Application of MESH Land Surface-Hydrology Model to a Large River Basin in Iran

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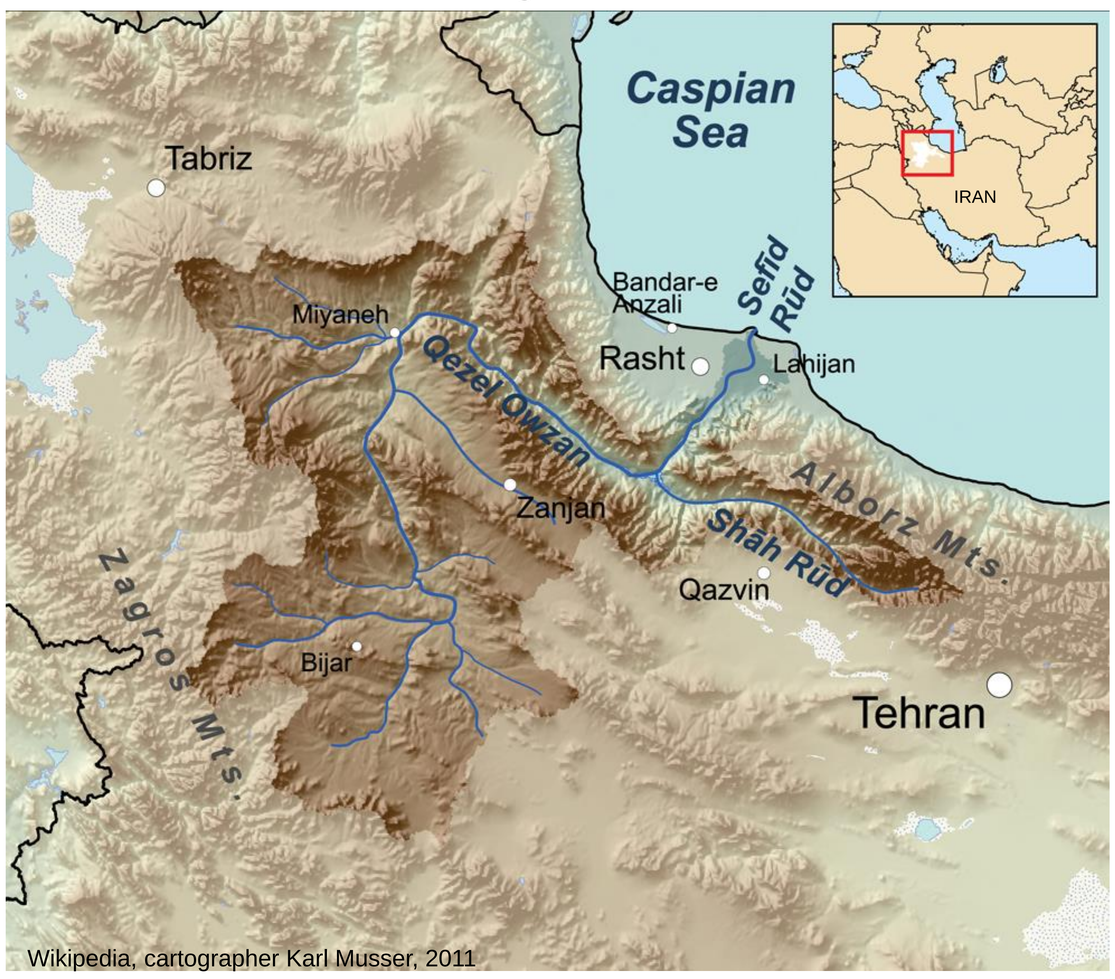
Abstract

In this work, we aim to enhance simulation of streamflows in Sefidrud River Basin in Iran, using advanced distributed coupled land surface-hydrology modelling system that allows for considering both water and energy balance, simultaneously. For this purpose, we apply Modélisation Environmentale– Surface et Hydrologie (MESH), which is a community platform for joint modeling of atmospheric, land surface and hydrologic models. In this MESH application, the Canadian land surface scheme (CLASS) is combined with WATROUTE hydrological routing component.

Sefidrud river basin is the second largest river of the country and inflows to the Caspian Sea. The basin is nearly 65000 km2 that is discretized into 683 grids (~10 km x 10 km). Most part of the basin is semiarid area with rangeland. Forcing data are obtained from the Global Environmental Multiscale Model (GEM) dataset available at 25 km resolution. Eighteen hydrometric stations are available for calibration and validation purposes.

