphere) and TGM4 (northern hemisphere), submitted in 2009, are scheduled to collect data through 2014.

T. Tachikawa summarized his proposal to update scheduler parameters. The TE WG will formulate a revised TGM plan based on scheduler results following the parameter updates.

H. Toonoka presented a cloud assessment update. The revised cloud assessment uses the Moderate Resolution Imaging Spectroradiometer (MODIS) *MOD35* cloud mask product. The new cloud cover values are available through GDS and the LP DAAC.

Radiometric Calibration/Atmospheric Correction Working Group

B. Eng reviewed the U.S. ASTER L2 software status. *v3.4* is undergoing testing at the LP DAAC, with release expected in January 2011.

F. Sakuma [JAROS] reviewed Visible/Near-Infrared (VNIR), Shortwave Infrared (SWIR), and TIR instrument status. The radiometric response of VNIR and TIR has been decreasing gradually. The degradation was corrected by updating the radiometric calibration coefficient (RCC) parameters to *v3.11* in July 2010.

M. Kikuchi reported the use of fault tree analyses to investigate possible causes for sensitivity degradation of VNIR and TIR.

K. Arai [Saga University] presented a detailed analysis of the effects of contaminant accretion from thruster plumes on ASTER's optical sensors. Hydrazine hydrate is one of the suspected causes of sensor degradation.

F. Sakuma reported on studies examining hydrazine absorption as a possible cause for the sensitivity decrease of the ASTER TIR sensor.

A. Iwasaki [University of Tokyo] analyzed ASTER VNIR stripe noise and presented his findings to the WG.

N. Leisso [University of Arizona], **S. Tsuchida** [AIST], and **K. Arai** [Saga University] reported on their respective VNIR field campaigns. **H. Tonooka**, **T. Matsunaga** [NIES], and **S. Hook** presented TIR field campaign results. Plans for upcoming field campaigns were also discussed.

G. Hulley demonstrated the use of Moderate Resolution Atmospheric Transmission (MODTRAN) *v5.2* in improving the accuracy of the ASTER surface radiance product (*AST09T*).

H. Suto [JAXA] summarized vicarious calibration activities for the Greenhouse gases Observing SATellite (GOSAT) and onboard Thermal And Near infrared Sensor for carbon Observation (TANSO) sensors at Railroad Valley.

Ecosystem/Oceanography Working Group

T. Matsunaga presented research conducted by Y. Sakuno [Hiroshima University] and H. Kunii [Shimane University] aimed at classifying "Aoko" algal bloom events, which occurred at Lake Shinji and Lake Na-kaumi, using satellite imagers.

M. Ramsey reported on research conducted with S. Scheidt [University of Pittsburgh] focusing on emission events of large dust plumes in arid lands. Instruments such as ASTER, MODIS, and the Spinning Enhanced Visible and Infrared Imager (SEVIRI) [on Meteosat] can be used as dust detection tools, aiding in tracking source locations and identifying mineral compositions.

T. Matsunaga relayed M. Kishino's [Tokyo University] use of ASTER VNIR in determining the relationship between ocean color and sea surface reflectance. Chromaticity coordinate values were calculated from sea surface reflectance in three VNIR channels, and chlorophyll-a concentration was determined from these values.

L. Prashad [Arizona State University (ASU)] provided an update on ASU's *100 Cities Project*. The application

of satellite remote sensing data in monitoring slow-onset disasters is being explored with support from the World Bank and United Nations. Additionally, collaborations were forged with the University of Newcastle and the Tyndall Center for Climate Change Research. New functionalities for *JEarth*, an open source Java-based geographic information system (GIS) and remote sensing analysis and visualization tool built from the Java Mission-planning and Analysis for Remote Sensing (*JMars*) application, were also reviewed.

S. Kato [NIES] presented his analysis of the relationship between surface temperature and shade in Tokyo. ASTER TIR data were compared to shaded areas extracted from high-resolution ALOS Panchromatic Remote-Sensing Instrument for Stereo Mapping (PRISM) DEMs.

J. Kargel demonstrated the use of ASTER imagery and DEMs in mapping animal habitats. Kargel related the ecological habitat of the Tibetan snowcock, found in the Imja Glacier region of Nepal, to glacial processes, vegetation densities, slopes and slope aspects, elevation, landscape stability, and geomorphic units.

T. Matsunaga presented research conducted by T. Ishiyama [Chiba University] that monitors land cover change in the Marginal Taklimakan Desert. Using imagery from multiple satellites, the investigators chronicled a rapid increase of cotton-producing areas.

M. Abrams presented a brief report on behalf of G. Geller (JPL) detailing the latest progress with *TerraLook*, a program that provides no-cost access to ASTER and historical Landsat images, along with a suite of simple visualization and analysis tools. The *beta v2.0* release is slated for early 2011.

STAR Committee

One new STAR proposal was presented, reviewed, and accepted by the STAR committee. GLIMS STAR progress was evaluated, with future requirements discussed by the GLIMS team and committee members. A GLIMS STAR with updated parameters will be submitted January 2011.

Closing Plenary Session

The meeting concluded with summaries from each working group chairperson. The 39th ASTER Science Team Meeting will be held June 6-9, 2011 in Tokyo, Japan. ■