

## 40<sup>th</sup> ASTER Science Team Meeting Report

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The 40<sup>th</sup> Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Science Team Meeting was held December 12-15, 2011, 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 almost 50 U.S. and Japanese Science Team members and interested participants to the 40<sup>th</sup> ASTER Science Team Meeting.

**M. Abrams** summarized the latest news from NASA Headquarters (HQ), and also presented ASTER science highlights. The Terra mission received a two-year extension following the 2011 NASA Earth Science Senior Review, with funding through September 2013. NASA and the Japanese Ministry of Economy, Trade, and Industry (METI) jointly released the ASTER Global Digital Elevation Model version 2 (GDEM2) on October 17, 2011. Improvements incorporated into the new version include better spatial resolution, elimination of most artifacts, reduction in data gaps, and superior water-body coverage and detection. Abrams concluded by displaying several ASTER images acquired in response to natural disaster tasking, and highlighted some recent publications and conference presentations.

**M. Kikuchi** [Japan Resources Observation System and Space Utilization Organization (JAROS)] reported on ASTER instrument status, addressing lifetime management and radiometric calibration.

**T. Matsunaga** [National Institute for Environmental Studies (NIES)], provided an update on METI's Hyperspectral Imager Suite (HISUI)<sup>1</sup>, a spaceborne instrument with hyperspectral and multispectral imagers.

**M. Hato** [ERSDAC] reported on ERSDAC Ground Data System (GDS) status, providing updates on observation scheduling, data processing, and product distribution. Additional topics included the completion of the ASTER Operation Segment (AOS) replacement, release of the Level-1A Plus (L1A+) Tool to correct nighttime thermal infrared (TIR) geolocation error, and a brief suspension of GDS operations in January 2012 due to facilities relocation.

**D. Meyer** [U.S. Geological Survey Land Processes Distributed Active Archive Center (USGS LP DAAC)] reviewed LP DAAC ASTER activities, including data

processing and access initiatives, GDEM2 validation, and distribution metrics.

**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.

**J. Kargel** [University of Arizona] demonstrated the use of ASTER visible and near-infrared (VNIR) and GDEM2 data in mapping animal habitats, specifically, determining an Optimum Suitability Index (OSI) for the Tibetan snowcock.

The opening plenary concluded with **M. Abrams** and **Y. Yamaguchi** [Nagoya University] proposing a list of issues for discussion in the working groups, including: data acquisition monitoring status; ASTER instrument power-reduction plan; and GDEM updates following the release of v2.

### Level-1/DEM Working Group

**H. Fujisada** [Sensor Information Laboratory Corporation (SILC)] reported no appreciable problems for instrument inter- and intratelescope registration. The implementation of L1A+ software corrects nighttime TIR geolocation error.

**M. Abrams** presented media coverage and publicity activities for the newly released GDEM2.

**D. Meyer** compared LP DAAC distribution metrics for GDEM2 and GDEM v1. First-month GDEM2 demand was on par with v1 distribution. **M. Hato** reported similar GDEM2 distribution demand at ERSDAC.

**R. Crippen** [JPL] summarized his GDEM2 validation results, reporting improvements over earlier products, with finer resolution and reduced glitches, but with more random noise. Work is underway to produce a new version of the Shuttle Radar Topography Mission (SRTM) DEM by filling voids with GDEM2, as well as developing a GDEM with reprocessed SRTM data and additional enhancements.

**H. Fujisada** set forth SILC's proposal to develop GDEM v3. GDEM quality will be further enhanced with additional input scene DEMs, smaller inland water body recognition, and the correction of large lake anomalies.

**M. Abrams** discussed two special ASTER GDEM2 sessions being organized for the XXII Congress of the

<sup>1</sup> HISUI will fly on the Advanced Land Observation Satellite (ALOS-3), which is scheduled to launch in 2018.

International Society of Photogrammetry and Remote Sensing (ISPRS), to be held August 25–September 1, 2012, in Melbourne, Australia. **M. Abrams, Y. Yamaguchi,** and **J.P. Muller** [University College London] will act as cochairs, and will edit a special journal issue compiled from the presentation material.

