

IGARSS 2009

Invited Session: Global DEM Interoperability: ASTER GDEM Initial Assessment

Paper Title:

The Global Elevation Replacement Project: Africa Hydrological Comparisons and Source Evaluations between the 1 Arc-Second ASTER GDEM and Comparable Higher Resolution Data Sources

Authors:

Jeffrey Danielson, Dean Gesch, and Norman Bliss

U.S. Geological Survey (USGS), Earth Resources Observation and Science (EROS) Center, Sioux Falls, SD, USA

Abstract:

A new multi-resolution global elevation model is being developed that will replace GTOPO30 as the elevation dataset of choice for global and continental scale applications. The primary source dataset for the new global model is the National Geospatial-Intelligence Agency (NGA) 1-arc-second void-filled Shuttle Radar Topography Mission (SRTM) data. SRTM data cover 80-percent of the Earth's land surface (all latitudes between 60-degrees north and 56-degrees south), and will provide a significant upgrade over the primary source datasets used for GTOPO30, the older 3-arc-second Digital Terrain Elevation Data (DTED) and Digital Chart of the World (DCW) 1:1,000,000-scale cartographic data produced by NGA. In northern Canada and Eurasia beyond 60-degrees latitude, 0.75-arc-second and 3-arc-second cartographically derived Canadian Digital Elevation Data (CDED) and 3-arc-second DTED will be used as source data for the new global model, respectively. Based on results from the ASTER Global Digital Elevation Model (GDEM) validation, the ASTER GDEM model will also be considered as a source dataset for the northern latitudes beyond the coverage of SRTM. The new global model will provide seven new elevation data products at three spatial resolutions: 30-arc-seconds (to be compatible with the legacy GTOPO30), 15-arc-seconds (about 500-meters), and 7.5-arc-seconds (about 250-meters). A spatial comparison of hydrological basins will be conducted between the new Africa 30 and 7.5 arc-second breakline products and basins derived from the 30 arc-second HYDRO1k and the 3 arc-second HydroSHEDS datasets. As part of the ASTER GDEM validation, a comparison in the northern latitudes beyond 60-degrees will be performed between the ASTER GDEM and the existing CDED and DTED products. The relative accuracy will be calculated by differencing the ASTER GDEM with the CDED and DTED data on a pixel-by-pixel basis. Difference statistics are being generated for each 1x1-degree tile and then aggregated together for an overall characterization. The absolute vertical accuracy of the GDEM, CDED, and DTED are also being measured by comparison to an independent reference geodetic dataset from the Geoscience Laser Altimeter System (GLAS) instrument onboard the Ice, Cloud, and land Elevation Satellite (ICESat). These

GLAS/ICESat L1B global elevation data points have sub-decimeter level vertical accuracy and better than six meters horizontal accuracy, as they are produced by a high-precision laser altimeter. Overall absolute vertical accuracy will be reported by aggregating the statistics from the individual 1x1-degree tiles. The development of the new multi-resolution global model is in progress, with expected completion scheduled for September 2009.