Accuracy assessment of global topographic data (SRTM & ASTER GDEM) in comparison with LiDAR for tropical mountain forest

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Abstract: Shuttle Radar Topographic Mission (SRTM) and ASTER Global Digital Elevation Model (GDEM) provide topographic data in a global scale. The potential use of these datasets for many forestry applications is highly depending on the accuracy of these datasets. In this study, we evaluated the accuracy of SRTM and ASTER GDEM with high accuracy topographic data of Light Detection and Ranging (LiDAR) acquired using Riegl LMS-Q560 sensor. This study is conducted in tropical mountain forest area of approximately 3,600 hectare, Malaysian Borneo. We resampled both the SRTM (90m resolution) and ASTER GDEM (30m resolution) with bilinear interpolation and cubic convolution method to five meter pixel resolution. The evaluation was divided into two sites; Site 1 (2,100 ha) and site 2 (1,500 ha). Our result revealed that resampling using cubic convolution performs better than bilinear interpolation method (when compared for all RMSE and SD values). The SRTM (SD; 9.4m-10.0m and RMSE; 27.5m-28.1m) is found to produce better topographic data in comparison with ASTER GDEM (SD; 19.5m-17.3m and RMSE; 31.6m-32.1m). However, both global topographic data shows underestimate by 24.9m to 27.0m in comparison to LiDAR data. The difference of RMSE and SD values for site 1 and site 2 are 0.53m and 0.58m, respectively. Further research to estimate forest variables (e.g. canopy height, volume and aboveground biomass) by combining this global topographic SRTM data with other dataset (e.g. surface model from aerial photographs) could provide additional insight knowledge on the extent of the application in forestry field.

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