### Geology Working Group

**C. Laukamp** [Commonwealth Scientific and Industrial Research Organisation (CSIRO)] reported on the Centre of Excellence for 3D Mineral Mapping's (C3DMM) ASTER project. A suite of publicly accessible ASTER-derived geoscience mineral map products of the Australian continent is under development. Version 1 (v1), covering Western Australia, was released to the public on November 15, 2011. The full v1 map covering the entire Australian continent will be released at the 34<sup>th</sup> International Geological Congress (IGC) in August 2012.

**J. Mars** [USGS] discussed a basin and range mineral-mapping project that identifies hydrothermal silica-rich rocks using shortwave infrared (SWIR) and TIR ratios obtained from ASTER data. Goals of the project are to detect potential economic deposits of gold, molybdenum, and copper, and to identify rocks that affect the pH of surface waters in watersheds.

**J. Kargel** analyzed the role of ASTER and Global Land Ice Measurements from Space (GLIMS) in composing accurate maps depicting Greenland's ice loss.

**A. Melkonian** [Cornell University] presented ongoing work conducted with **M. Pritchard** [Cornell University] analyzing glacier velocities and elevation changes in Patagonian icefields. Results show each icefield is losing volume; despite high variability, rates agree with Gravity Recovery and Climate Experiment (GRACE) measurements. Next, Melkonian updated the audience on the Cornell Andes Project. The principal investigator (Pritchard) and the team combined ASTER TIR data with Interferometric Synthetic Aperture Radar (InSAR) data and seismic observations to identify background activity at 200 volcanoes in the Southern and Central Andes region.

**M. Ramsey** [University of Pittsburgh] provided an update on the ASTER Urgent Request Protocol (URP) program, a rapid-response volcano-alert system. The system will expand from monitoring volcanic activity in the North Pacific to a global scale, following integration and testing using Moderate Resolution Imaging Spectroradiometer (MODIS) IR data and the MODIS Volcano (*MODVOLC*) algorithm. Ramsey also speculated on the evolution of volcano remote sensing in the coming decade.

**V. Realmuto** [JPL] presented *Plume Tracker*, a new toolkit for mapping volcanic plumes with multispectral

TIR remote sensing. *Plume Tracker* allows for interactive data analysis through the use of multiple instruments and ancillary data sources, thus providing multi-resolution analysis.

**M. Urai** [Geological Survey of Japan (GSJ)/National Institute of Advanced Industrial Science and Technology (AIST)] discussed the ASTER time series DEM and orthorectified image dataset, accessible to contracted researchers for applications such as disaster monitoring and land-use classification. The dataset, consisting of the time-series image, DEM, cloud mask, and image-shift data, is currently available for Asia and Africa, with additional areas to be included in coming years.

**D. Pieri** [JPL] provided updates on several ASTER-related projects. Pieri reviewed ASTER Volcano Archive (AVA) statistics, challenges, and future plans. He also presented work on low-temperature anomaly detection using pixel probability distributions. Pieri ended with a progress report on *in situ* gas-sampling activities at Turrialba Volcano in Costa Rica. Field data are combined with satellite measurements for detailed volcano-emission analysis.

### Operations and Mission Planning Working Group

**M. Fujita** analyzed ASTER observation resources and provided status updates for various STARS. GM4 acquisitions are leveling off, prompting the recommendation to start GM5 to increase global coverage. TGM5 is successfully acquiring nighttime TIR data, and will proceed as submitted. The UA2011 STAR is underway. This request was generated during GDEM2 development and targets rarely observed areas. The Gap-filler STAR is designed to fill the cloudy holes of GDEM. Areas for a 2012 version will be determined by analyzing GDEM2, with additional input from **R. Crippen**. The presentation concluded with updates for GLIMS, urgent observations, and pointing status.

**T. Tachikawa** [ERSDAC] provided preliminary results assessing the efficiency of cloud avoidance in the late-change one-day schedule.

**M. Hato** announced completion of the AOS replacement, and detailed the GDS office relocation plan.

**M. Kikuchi** presented six possible scenarios for ASTER if a power-reduction plan is mandated for Terra.

**D. Meyer** reviewed Long-Term Archive (LTA) plans for ASTER data following the end of its mission. The draft plan for the LTA, outlining procedures beyond three years of post-mission data production, was delivered to the Earth Science Data and Information System (ESDIS). NASA HQ will revisit the proposal at a later date.

