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Analysing DEM errors over an urban region across various scales with different elevation sources

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Abstract

With scant information available on domestic DEM quality and suitable evaluation methods, particularly in city regions, this study set out to evaluate and compare nine contemporary seamless DEM from different sources and spatial resolutions. The assessment focused on DEM accuracy, as well as determining the variation in data quality across several urban land cover types and slope classes. This was systematically determined against independent LiDAR-derived control points, co-registered reference grids, and resampled data from relevant land cover information. It showed that different sensor configurations and interpolation techniques directly relate to the unique ground cover and topographic variations as manifested by the particular digital surface model (DSM) or terrain model (DTM). An experimental photogrammetric DTM and SA National DEM compared very well with 'off-the-shelf' tri-stereo Elevation4™ and WorldDEM™ DTM products. Their good performance eluded to them being the least affected by land surface cover and gradient variations. The accuracy metrics produced by the AW3D30 DEM throughout were on average substantially higher than those calculated for both the National DEM and the SRTM-X DEM. Two local commercial versions, the older SADTM and more recent SUDEM, and lastly the ASTER GDEM2 in particular, yielded noticeably less accurate results that would restrain their usefulness.