Name: Claudia C. Carabajal
Organization: NVI, Inc.@ NASA/GSFC
Address 1: NASA Goddard Space Flight Center
Address 2: Code 697 - Space Geodesy Laboratory
City: Greenbelt
State: MD
Zipcode: 20771
Country: USA
Business Phone: 301-614-6111
Other Phone:
Fax: 301-614-6099
Email: claudia@bowie.gsfc.nasa.gov
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Abstract: Understanding the quality of the DEM data sets is crucial to their use in land process studies, as inputs to models, and in detection of change obtained from comparison of DEMs acquired at different times. Elevation data from the Geoscience Laser Altimeter System (GLAS) on board the Ice Cloud and Land Elevation Satellite (ICESat) provides a globally distributed data set that is well suited to evaluate the vertical accuracy of Digital Elevation Models (DEMs), such as those produced by the Shuttle Radar Topography Mission (SRTM). Here we document elevation differences between the SRTM C-band DEM and ICESat 1064 nm altimeter channel data. GLAS received echo waveforms enable estimation of SRTM radar phase center elevation biases with respect to the highest, centroid (distance-weighted average), and lowest elevations detected within the 80 m diameter ICESat laser footprints. Distributions of ICESat minus SRTM elevation differences are quantified as a function of SRTM local relief, percent tree cover (from the MODIS Vegetation Continuous Fields product), and waveform extent, a surrogate for total relief due to canopy height and ground topography. The results provide insights into C-band penetration into vegetation, and resulting biases with respect to the canopy top and underlying ground. The SRTM phase center is usually located between the ICESat highest and lowest elevations, and on average is closely correlated with the ICESat centroid. Regional comparisons have been completed for the northwestern United States, southern Alaska, the Amazon basin, east Africa, the Himalayas and Tibetan Plateau, and western Australia.