EGU21-7949
https://doi.org/10.5194/egusphere-egu21-7949
EGU General Assembly 2021

Deployment, calibration, and efficiency of SHUD model in cold and arid watersheds

Lele Shu[1,2], Hao Chen[1,2], and Xianhong Meng[1,2]
[1]Chinese Academy of Sciences, Northwest Institute of Eco-Environment and Resources, Lanzhou, China
[2]Chinese Academy of Sciences, Key Laboratory of Land Surface Process and Climate Change in Cold and Arid Regions

The hydrologic model is ideal for experimenting and understanding the water movement and storage in a watershed from the upper mountain to the river outlet. Nevertheless, the model's performance, suitability, and data availability are the primary challenge for a modeler. This study introduces the Simulator for Hydrologic Unstructured Domains (SHUD), a surface-subsurface integrated hydrological model using the semi-discrete Finite Volume Method. Though the SHUD applies a fine time-step (in minutes) and flexible spatial domain decomposition (m to km) to simulate the fully coupled surface-subsurface hydrology, the model can solve the watershed-scale problem efficiently and dependably. Plenty of applications in the USA proved the SHUD model's performance and suitability in the humid and data-rich watersheds.

In this research, we demonstrate the SHUD model deployment in two data-scarce watersheds in the northwest of China with global datasets, validate the simulations against local observational data, and assess the SHUD model's efficiency and suitability. The one is the Upstream Heihe River (UHR), which is a typical semi-arid mountainous watershed. The other is Yellow River Source (YRS), the upstream of Yellow River, contributing more than 50% of total discharge. The results, figures, and analysis based on SHUD simulations under global datasets highlight the model's suitability and efficiency in data-limited watersheds, even ungaged ones. The SHUD model is a useful modeling platform for hydrology and water-related coupling studies.