EGU21-4924
https://doi.org/10.5194/egusphere-egu21-4924
EGU General Assembly 2021


# Soil moisture simulation with the WRF-Hydro modeling system by involving a more precise infiltration process module

**Wei Wang**[1,2], Jia Liu[1], Chuanzhe Li[1], Fuliang Yu[1], and Yuchen Liu[1]
[1]China institute of water resources and hydropower research, Beijing, China (wangwei_hydro@163.com, hettyliu@126.com, azhe051@163.com, yufl@iwhr.com, melodieyu@163.com)
[2]Hohai University, Nanjing, China (wangwei_hydro@163.com)

Soil moisture is an important factor affecting atmospheric processes as well as land surface hydrological processes. The description of the infiltration process greatly influences the accuracy of the soil moisture simulation, but there is still a lack of a consistent theoretical framework for predicting the effective fluxes and parameters that control infiltration in the atmospheric-hydrological modeling system. A coupled simulation study of the Weather Research and Forecasting model (WRF) and its terrestrial hydrologic component WRF-Hydro is carried out in two mesoscale watersheds of northern China. An infiltration module that is suitable for convective rainfall with large intensity and mixed runoff generation mechanism is added in WRF-Hydro to replace the original infiltration description. The main principle of the new module is: 1) The grid-based topographic index is used as an indication for the infiltration capacity and the soil water storage capacity across the watersheds; and 2) the infiltration is controlled by the variation of the surface soil moisture during the process of the rain, i.e., the infiltration is in an exponential decline as the increase of the surface soil moisture. Three long-duration rainfall-runoff events during the flood season are selected for this study. WRF runs to provide appropriate meteorological inputs to WRF-Hydro, and the simulated soil moisture results are compared with data from the Global Land Data Assimilation System (GLDAS). The results show that the added infiltration module, compared to the original, produces more consistent simulations with the observations regarding the spatial replication of the soil moisture and thus overall results in a higher simulation accuracy.

Keywords: soil moisture, infiltration, WRF-Hydro, topographic index