IGARSS 2009
Invited Session: Global DEM Interoperability: ASTER GDEM Initial Assessment

Paper Title:

Validation of the ASTER GDEM over the United States: Comparison with SRTM, the USGS National Elevation Dataset, and GPS Benchmarks

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Abstract:

The ASTER Global Digital Elevation Model (GDEM) over the conterminous United States is undergoing extensive validation through comparisons with other elevation data and geodetic control points. The other elevation datasets include the USGS National Elevation Dataset (NED) and the Shuttle Radar Topography Mission (SRTM) data. Each of the more than 900 1x1-degree tiles of the GDEM that cover the conterminous United States is being compared to the corresponding 1-arc-second data from the NED and SRTM data. The comparison includes differencing the ASTER GDEM with the NED and SRTM data on a pixel-by-pixel basis. Difference statistics are being generated for each 1x1-degree tile, and then the statistics will be aggregated for an overall characterization of the differences. The absolute vertical accuracy of the GDEM is also being measured by comparison to an independent reference geodetic control point dataset from the National Geodetic Survey (NGS). The "GPS on bench marks" dataset includes more than 13,000 points distributed throughout the conterminous United States that NGS uses for gravity and geoid modeling. These points have centimeter-level accuracy in their horizontal and vertical coordinates, as they are produced by high-precision GPS observations on established survey benchmarks. The vertical accuracy of the NED and SRTM data also will be assessed using the NGS reference points to give context to the ASTER results. Not every 1x1-degree tile contains reference points, but for the tiles that do contain a sufficient number of points (for example, a minimum of 10 points), vertical accuracy statistics will be calculated for the individual tiles. Overall absolute vertical accuracy will be reported for all of the study area by aggregating the statistics from the individual tiles. The reference control points also provide a useful sample of locations at which land surface characteristics (slope, aspect, local relief) can be measured and compared among the three elevation datasets. Measurement of these derivative parameters will allow for examination of the vertical accuracy as a function of specific terrain conditions. Additionally, the land cover at each of the reference control point locations will be recorded based on the USGS National Land Cover Dataset, which will allow the assessment to include calculation of vertical accuracy by land cover class. Use

of the reference control point dataset also allows for calculation of the relative, or point-to-point, vertical accuracy, which is especially important for derivative products that make use of the local differences among adjacent elevation values, such as slope and aspect calculations. The relative accuracy information will be used to produce an estimate of the uncertainty of slope information derived from the ASTER GDEM. The absolute and relative vertical accuracies, and the slope accuracies, of the NED and SRTM also will be calculated and reported to give context to the ASTER results.