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Vertical Accuracy Assessment of TanDEM-X Global DEM over various Indian Terrains

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Accurate and precise topographic information from Digital Elevation Models (DEM) is of fundamental requirement for many geoscience and engineering applications. With a goal of providing accurate global topographic products, German Aerospace Centre (DLR) and Airbus Defence and Space developed X-band TanDEM-X mission. The TanDEM-X Global DEM is generated with a pixel spacing of 12 × 12 m from interferometric data acquired in strip map mode with a resolution of 3.3 m [1]. In this study, the vertical accuracy of TanDEM-X Global DEM is assessed by comparing it with various elevation datasets. The elevation datasets include DGPS measurements, SRTM 30m, and 90 m DEM, CartoSat DEM, LiDAR data, photogrammetry data, intermediate and fused DEMs' derived from TanDEM-X CoSSC [2], ICESat elevations and the newly released TanDEM-X 90 m DEM. The study areas include Bihar (flat terrain), Mumbai (moderate and urban terrain), Godavari (moderate and hilly), Koyna (hilly and vegetated), Manali (rugged Himalayan) and Kartarniaghat Wild Life Sanctuary-KWLS (flat and forest) with different terrain conditions. Widely used statistical parameters such as mean, standard deviation (SD) and root mean square error (RMSE) are used for vertical accuracy assessment [3]. The minimum and maximum differences between elevations are also noted, which are useful in exploiting quality of DEM under evaluation. The accuracy of the TanDEM-X Global DEM is found to be less than 1.6 m, 4 m, 5 m, 13 m, 6 m for plain, moderate relief, hilly, Himalayan, vegetated terrains respectively. In vegetated areas (KWLS), we observed an 8 m difference in tree height estimation using TanDEM-X Global DEM and GPS measurement. Elevation and difference profiles were drawn to understand the vertical accuracy of these DEMs'. In all cases, the elevations of TanDEM-X Global DEM closely matched with heights derived from DGPS, ICESAT, LiDAR and photogrammetry data.

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