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Achievement of the ASTER program

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Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) is a multi-spectral imaging radiometer onboard Terra, the flagship satellite of NASA's Earth Observing System (EOS) launched in December 1999. ASTER is a cooperative effort among NASA, Japan's Ministry of Economy, Trade and Industry (METI), Japan Space Systems (JSS), and National Institute of Advanced Industrial Science and Technology (AIST). Recognizing the importance of science-driven activities, we formed ASTER Science Team, which consists of Japanese and U.S. scientists, and has been closely working together with the ASTER instrument team, NASA platform operation team, and data processing and distribution agencies. We hold ASTER science team meetings regularly, the 45th meeting was held in December 2014 in Tokyo.

ASTER captures high spatial resolution data in 14 spectral bands from the visible through thermal infrared regions with 15 to 90 m spatial resolution. The VNIR subsystem has nadir and backward-viewing bands for stereoscopic observation in the along-track direction. Because of its high spatial resolution, ASTER is called as the "zoom lens" for Terra, and ASTER data are useful for validation and calibration of other Terra and satellite instruments. ASTER data are being used for many scientific and practical applications. Because the ASTER data have wide spectral coverage and relatively high spatial resolution, we can discriminate a variety of surface materials. Wide spectral coverage of ASTER allows not only detailed surface mapping but also analysis of surface physical processes. For instance, ASTER data covering from the visible to thermal infrared regions are useful to quantitatively analyze heat balance at the Earth surface in local to regional scale that is essential to study hydrological cycles in vegetated terrain and heat island effect in urban areas. These ASTER characteristics along with flexible operation have been contributing to rapid damage assessment in case of disasters.

ASTER data are being provided from the ASTER Ground Data System (GDS) of JSS in Japan and Land Processes Distributed Active Archive Center (LP DAAC) in U.S.A., a component of NASA's EOS Data and Information System (EOSDIS). Available ASTER data include the Level 1 products as well as higher level data products such as surface radiance, surface reflectance, surface temperature, surface emissivity, digital elevation model (DEM), and ortho-rectified radiance at sensor. Moreover, ASTER global digital elevation model (GDEM) was generated from the ASTER data archive and was released to public in June 2009 as contribution to Global Earth Observation System of Systems (GEOSS). The updated ASTER GDEM ver.2 was released in October 2011, and ver.3 is planned in the near future. The ASTER GDEM comprises a seamless global mesh with a 1 arc-second (30 m) grid of elevation posting that extends up to 83 degrees N and S latitudes.

ASTER obtains data by target observation based upon data acquisition requests by users. ASTER is currently acquiring approximately 518 scenes per day as an average, one scene covers an area of 60 by 60 km. As of November, 2014, ASTER had acquired about 2.7 million scenes and achieved a very good coverage of the whole land surface. In order to maximize the science return, the ASTER Science Team has been continuously monitoring the ASTER data acquisition status, generating appropriate observation scenarios, and modifying observation parameters. For instance, in addition to local observations by individual users, we have repeated six cycles of the global mapping as background data acquisition, since data acquisition efficiency decreases when the target areas become patchy. We are also conducting data acquisition for Global DEM, thermal infrared night-time global mapping, and the other observation categories on behalf of the earth science community in large.

Keywords: ASTER, NASA, EOS, Terra, remote sensing, earth observation