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An Extended-range Hydrometeorological Ensemble Prediction System for Alpine Catchments in Switzerland

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In recent years meteorological ensemble prediction systems have increasingly be used to feed hydrological models in order to provide probabilistic streamflow forecasts. Such hydrological ensemble prediction systems (HEPS) have been analyzed for different lead times from short-term to seasonal predictions and are used for different applications. Especially at longer lead times both such forecasts exhibit systematic biases which can be removed by applying bias correction techniques to both the meteorological and/or the hydrological output. However, it is still an open question if pre- or post-processing techniques or both should be applied.

We will present first results of the analysis of pre- and post-processed extended-range hydrometeorological forecasts. In a first step the performance of bias corrected and downscaled (using quantile mapping) extended-range meteorological forecasts provided by the ECMWF is assessed for approximately 1000 ground observation sites across Europe. Generally, bias corrected meteorological forecasts show positive skill in terms of CRPSS up to three (two) weeks for weekly mean temperature (precipitation) compared to climatological forecasts. For the Alpine region the absolute skill is generally lower but the relative gain in skill resulting from the bias correction is larger.

These pre-processed meteorological forecasts of one year of ECMWF extended-range forecasts and corresponding hindcasts are used to feed a hydrological model for a selected catchment in the Alpine area in Switzerland. Furthermore, different post-processing techniques are tested to correct the resulting streamflow forecasts. This will allow to determine the relative effect of pre- and post-processing of extended-range hydrometeorological predictions in Alpine catchments. Future work will include the combination of these corrected streamflow forecasts with electricity price forecasts to optimize the operations and revenues of hydropower systems in the Alps.