Quantitative Comparison of AIRSAR and SRTM DEM data

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The NASA/JPL Airborne Synthetic Aperture Radar (AIRSAR) project, an airborne, multi-frequency, fully polarimetric synthetic aperture radar (SAR) system, has been acquiring and processing fixed-baseline interferometric SAR data since 1993. Over 1,000 high resolution Digital Elevation Models (DEM) at C-band have been produced since then, each covering between 100 and 600 square km of terrain. In addition, over 400 of these data-takes have simultaneous and coincident L-band derived DEMs. It has been shown that it is possible to reduce the height error of the AIRSAR C-band DEM's to less than 2 meters with 5 m horizontal postings if suitable tie-points are employed to constrain systematic errors.

Over the years, the AIRSAR hardware and processing system have evolved, resulting in a variety of DEM resolutions and height accuracies as radar hardware, motion measurements, and processing techniques have been refined. The objective of this work is to quantitatively assess the characteristics of this data archive through comparison with results from the C-band Shuttle Radar Topography Mission (SRTM), which has generated a global (between plus and minus 60 degrees latitude) DEM at 30 m horizontal postings and high vertical accuracy.

While the SRTM DEM was acquired for the operational use of the USA National Imagery and Mapping Agency (NIMA), the AIRSAR project has been a NASA test-bed for interferometric SAR techniques, and its products often reflect the experimental nature of this instrument. Analysis of the height accuracy of the AIRSAR DEM's versus processing and hardware considerations were used to produce requirements for recent interferometric systems such as SRTM, and the airborne GEOSAR interferometric SAR, as well as other proposed instruments.

However, the AIRSAR DEM's, which are available to investigators worldwide, have often been used by investigators as the best available DEM for their scientific investigations. In addition, the DEM's are used to radiometrically and geometrically correct the simultaneously acquired P-band and L-band polarimetric data. Therefore, an assessment of the accuracy of the DEM has been undertaken to document the characteristics of this extensive data archive.