**M. Ramsey** expanded on integrating *MODVOLC* triggers into the current rapid-response volcano alert system. Five volcanoes will act as test cases before implementing a worldwide monitoring system.

**J. Kargel** discussed GLIMS acquisition status and strategies to boost data collection.

#### Temperature-Emissivity Separation Working Group

**G. Hulley** [JPL] began with an update on global ASTER emissivity grids. North America and Africa products are complete. The worldwide emissivity database should be complete by December 2012.

**H. Tonooka** [Ibaraki University] reviewed features of the Satellite-based Lake and Reservoir Temperature Database in Japan (SatLARTD-J). Beta v1, which uses ASTER TIR data, is publicly available, and includes all major lakes and many small water bodies in Japan. Tonooka then discussed AIST's ASTER time-series orthorectified products and Ibaraki University's role in generating land-surface temperature and emissivity (TE) products.

**A. Gillespie** [University of Washington] provided continued validation results for ASTER TE products over water. **H. Tonooka** followed with validation results obtained from data collected by permanent stations at select lakes in Japan. **S. Hook** [JPL] completed the presentations involving TE product validation over water bodies with data retrievals from Lake Tahoe and the Salton Sea.

**H. Tonooka** detailed the use of ASTER TIR nighttime data in flood analysis, providing application results from extensive flooding in Queensland.

**T. Tachikawa** presented validation results following the correction of the TIR geolocation error in nighttime data using the L1A+ process.

**G. Hulley** discussed the use of principal component regression in generating a high-spectral-resolution ASTER emissivity spectrum. Applications include the validation of hyperspectral IR sounder emissivities and land-surface temperature from IR sounders using a radiance-based method.

**S. Kato** [NIES] presented work on the relative accuracy of the ASTER emissivity product using data collected at one of several vicarious calibration sites for ASTER TIR, located in Railroad Valley, NV.

**K. Iwao** [AIST] presented research conducted by **N. Yamamoto** [AIST] on a Sensor Alert Service (SAS) for ASTER data using volcano *hotspot* detection as a case study. An event triggers an automatic processing chain,

with results published using a spatiotemporal Web-feed format (GeoRSS), with event information easily obtainable via visualizations in *Google Earth*.

**M. Fujita** provided observation completion rates for TGM3 and TGM4, and status updates for the active TGM5 STAR.

**H. Tonooka** explained the TGM5 area-of-interest (AOI) generation process and cloud assessment. TGM5 achievement is based on analyzing the number of clear nighttime scenes acquired.

#### Radiometric Calibration/Atmospheric Correction Working Group

**F. Sakuma** [JAROS] reviewed VNIR, SWIR, and TIR instrument status. The radiometric response of VNIR and TIR has been decreasing gradually. Radiometric Calibration Coefficient (RCC) parameters for VNIR and TIR will be updated from v3.11 during the first quarter of 2012 to prevent further deviation from the fitting curve. Sakuma also reported on the influence the Inclination Adjustment Maneuver (IAM) has had on the VNIR and TIR sensors. The effect was not remarkable for VNIR, while a small change was observed for TIR. Sakuma ended by comparing ASTER VNIR degradation with degradation trends for other sensors.

**A. Iwasaki** [University of Tokyo] analyzed ASTER VNIR odd/even stripe noise, apparent in L1A data after radiometric correction. Investigations into the relationship between detector temperature and the odd/even difference are ongoing.

**S. Tsuchida** [AIST] presented research conducted by **H. Yamamoto** [AIST] that evaluated ASTER gains and offsets using long-term Terra ASTER/MODIS cross-calibration over Committee on Earth Observing Satellites (CEOS) reference standard test sites. Relative differences between ASTER and MODIS top-of-atmosphere (TOA) reflectance are increasing as a function of mission elapsed time.

**B. Eng** [JPL] reviewed U.S. ASTER L2 software status. V3.4 has been delivered and tested at the LP DAAC, and will be implemented following a transition from 32-bit to 64-bit hardware. V3.5 is under development.

