

Accuracy Comparison of Digital Elevation Models Generated from Different Sources

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SUMMARY

Digital elevation model (DEM) is a digital representation of ground surface topography and have been used in various applications. The introduction of global coverage DEM available for free or at reasonable cost was a new phenomenon in mapping. The issue is how accurate are these datasets and can it be used for topographic mapping. This paper aims to evaluate the height accuracy of DEMs generated from different sources. Results presented in this paper is part of a study to evaluate the suitable use of different DEMs and high resolution imagery such as Quickbird, Worldview, GeoEye, Ikonos or SPOT 5 imagery for topographic map updating. For this paper, Advanced Spaceborne Thermal Emission and Reflection Radiometer Global Digital Elevation Model (ASTER GDEM), Intermap Airborne Interferometric Synthetic Aperture Radar Digital Terrain Model (IFSAR DTM), IFSAR Digital Surface Model (IFSAR DSM), digital topographic map (with a 5m contour interval) and Light Detection and Ranging (LiDAR) datasets are used to generate the contours, height points and height profiles. LiDAR dataset is used as reference DEM to evaluate the accuracy of IFSAR DTM and DEM generated from digital topographic maps acquired from the Department of Survey and Mapping Malaysia. ASTER GDEM is compared with IFSAR DSM to determine the vertical accuracy. The Root Mean Squares Error (RMSE) of the heights generated from IFSAR DTM, IFSAR DSM, digital topographic map of the non-vegetated areas within the study area are 1.060 m, 5.158 m, and 3.229 m respectively. For the vegetated area, the RMSE of IFSAR DTM and digital topographic map are 5.603 m and 10.790 m respectively. The accuracy of ASTER GDEM in the vegetated and non-vegetated areas are 16.740 m and 50.140 m respectively. Visual comparison between the contours generated from IFSAR DTM and LiDAR has shown promising result. ASTER GDEM can be used to capture the general characteristic of the terrain. Future work will include the evaluation of factors that contribute to the accuracy of DEMs generated from different sources.