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Accuracy assessment of Digital Elevation Models (DEM), SRTM and ASTER satellites and the DEM derived from 1:25000-scale topographic maps using DGPS

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ABSTRACT:

In this study, the accuracy of DEMs derived from ASTER satellite images and SRTM data with 30- and 90-meter pixel dimensions and the digital elevation model derived from topographic 1:25000-scale maps with Differential Global Positioning System (DGPS) in different landforms including plains, hills and mountains were checked. The compliance of these data was analyzed using Pearson correlation analysis. The accuracy of different digital elevation models were analyzed using RMSE, errors mean and standard deviation. The results showed that the determination coefficient of the correlation between the ground data and digital elevation models are between 97 and 99. The greatest compliance was found to be related to the digital elevation model derived from 1: 25000 topographic data and ASTER30 – meter digital elevation model, while the lowest compliance was related to SRTM90 meter data. In general, as the field's conditions becoming more difficult from deserts to mountains, there was a reduction in the compliance of the digital elevation models with the ground data. The results of assessing the accuracy of digital elevation models showed that the lowest error was primarily related to the digital elevation model derived from 1:25000 contour lines (RMSE=6.27) and then to ASTER30 meter digital elevation model (RMSE=7.43). The pixel size of 30 meters had better results than the 90-meter pixel. The standard error OD mean shows that the minimum bias is related to ASTER 30 m (bias of 2 m) and then to the 1: 25,000 DEM (2017). The maximum bias was related to 30-and 90-meter models derived from the SRTM data. The results of standard deviation error were in compliance with the RMSE results, confirming superiority of the digital elevation models derived from topographic maps 1:25000 and ASTER30 m DEM

Keywords:
Digital elevation model (DEM), ASTER, SRTM, topography, DGPS

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