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Application of a Distributed Hydrological Model in the Karun River Basin, Iran.

Making best use of available knowledge, such as hydrological modeling and globally available remote sensing data, is one of the big challenges of PUB, in particular arid and semi-arid regions where lack ground based observations. To tackle this challenge, we improved a block-wise use of TOPMODEL with Muskingum-Cunge routing method (BTOPMC) to incorporate dryland soil surface hydrological processes and snowpack and snowmelt processes. The model utilizes globally available datasets such as the HydroSHEDS with a scaling algorithm for river network, the GLCC/IGBP V2 for land cover type, and the FAO DSMW for soil map. Most of the model parameters to be identified are related to physical basin features of land cover and soil, which are globally available in the public domain.

To test the applicability of the BTOPMC in arid and semi-arid regions, we conducted rainfall-runoff analysis in the largest river basin in Iran, the Karun river, using freely available time series datasets such as the APHRODITE for precipitation, the CRU-TS for other climate forcing, and the GIMMS for NDVI. BTOPMC parameter values previously optimized in a humid region were applied, and the model simulation successfully reproduced flood events and seasonal flow regime at the Karun 1 dam in the middle part of the Karun river. This result demonstrated the applicability of the BTOPMC for prediction in ungauged basins in arid and semi-arid regions. The application of the BTOPMC can be also extended by incorporating anthropogenic impacts, such as dam reservoir operations and water withdrawal, in order to provide temporal and spatial distribution of water resources in the river basin for planning of water resource management and climate change adaptation in arid and semi-arid regions.