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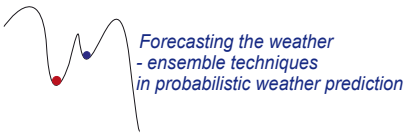

Medium-Range Ensemble Prediction of Hydrological Droughts

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Droughts can be defined by a variety of parameters and can occur on a wide temporal range. Typical indicators for droughts are a temporal and spatial extended lack of precipitation (meteorological droughts), reduced soil moisture (soil moisture droughts) and low levels of streamflow or groundwater (hydrological droughts). The large variety of drought definitions is a direct consequence of the numerous socioeconomic impacts for different interest groups. In the framework of this study, the quality of monthly forecast of hydrological droughts, characterized by low streamflow (low-flow) is assessed. Low-flow forecasts on a monthly time scale are potentially useful for hydropower generation, agriculture (irrigation), conventional power production (supply of heat exchange water), water quality, navigation or the recreational sector. Skillful forecasts of low-flows can therefore help to prevent or mitigate the consequences of water shortage for those applications.

Forecasting low-flow by using numerical models is advancing more and more into the focus of research. Streamflow forecasts from coupled meteorological hydrological models have shown to provide useful information for the short- to medium-range when considering rapid events like peak runoff. Additional value can be expected when using ensemble prediction systems (EPS) or multi model ensembles but, generally, so far no skillful forecast beyond two weeks seems possible. Yet, for low-flow predictions those forecast systems might be valuable, mainly out of interest in events of longer duration or cumulative parameters as e.g. the expected water deficit.

We consider monthly ensemble runoff forecast of low-flow duration, severity and magnitude in order to assess their potential in giving guidance for potential users. The study is performed for the river Thur, having its source in the Swiss Alps. The ECMWF VarEPS (re)forecast data is used as forcing for the hydrological model PREVAH. A thoroughly performed verification shows, that low-flow forecasts are skillful and users could benefit by including them in a decision making process. Besides the long-term verification, the 2006 summer drought in Europe is analyzed in greater detail. The results should motivate the use of monthly streamflow forecast for accessing the risk of hydrological droughts.