A Comparative Study of Delineated Watersheds through ASTER, SRTM and ALOS for evaluating morphological changes in Hathmati Basin, Gujarat, India.

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Watershed morphological analysis is important for controlling floods and planning restoration actions, as well it is foremost useful to understand catchment hydrology. The morphometric parameters depend on the watershed characteristics; the characteristics vary as per their natural integrators of hydrological and geological processes, such that it requires an integrated approach to data analysis and modeling. In this study, Hathmati basin has been delineated by using a Digital Elevation Model (DEM). A crucial aspect of this task is the reliability of the DEM. If the DEM is not accurate, a catchment cannot be expected to be accurately delineated. Therefore, the present study focuses on the comparison of various morphological parameters like area, perimeter etc of a watershed which delineated through open source DEM i.e. 30-m ASTER, 30-m SRTM and 30-m ALOS (AW3D30). For a precise delineation of mini-watersheds, drainages were manually digitized from the Survey of India Topographic sheet and overly on DEMs to create Agree-DEM with the help of ArcGIS 10.2 and Arc Hydro Tool. As the result, delineated watersheds from ASTER, SRTM and ALOS were compared using the regression analysis. The area of the watershed delineated from SRTM DEM is 1988.41 km-2, while the ASTER-based and the ALOS-based watershed is 2008.55 km-2 and 1990.90 km-2. The regression analysis comparing the complete area of mini-watersheds yielded an R-2 of 0.9979 between the SRTM and ASTER-based, 0.9992 for the SRTM and ALOS-based and 0.9977 for ALOS and ASTER-based mini-watershed. The area of SRTM and ALOS-based watersheds are almost similar as per the R-2 value and which is same as for the derived basin length. The perimeter of watershed delineated from SRTM-based is 1464.35 km, while the perimeter of the ASTER-based watershed is 0.25% short and 0.6% long for the ALOS-based watershed. A yielded R-2 from the regression analysis compared with the perimeter of mini-watersheds between SRTM and ASTER-based reveals 0.9796, 0.9705 for the SRTM and ALOS-based, and 0.9879 for ALOS and ASTER-based watershed. Hence, SRTM can be more pertinent to derive the morphological parameters of Hathmati basin.