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Updating of states in operational hydrological models

O. Bruland, S. Kolberg, K. Engeland, A. S. Gragne, G. Liston, K. Sand, L. Tøfte, and K. Alfredsen
Norway (oddbjorn.bruland@statkraft.no)

Operationally the main purpose of hydrological models is to provide runoff forecasts. The quality of the model state and the accuracy of the weather forecast together with the model quality define the runoff forecast quality. Input and model errors accumulate over time and may leave the model in a poor state. Usually model states can be related to observable conditions in the catchment. Updating of these states, knowing their relation to observable catchment conditions, influence directly the forecast quality.
Norway is internationally in the forefront in hydropower scheduling both on short and long terms. The inflow forecasts are fundamental to this scheduling. Their quality directly influence the producers profit as they optimize hydropower production to market demand and at the same time minimize spill of water and maximize available hydraulic head.
The quality of the inflow forecasts strongly depends on the quality of the models applied and the quality of the information they use. In this project the focus has been to improve the quality of the model states which the forecast is based upon. Runoff and snow storage are two observable quantities that reflect the model state and are used in this project for updating. Generally the methods used can be divided in three groups: The first re-estimates the forcing data in the updating period; the second alters the weights in the forecast ensemble; and the third directly changes the model states.
The uncertainty related to the forcing data through the updating period is due to both uncertainty in the actual observation and to how well the gauging stations represent the catchment both in respect to temperatures and precipitation. The project looks at methodologies that automatically re-estimates the forcing data and tests the result against observed response. Model uncertainty is reflected in a joint distribution of model parameters estimated using the Dream algorithm.