Comparisons of SRTM Derived DEM vs. 1:50,000 Topographic Map Derived DEM of Part of South Eastern Nigeria

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SUMMARY

Digital Elevation Model (DEM) is basic to many earth surface processes. It is used for the production of topographic map, and in analyses in ecology, hydrology, agriculture, climatology, geology, pedology, geomorphology, environmental modeling, rainfall-runoff studies, landslide hazard zonation, seismic source modeling, and many others. Up to date DEM is very scarce in developing countries including Nigeria. In most cases only the 1:50,000 topographic sheets of Nigeria produced in the 1960's are available for DEM extraction. Up till now in Nigeria, researchers and map makers of different types have to rely on the time-consuming and costly processes of digitization of contours from the 1:50,000 topographic map or photogrammetry for the generation of DEM. In 2003, the National Aeronautics and Space Administration (NASA) released the Shuttle Radar Topography Mission (SRTM) dataset for some regions, with 3 arc-second resolution for the globe, and 1 arc-second for the United States. These data are very useful for research purposes as well as to supply basic topographic mapping data for poorly mapped countries. Particularly, in Nigeria, this giant leap forward in freely available DEMs with nation wide coverage is likely to change the way in which related research and topographic mapping can be performed in Nigeria. Given the great potential and applicability of SRTM DEM, it is important to examine carefully the quality of the dataset, comparing it with the best alternative general source for DEM data in Nigeria today (the 1:50,000 topographic map sheets). In this paper, we critically examine the quality of SRTM data through direct comparison with GPS measurement, as well as comparison with DEM derived from the 1:50,000 topographic sheet using part of South Eastern Nigeria as a case study. These comparisons will be made on simple altitudinal differences, as well as for first order topographic derivatives, such as slope, curvature, aspect, flow direction, flow accumulation and compound topographic index (CTI). The second part of the paper will consist in assessing the vertical accuracy of the SRTM DEM and if systematic displacements occur due to land use land cover classes.

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