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Seasonal Forecasting of Reservoir Inflow for the Segura River Basin, Spain

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A major threat to the agricultural sector in Europe is an increasing occurrence of low water availability for irrigation, affecting the local and regional food security and economies. Especially in the Mediterranean region, such as in the Segura river basin (Spain), drought epidodes are relatively frequent. Part of the irrigation water demand in this basin is met by a water transfer from the Tagus basin (central Spain), but also in this basin an increasing pressure on the water resources has reduced the water available to be transferred.

Currently, Drought Management Plans in these Spanish basins are in place and mitigate the impact of drought periods to some extent. Drought indicators that are derived from the available water in the storage reservoirs impose a set of drought mitigation measures. Decisions on water transfers are dependent on a regression-based time series forecast from the reservoir inflows of the preceding months. This user-forecast has its limitations and can potentially be improved using more advanced techniques.

Nowadays, seasonal climate forecasts have shown to have increasing skill for certain areas and for certain applications. So far, such forecasts have not been evaluated in a seasonal hydrologic forecasting system in the Spanish context. The objective of this work is to develop a prototype of a Seasonal Hydrologic Forecasting System and compare this with a reference forecast. The reference forecast in this case is the locally used regression-based forecast. Additionally, hydrological simulations derived from climatological reanalysis (ERA-Interim) are taken as a reference forecast.

The Spatial Processes in Hydrology model (SPHY - http://www.sphy.nl/) forced with the ECMWF- SFS4 (15 ensembles) Seasonal Forecast Systems is used to predict reservoir inflows of the upper basins of the Segura and Tagus rivers. The system is evaluated for 4 seasons with a forecasting lead time of 3 months. First results show that only for certain initialization months and lead times, the developed system outperforms the reference forecast.

This research is carried out within the European research project IMPREX (www.imprex.eu) that aims at investigating the value of improving predictions of hydro-meteorological extremes in a number of water sectors, including agriculture . The next step is to integrate improved seasonal forecasts into the system and evaluate these. This should finally lead to a more robust forecasting system that allows water managers and irrigators to better anticipate to drought episodes and putting into practice more effective water allocation and mitigation practices.