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Research Paper :

Analysis of watershed boundaries derived from ASTER, SRTM digital elevation data and from manually digitized topographic map

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ABSTRACT

The watershed is natural entity having ridge line which contributes runoff to single outlet. This plays important role in the planning of natural resources. A properly delineated watershed forms a convenient hydrological unit for computation of water balance parameters and thus implementation of water management schemes. The objective of this work was to evaluate the accuracy of watershed boundaries derived from different sources of digital elevation data and manually digitized topographic map. The present case study was done for the Nanduri (Saptshrungi gad) watershed, which is located in Kalwan Tahsil Dist. Nashik, Maharashtra (India) having average elevation range from 590 to 1300m.From the present study it was found that the boundaries derived from the ASTER DEM were more closer to the manually digitized watershed boundaries. As ASTER DEMs appeared to be highly complementary to other types of satellite-derived data, such as Shuttle Radar Topography Mission (SRTM). It had been shown that a fusion of DEM from different sources (optics and radar) lead to improved results in comparison to the reference DEM.

Key words : Watershed, SRTM, ASTER, DEM, Delineation

The watersheds are natural hydrological entities that cover a specific aerial expanse of land surface from which the rainfall runoff flows to a defined drain, channel, stream or river at any particular point. The terms region, basin, catchment, watershed etc are widely used to denote hydrological units.

In the last two decades, watershed management has gained the top most priority in water resources sector. Implementation of any water management measure requires a suitable hydrological unit. A properly delineated watershed forms a convenient hydrological unit for computation of water balance parameters and thus implementation of water management schemes. The objective of this work was to evaluate the accuracy of watershed boundaries derived from different sources of elevation data.

METHODOLOGY

Digital elevation eata (DEM):

Digital elevation models are data files that contain the elevation of the terrain over a specified area, usually at a fixed grid interval over the surface of the earth. Digital elevation models may be prepared in a number of ways, but they are frequently obtained by remote sensing rather than direct survey. Digital elevation models (DEM) provide good terrain representation from which the watersheds can be derived automatically using GIS technology.

The United States Geological Survey (USGS) is the primary distributor of DEMs in the U.S.(USGS, 2000). The Shuttle Radar Topography Mission (SRTM), developed jointly by the National Aeronautics and Space Administration (NASA) and the National Geospatial Intelligence Agency (NGA), provides elevation datasets for the globe at 3 arc second resolution (approximately 90 m at the equator) (USGS, 2006).

The original SRTM dataset was developed from raw radar echoes into DEMs, which are readily available at several resolutions, 1 arc second resolution for the US, and at 3 arc seconds for the world (USGS, 2006). The SRTM is projected into a geographic coordinate system (GCS) with the WGS84 horizontal datum and the EGM96 vertical datum (USGS, 2006).

The SRTM data are available in NASA-distributed "Research" grade and National Geography Agency (NGA)-distributed "Finished" grade formats. Voids are present in certain regions of SRTM datasets (USGS, 2006). Grohman *et al.* (2006) explain that voids, or no data holes, in SRTM data can be attributed to the complexity of interferometric synthetic aperture radar (ISFAR) technology and topographic shadowing from cloud cover and dense vegetation. The "Research" grade SRTM data have not been processed to fill data voids (USGS, 2006). The USGS and the Consultative Group