**S. Biggar** [University of Arizona], **S. Tsuchida**, 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 discussed.

The session concluded with a power-limit discussion, assessing the impact to onboard calibration in the event that long-term calibration can no longer be carried out.

## Ecosystem/Oceanography Working Group

The meeting began with an announcement from **T. Matsunaga** that he is resigning from his position as working group cochair. **K. Iwao** will assume the role of cochair alongside **G. Geller** [JPL].

**L. Prashad** [Arizona State University (ASU)] discussed the ASU 100 Cities Project's *beta* release of Java Mission-planning and Analysis for Remote Sensing (JMARS) for the Earth (J-Earth). This open-source geographic information system (GIS) application allows users to search for and analyze multispectral remotely sensed data.

**J. Kargel** demonstrated the combined use of ASTER data and field observations to document vegetation destruction and primary succession as part of the glacier-climate-Earth surface process system.

**D.D.G.L. Dahanayaka** [Ibaraki University] presented work aimed at estimating the concentration of chlorophyll-a (Chl-a) in Sri Lankan tropical coastal water bodies using ASTER data and *in situ* measurements. ASTER bands 1 and 2 were found to be useful for monitoring Chl-a, and results were compared to estimates obtained from other instruments.

**S. Kato** [NIES] presented an analysis of shaded and sunlit surface temperature in Tokyo, estimated by using ASTER VNIR and TIR data.

**K. Iwao** reviewed AIST's hotspot detection system and provided Group on Earth Observation (GEO) activity updates. The ASTER GDEM2 and human settlement map were highlighted at the GEO-VIII Plenary held in Istanbul, Turkey in November 2011.

**T. Matsunaga** described research conducted by **Y. Sakuno** [Hiroshima University] monitoring water mass

change around Tachinaba Bay using ASTER Multi-Channel Sea Surface Temperature (MCSST) data. The cold-water movement observed in ASTER data aligns with *in situ* measurements of surface residual flow.

**T. Matsunaga** presented research conducted by **E. Suwandana** [Hiroshima University] on assessing accuracy for the ASTER GDEM and SRTM DEM in watershed delineation, using West Java as a test case. When compared to Differential Global Positioning System (DGPS) data and Topographic DEMs (Topo-DEM), agreement with space-based DEMs is generally good.

**G. Geller** provided an update on *TerraLook*, a program that provides no-cost access to ASTER and historical Landsat georeferenced *jpeg* images, along with a suite of simple visualization and analysis tools. Discussions are underway with the USGS Earth Resources Observation Systems Data Center (EROS) and the LP DAAC to increase the number of sensors involved.

## STAR Committee

One new STAR proposal was presented, reviewed, and conditionally accepted, pending resubmission with GLIMS sponsorship.

## Closing Plenary Session

The meeting concluded with summaries from each working group chairperson and commentary on the issues proposed at the opening plenary. **S. Hook** spoke on the Hyperspectral Infrared Imager (HypIRI) and Hyperspectral Thermal Emission Spectrometer (HyTES), and **M. Ramsey** discussed the Mineral and Gas Identifier (MAGI). The 41<sup>st</sup> ASTER Science Team Meeting is tentatively scheduled for June 11–14, 2012, in Tokyo, Japan. ■

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## Resources and Additional Information

**GRACE Program** – [www.nasa.gov/grace](http://www.nasa.gov/grace)

**GRACE Mission Project** – [www.csr.utexas.edu/grace](http://www.csr.utexas.edu/grace)

**GRACE Tellus** – [grace.jpl.nasa.gov](http://grace.jpl.nasa.gov)

**NASA Mission Update GRACE 2009** – YouTube [www.youtube.com/watch?v=9vdvkGFkhWs](http://www.youtube.com/watch?v=9vdvkGFkhWs)

**Background on Gravity Missions (CHAMP, GRACE, GOCE)** – [www.ggos-portal.org/lang\\_en/GGOS-Portal/EN/Topics/SatelliteMissions/GravityField/GravityField.html](http://www.ggos-portal.org/lang_en/GGOS-Portal/EN/Topics/SatelliteMissions/GravityField/GravityField.html)

## Assessing the State of GRACE@10

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