CALIBRATION AND ACCURACY ASSESSMENT OF ASTER GDEM FOR THE MAJOR RIVER BASINS IN THE PHILIPPINES

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KEYWORDS: ASTER, Digital Elevation Model calibration, Philippine River Basins

ABSTRACT: The recent devastation experienced by the Philippines from tropical cyclones has prompted the national government to support research in flood modelling and hazard assessment for critical river systems in the country. A key component in the rapid creation of such flood models are digital elevation models (DEM) that are freely available, such as the ASTER Global DEM. This paper aims to assess the vertical accuracy of the ASTER GDEM in reference to its use in producing flood models for the major river basins in the country. The 30m ASTER GDEM data was downloaded and compared to existing 1:50,000 topographic maps in the country. Spot height values obtained from the topographic maps were plotted against their corresponding elevation values in the ASTER DEM. The two-sigma rule was used to detect and remove outliers from the elevation dataset. The formula of the best fit line of the scatter plot was used to calibrate the ASTER DEM. The RMSE of the dataset was used to assess the accuracy of the calibrated ASTER DEM. The RMSE was also used to assess the accuracy of the DEM elevation against the slope and the land cover characteristics of its location. The residuals were also normalized and plotted against its elevation values. The RMSE values for each river basin ranged from 9.3 meters to 24.93 meters, with an average value of 16.08 meters. Preliminary results show the degradation of RMSE values with increasing slope, with an RMSE value of 13.76m for slopes ranging from 0°-5°, to an RMSE value of 20.7m for slopes ranging from 20°-40°. In terms of land cover, higher accuracy is obtained from points located in built-up and cultivated areas, with an RMSE of 14.9m, as opposed to points located on open canopy forests, with an RMSE of 21.0m. Results also show that the normalized residual exponentially decreases with respect to the elevation of the point.