Evaluation of high-resolution satellite precipitation products for streamflow simulation in the Mishui Basin, South China

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An attempt is made to evaluate three high-resolution satellite precipitation products (TRMM 3B42V6, 3B42RT and CMORPH) for streamflow simulation in the Mishui Basin, South China. Firstly, three satellite precipitation products were compared with the dense rain-gauged observations at basin scale from 2003 to 2008. Secondly, the satellite precipitation products were used as input into the gridded Xinanjiang Model in order to evaluate their hydrological predictive capability. Finally, the authors corrected the real-time systematic bias at daily, monthly and annual time-scales for the two real-time 3B42RT and CMORPH products. The direct comparison shows that all those three satellite precipitation products perform very well in detecting the occurrence of the rainfall events, while there are some different biases in terms of rainfall amount. 3B42V6 data sets with a bias of -5% fit best with the rain-gauged observations, while the 3B42RT and CMORPH underestimate the precipitation about 43% and 41%, respectively, which are much higher than a normal acceptable threshold. The results of those three satellite precipitation products in streamflow simulation are similar with those of the direct comparison. The result of streamflow modeling from 3B42V6 with a BIAS of -2% and daily NSCE coefficient of 47% is the optimal simulation from the three products. However, it still reveals that the accuracy of daily time-scale distribution of 3B42V6 data sets should have the increasing possibility, so as to follow the real situation. The 3B42RT and CMORPH have produced larger BIAS and lower NSCE coefficients. The corrections from daily to yearly time-scale biases suggest that the adjustment of yearly-scale bias be difficult if the two real-time products are needed to improve in the studied area. The CMORPH data sets ameliorated with a BIAS of 4.6% and daily NSCE of 60% as the monthly-scale bias was adjusted for use in streamflow simulation. Both 3B42RT and CMORPH data have a good improvement if the daily time-scale bias is corrected.