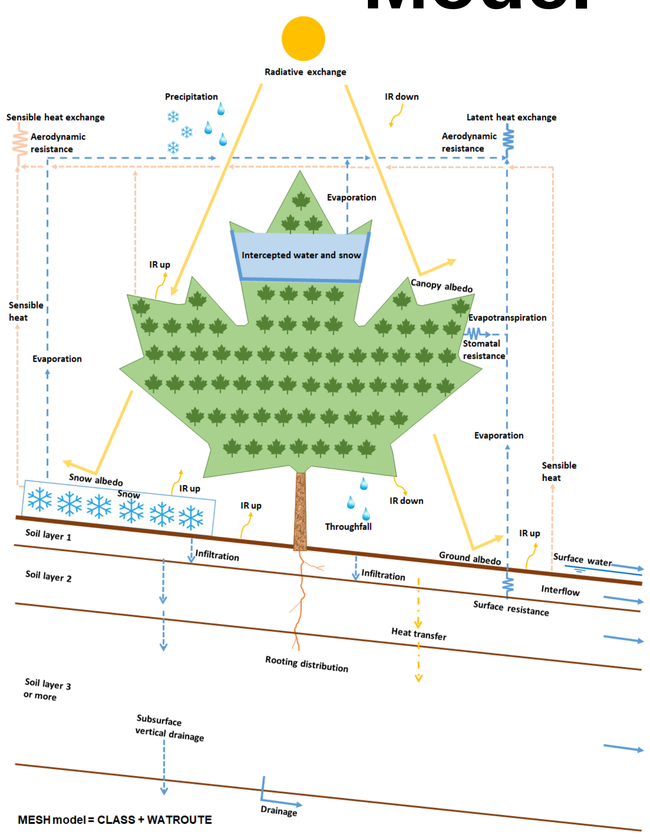
Preliminary results show that model gives reasonable water balance components for the basin. Simulated hydrographs are expected to improve significantly after incorporating three significant reservoirs located in this basin. This work is the first application of the MESH model in Iran, and is expected to significantly improve simulation and prediction of not only streamflows, but also other important water and energy fluxes such as soil moisture profile. Future works can include using MESH for climate and land use change impact studies in this basin.

