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Hydrological Ensemble Prediction System (HEPS)

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Flood forecasting systems form a key part of 'preparedness' strategies for disastrous floods and provide hydrological services, civil protection authorities and the public with information of upcoming events. Provided the warning leadtime is sufficiently long, adequate preparatory actions can be taken to efficiently reduce the impacts of the flooding. Following on the success of the use of ensembles for weather forecasting, the hydrological community now moves increasingly towards Hydrological Ensemble Prediction Systems (HEPS) for improved flood forecasting using operationally available NWP products as inputs. However, these products are often generated on relatively coarse scales compared to hydrologically relevant basin units and suffer systematic biases that may have considerable impact when passed through the non-linear hydrological filters. Therefore, a better understanding on how best to produce, communicate and use hydrologic ensemble forecasts in hydrological short-, medium- und long term prediction of hydrological processes is necessary.

The "Hydrologic Ensemble Prediction Experiment" (HEPEX), is an international initiative consisting of hydrologists, meteorologist and end-users to advance probabilistic hydrologic forecast techniques for flood, drought and water management applications. Different aspects of the hydrological ensemble processor are being addressed including

• Production of useful meteorological products relevant for hydrological applications, ranging from nowcasting products to seasonal forecasts. The importance of hindcasts that are consistent with the operational weather forecasts will be discussed to support bias correction and downscaling, statistically meaningful verification of HEPS, and the development and testing of operating rules;

• Need for downscaling and post-processing of weather ensembles to reduce bias before entering hydrological applications;

• Hydrological model and parameter uncertainty and how to correct and quantify them;

• Post-processing of hydrological outputs to assess the total uncertainty as well as the different contributions of the errors – including input errors - cascading through the highly non-linear filter that a river basin represents;

- Assessment of skill of probabilistic hydrological forecasting;
- Communication of probabilistic results to different end-users for improved decision making.

Here an overview of the state of HEPEX is given with particular emphasis on the need of meteorological products and their adaptation to hydrological applications. In particular, the conclusions of the last topical workshop on "Post-Processing and Downscaling Atmospheric Forecasts for Hydrologic Applications" held at Meteo-France, Toulouse, in June 2009 is presented.