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Vertical Accuracy Assessment of Improvised Global Digital Elevation Models (MERIT, NASADEM, EarthEnv) Using GNSS and Airborne IFSAR DEM

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Abstract
During the last decades, freely available GDEMs, such as ASTER, SRTM, and AW3D30, have been widely used in many applications such as for environmental, spatial analysis, research in geomorphology, hydrology, etc. However, these available GDEMs suffer from various limitations. In order to enhance the quality and accuracy of GDEMs, several GDEMs have been merged or reprocessed using a more rigorous method to develop new GDEMs. The advent of these new improvised GDEMs has advanced their applications. Unfortunately, there are very limited studies that focus on the comprehensive and systematic evaluation of the quality of improvised GDEM. Therefore, this study examines the vertical accuracy of three freely available improvised GDEMs (MERIT, NASA, and EarthEnv GDEMs) over the northern region of Peninsular Malaysia using 7757 GNSS points and two reference model, i.e., TanDEM-X DEM 12m resolution and local airborne IFSAR DEM 5m resolution. The accuracy assessments have been performed over three different land covers (urban, non-forest, and forest areas) to evaluate the impact of different land covers on the GDEM's accuracy. Since SRTM DEM is the primary data input in the improvised GDEM, this GDEM is also considered to identify the performance of the new improvised GDEMs. Comparison with GNSS points shows that the accuracy of MERIT DEMs outperforms SRTM DEM and other GDEMs with RMSE of ±2.668m, followed by NASA (±3.656m), SRTM (±5.666m), and EarthEnv (±5.948m). The vertical accuracy of DEM varies with different land cover conditions. Comparison with TanDEM-X and IFSAR DEM shows that all tested GDEMs' accuracy is high over a non-forest area, followed by urban area, and worse over forest area. Overall, the tested GDEM shows only a slight improvement compared to the SRTM. However, these results will help users in selecting the optimum DEM for any application. © Geoinformatics International.

Author Keywords
EarthEnv; MERIT; NASA; TanDEM-X; Vertical Accuracy

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accuracy assessment, comparative study, digital elevation model, GNSS, TanDEM-X; Malaysia, West Malaysia

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