Suitability of the TRMM satellite rainfalls in driving a distributed hydrological model for water balance computations in Xinjiang catchment, Poyang lake basin

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Abstract
Spatial rainfall is a key input to distributed hydrological models, and its precisions heavily affect the accuracy of stream flow predictions from a hydrological model. Traditional interpolation techniques which obtain the spatial rainfall distribution from rain gauge data have some limitations caused by data scarcity and bad quality, especially in developing countries or remote locations. Satellite-based precipitation products are expected to offer an alternative to ground-based rainfall estimates in the present and the foreseeable future. For this purpose, the quality and usefulness of satellite-based precipitation products need to be evaluated. The present study compares the difference of Tropical Rainfall Measuring Mission (TRMM) rainfall with rain gauges data at different time scales and evaluates the usefulness of the TRMM rainfall for hydrological processes simulation and water balance analysis at the Xinjiang catchment, located in the lower reaches of the Yangtze River in China. The results show at daily time step TRMM rainfall data are better at determining rain occurrence and mean values than at determining the rainfall extremes, and larger difference exists for the maximal daily and maximal 5-day rainfalls. At monthly time scale, good linear relationships between TRMM rainfall and rain gauges rainfall data are received with the determination coefficients (R^2) varying between 0.81 and 0.89 for the individual stations and 0.88 for areal average rainfall data, respectively. But the slope of regression line ranges between 0.74 for Yingtan and 0.94 for Yushan, indicating that the TRMM satellite is inclined to underestimate the monthly rainfall in this area. The simulation of daily hydrological processes shows that the Water Flow Model for Lake Catchment (WATLAC) model using conventional rain gauge data produces an overall good fit, but the simulation results using TRMM rainfall data are discontented. The evaluation results imply that the TRMM rainfall data are unsuited for daily stream flow simulation in this study area with desired precisions. However, good performance can be received using TRMM rainfall data for monthly stream flow simulations. The comparison of the simulated annual water balance components shows that the different rainfall data sources can change the volume value and proportion of water balance components to some extent, but it generally meets the need of practical use. (C) 2012 Elsevier B.V. All rights reserved.

Keywords
Author Keywords: Rainfall; TRMM; Hydrological process; Water balance; Distributed hydrological model; Xinjiang catchment

KeyWords Plus: TERRESTRIAL BIOPHYSICAL PARAMETERS; MULTIVARIATE SPATIAL INTERPOLATION; TROPICAL RAINFALL; GLOBAL FIELDS; NDVI DATA; PRECIPITATION; AFRICA; EVAPOTRANSPIRATION; VALIDATION; GENERATION

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