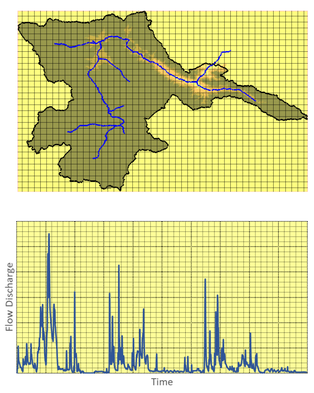
Study area



Wikipedia, cartographer Karl Musser, 2011

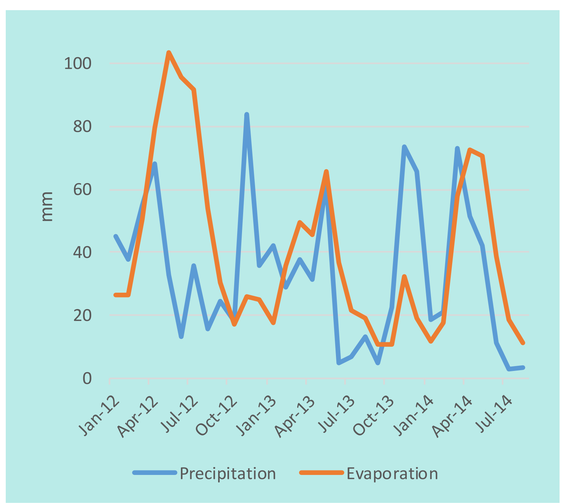
Model

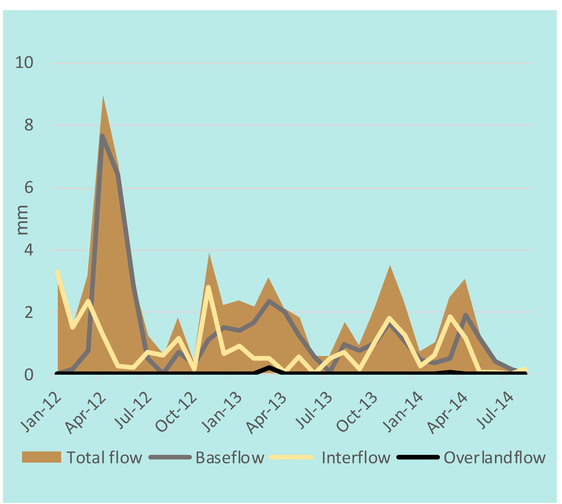


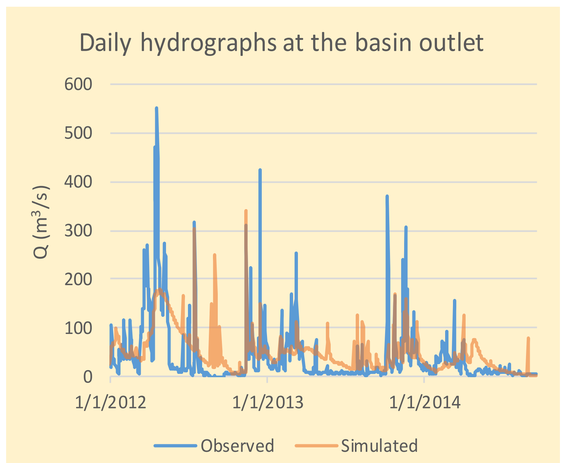


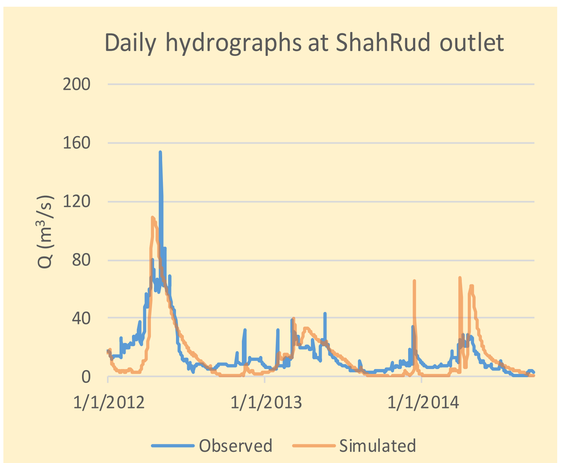
Primary Results

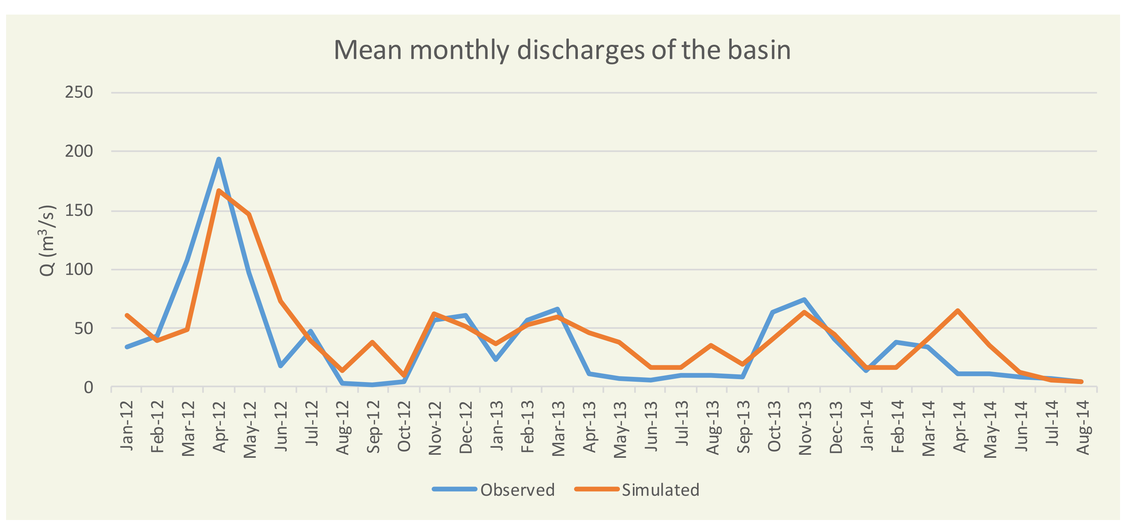
Water balance components for the basin











Prospective works

- Validating the forcing precipitation data with gauge observations
- Incorporating the reservoirs into the simulations
- Comparison of the simulated basin and subbasins hydrology with the successful catchment models commonly used in Iran
- Studies of climate and landuse change impacts

References

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2. Verseghy DL. (1991). CLASS - A Canadian land surface scheme for GCMs, I. Soil model. International Journal of Climatology 11: 111-133.