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Invited Session: Global DEM Interoperability: ASTER GDEM Initial Assessment

ICESAT LASER ALTIMETER EVALUATION OF THE ASTER GLOBAL DIGITAL ELEVATION MODEL (GDEM)

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Geodetic control is extremely important in the production and quality control of topographic data sets, enabling elevation results referenced to an absolute vertical datum. Global topographic data with improved geodetic accuracy achieved using global GCP (Ground Control Points) databases enables more accurate characterization of coastal inundation hazards and land surface changes related to solid Earth processes, natural hazards and climate change.

The Ice, Cloud and land Elevation Satellite (ICESat) has acquired globally distributed laser altimetry profiles (± 86°) since February of 2003. They provide a consistently referenced elevation data set with unprecedented accuracy and quantified measurement errors that can be use for this purpose. The capability of ICESat to record a waveform, representing the elevation distribution of surfaces illuminated in the laser footprint, allows for comparisons with respect to the highest, centroid (average) and lowest elevations observed by ICESat. In regions of vegetation cover, the waveform measures the vertical distribution of vegetation and the underlying ground where illuminated through canopy gaps. After appropriate editing criteria are applied, these data constitute an asset that can be exploited to accurately characterize topography and improve existing data sets. The Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) new Global DEM (GDEM) is being produced by Japan's Ministry of Economy, Trade, and Industry (METI) and the National Aeronautics and Space Administration (NASA), and its validation will be accomplished as a cooperative activity of the U.S. Geological Survey (USGS), NASA, and METI's Earth Remote Sensing Data Analysis Center (ERSDAC), coordinated by the USGS.

As part of it validation effort, we have selected ICESat data yielding land-surface elevations with sub-decimeter vertical accuracy and better than 10 m horizontal accuracy to build a global, geodetic, ground control point (GCP) database that will be used to assess, and can help correct spatially varying elevation biases in this new GDEM product being produced from ASTER data. As previously done with the SRTM elevation data set, evaluation of elevation biases and reported error statistics will be done in the context of land cover types and various topographic relief conditions for the various continents, including Northern and Southern latitudes above and below ±60°, where other global topographic data assets are not available, and topographic control may be scarce.