Multi-parametric Variational Data Assimilation of MODIS snow cover data through HBV Model in Mountainous Upper Euphrates River Catchment

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Modeling streamflows is challenging in snow dominated high altitude regions due to limited observations, harsh topographic conditions and complex snow physics. Different uncertainties arise from multiple sources in modeling and forecasting. The uncertainties of the initial conditions are mainly tackled with data assimilation techniques. On the other hand, the uncertainty of the model structure should also be considered since assimilation techniques can only use same model and parameter sets in each implementation. Generally, this uncertainty can be taken into account using multi-modelling methods that can produce ensemble set of parameters. In order to make use of this approach, this study aims the realization of a novel method that generates a probabilistic estimate of initial states using a multi-parametric modelling method with deterministic Variational Data Assimilation, as referred to the multi-parametric variational data assimilation, MP-VarDA. The study is accomplished for runoff predictions over the mountainous Eastern part of Turkey concerning the importance of snowmelt and the limited availability of observed data. The model pool is generated with Generalized Likelihood Uncertainty Estimation (GLUE) method with a calibrated hydrological model using HBV. The implementation of MP-VarDA assimilates both discharge and satellite snow observations on snow cover. The preliminary results having 3 model instances are promising to set a model pool for MP-VarDA method which can reduce model uncertainty. The model is also tested via hindcast experiments under close-loop mode in order to assimilate discharge and satellite snow data, and model results showed that runoff and snow state predictions are improved compared to conditional assimilation techniques.