

Calibration and Validation of ArcSWAT Model for Estimation of Surface Runoff and Sediment Yield from Dhangaon Watershed

Authors : M. P. Tripathi, Priti Tiwari

Abstract : Soil and Water Assessment Tool (SWAT) is a distributed parameter continuous time model and was tested on daily and fortnightly basis for a small agricultural watershed (Dhangaon) of Chhattisgarh state in India. The SWAT model recently interfaced with ArcGIS and called as ArcSWAT. The watershed and sub-watershed boundaries, drainage networks, slope and texture maps were generated in the environment of ArcGIS of ArcSWAT. Supervised classification method was used for land use/cover classification from satellite imageries of the years 2009 and 2012. Manning's roughness coefficient 'n' for overland flow and channel flow and Fraction of Field Capacity (FFC) were calibrated for monsoon season of the years 2009 and 2010. The model was validated on a daily basis for the years 2011 and 2012 by using the observed daily rainfall and temperature data. Calibration and validation results revealed that the model was predicting the daily surface runoff and sediment yield satisfactorily. Sensitivity analysis showed that the annual sediment yield was inversely proportional to the overland and channel 'n' values whereas; annual runoff and sediment yields were directly proportional to the FFC. The model was also tested (calibrated and validated) for the fortnightly runoff and sediment yield for the year 2009-10 and 2011-12, respectively. Simulated values of fortnightly runoff and sediment yield for the calibration and validation years compared well with their observed counterparts. The calibration and validation results revealed that the ArcSWAT model could be used for identification of critical sub-watershed and for developing management scenarios for the Dhangaon watershed. Further, the model should be tested for simulating the surface runoff and sediment yield using generated rainfall and temperature before applying it for developing the management scenario for the critical or priority sub-watersheds.

Keywords : watershed, hydrologic and water quality, ArcSWAT model, remote sensing, GIS, runoff and sediment yield

Conference Title : ICWREP 2015 : International Conference on Water Resource and Environmental Protection

Conference Location : Berlin, Germany

Conference Dates : September 14-15, 2015