

Development of a coupled land-surface and hydrology model system for mesoscale hydrometeorological simulations

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Abstract In this study, the coupled land-surface and hydrology model system (Noah LSM-HMS) was developed; it couples the Noah land-surface model (Noah LSM) with the large-scale hydrological model system (HMS). Detailed hydrological processes, such as unsaturated-zone soil moisture dynamics, river/lake–vadose and river/lake–groundwater exchange, streamflow routing, groundwater-table depth and horizontal groundwater flow are explicitly considered in this system. It is designed for interactive meteorological and hydrological simulations driven by a mesoscale meteorological model such as the Weather Research and Forecasting (WRF) system. Subsequently, Noah LSM-HMS was applied for streamflow simulations using the routine meteorological observations at 10-km resolution in the Chishui watershed in China. Results show that the streamflows calculated at the watershed outlet and two upstream hydrological stations are in reasonable agreement with those observed. Large differences between the simulated and observed streamflows still exist due to probable errors in the model structure and the meteorological forcings, especially the precipitation data.

Key words land-surface model; large-scale hydrological model; runoff