Post-processing of monthly hydrological forecasts in Switzerland

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Reliable monthly hydrological forecasts are of growing importance for many different environmental applications like for the management of the hydro-power production and for the optimization of the agricultural production to name a few. However to gain maximum benefit from monthly forecast systems it is essential to calibrate the meteorological forecast, to derive optimal estimates of the initial conditions, and to post-process the hydrological forecasts. Quantile mapping methods for pre-processing the meteorological forecasts and improved data assimilation methods of snow measurements, which accounts for much of the seasonal predictability for the majority of the basins in Switzerland, have been tested previously.

The objective of this study is the assessment of various post-processing methods regarding their ability to remove bias and dispersion errors and to derive the predictive uncertainty of a hydrological forecast system. Therefore various error correction techniques with different degrees of complexity have been applied ranging from simple AR models to methods including wavelet transformations and neural networks. The predictive uncertainty has been estimated with methods based on Bayesian principles (e.g. the Hydrological Uncertainty Processor, HUP) or with Quantile Regression (QR) methodologies. These post-processing techniques have been adapted to hydrological forecasts driven by the raw uncalibrated monthly ENSemble prediction system from ECMWF, which will be compared with calibrated pre-processed ENS forecasts later on. The skill of these monthly probabilistic forecasts produced by the hydrological model PREVAH has been evaluated at four different catchments in Switzerland representing different management objectives. The variables under investigation are the stream-flow predictions for evaluating possible economical gains in hydro-power production systems and soil moisture predictions for agricultural dominated catchments.

First results of various skill scores like the CRPS and its decompositions and the quantile score will be shown.