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# The investigation on the effects of model parametrization on daily water flux simulations at various spatial resolutions

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Accurate and reliable predictions of streamflow and other spatio-temporal distribution of water fluxes and state variables such as soil moisture, evapotranspiration, among others, are needed for efficient management of water resources at a mesoscale. Distributed hydrologic models that provides such predictive abilities requires, among other things, a robust parametrization method that estimates the spatial fields of model parameters. The performance of such models greatly depends upon the parameterization method employed and a spatial scale chosen for modeling purposes.

The objective of this study is to explore the effects of distributed model parameterizations on the prediction of streamflow and other water fluxes at various spatial resolutions. For this purpose, two parameterization methods namely: Hydrological Response Units (HRU) and Multiscale Parameter Regionalization (MPR), were employed in a grid based mesoscale hydrologic model (mHM). The HRU method uses a static categorical classification scheme (e.g. k-NN method) to group the grid cells into homogenous units based on the basin physical characteristics (e.g. topography, soil, vegetation). Unique sets of model parameters are assigned to each HRU through the calibration process. The MPR method, on the other hand, establishes a dynamic quasi-continuous functional relationships between model parameters with basin characteristics. In this case, the global parameters that establishes such functional relationships are estimated through calibration, instead of model parameters of each grid cells.

mHM with both parameterization methods was applied in the upper catchment of Necak river (area of approximately 4000 $km^2$) to simulate the spatio-temporal dynamics of hydrological processes at three spatial resolutions: 2, 4, 8 km. Model parameters for both methods at each scale were separately estimated using dynamically dimensioned search algorithm. The results indicated that both parameterization methods performed more or less same for the streamflow simulation at all modeling scale as long as calibration was performed. In cases, when model parameters were transferred from calibration scale to other scales, the HRU method showed the significant deterioration for the daily streamflow simulations, as compared to those obtained through the MPR method. Moreover, HRU, as opposed to MPR, showed a significant bias in the conservation of mass balance of spatially distributed water fluxes and state variables. Additionally, the soil moisture patterns obtained with MPR was more realistic than those obtained through HRU method, when compared against proxies derived from daily MODIS images (NASA).