EGU22-8741
https://doi.org/10.5194/egusphere-egu22-8741
EGU General Assembly 2022

Evaluation of different forecasting approaches in predicting the spring flood in Northern Sweden

Wei Yang[1], Kean Foster[2,3], and Ilias G Pechlivanidis[1]
[1]Swedish meteorological and hydrological institute, Hydrology, Norrköping, Sweden (wei.yang@smhi.se)
[2]Lund university
[3]DHI Sweden

About 70% of the annual streamflow volume in Northern Sweden is generated during the spring flood (i.e., May-July), and consequently this relatively short period is of great significance to the hydropower industry. Moreover, the mismatch in the timing between the energy demand and the natural streamflow generation, as well as the condition to regulate the reservoirs for flooding control, make the storage management challenging.

Over the past years, different methodologies have been developed to enhance the skilfulness of seasonal hydrological forecasts. Ensemble streamflow prediction (ESP) is a well-established approach in which a hydrological model is forced with historical meteorological observations, hence representing a climatological evolution constrained by the initial hydrological conditions. In addition, dynamic forecasting employs bias-adjusted (at least in most cases) seasonal forecasts of daily precipitation and temperature from Global Circulation Models (GCM) to force a hydrological model to estimate the hydrological evolution. Moreover, statistical forecasting is based on deriving links between predictors and predictands, for instance large-scale atmospheric variables and observed spring flooding volume can be used to make forecasts of the seasonal inflow volumes. Another approach is based on analogue conditioned ESP (A-ESP) and uses hydrological weather regimes (HWRs) as a condition to select analogues from the historical ensemble of meteorological observations and combining these together with the ESP to create a weighted ESP. The HWRs are based on large-scale circulation patterns and optimized using local precipitation observations.

Here, we compare the A-ESP approach against statistical and dynamic forecasting approaches in predicting the spring flood in 84 sub-catchments in Northern Sweden. The forecast skills are assessed by using the traditional ESP approach as a benchmark. The results show that: (1) the A-ESP can improve forecast skill at all lead-times, (2) statistical forecasting is of most benefit for forecasts with long lead-times, and (3) dynamic forecasting has limited skill at short lead-times.