AOGS 2006

Incorporation of Infiltration Process into the Yamanashi Hydrological Model For Event Runoff Simulation in Arid River Basins

GUOJIANG WANG[1], KUNIYOSHI TAKEUCHI[1], HIROSHI ISHIDAIRA[1]

[1] *Takeuchi Lab. Dept. of Civil and Environment, University of Yamanashi, Japan*

Lushi River basin is a typical arid region which locates in the middle of China. As one key hydrological process for the discharge simulation in Lushi River basin, the infiltration process is presented by solving the Philip's equation with time compression approximation technique for simulating continuous infiltration process during storm events. This approach brings understanding into physical processes of infiltration and ponding under variable rainfall. We incorporate it into the Yamanashi Hydrological Model (YHyM) to analyze the infiltration and runoff in arid regions. Time compression approximation provides an adequate tool for description transition of unstable, state dependent infiltration processes from rainfall control to soil control. In this study, the TCA method is stated under both constant rainfall and stepwise variable rainfall. This study focused on improving the performance of TCA in calculating infiltration under stepwise variable rainfall and applying the improved TCA method for simulating infiltration in arid regions. For storm based simulation, especially during multi-storms, there are obvious temporal gaps among storms. In order to calculate the sorptivity changing caused by soil water redistribution, the soil water redistribution model is also included to bridge these temporal gaps. The presented TCA based infiltration model is incorporated into the YHyM for the infiltration excess runoff generation. Seven continuous storms in three years were selected for runoff simulations with both modified and unmodified versions of YHyM. The Nash efficiencies for results from modified YHyM are 93.8%, 92.8% and 93.1% and for results from unmodified YHyM are 86.4%, 78.7% and 88.1% in these three years respectively. The results show that by applying the TCA method to incorporate multi-storm infiltration processes in YHyM, the modified model can improve the calculation accuracy of peak runoff obviously in arid river basins.