Geophysical Research Abstracts
Vol. 12, EGU2010-8216, 2010
EGU General Assembly 2010

Impact of streamflow data assimilation on the quality of ensemble short-term hydrological forecasts

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In this study a comparative analysis is conducted to assess the impact of discharge data assimilation on the quality of streamflow forecasts issued by two different modelling conceptualizations of catchment response, both driven by the same weather ensemble prediction system. Weather forecasts come from the ensemble prediction system PEARP of Météo-France, which is based on the global spectral ARPEGE model zoomed over France. The model runs 11 perturbed members for a forecast range of 60 hours. The two hydrological modelling approaches used are: 1) the coupled physically-based hydro-meteorological model SAFRAN-ISBA-MODCOU developed at Météo-France and based on a fully distributed catchment model, with a data assimilation procedure that uses streamflow measurements to assess the best initial state of soil water content, and 2) the lumped soil-moisture-accounting type rainfall-runoff model GRP developed at Cemagref, with the assimilation of the last observed discharge to update the state of the routing store. The study is conducted on 86 catchments in France and over a 17-month period (March 2005-July 2006). Forecasts are compared to observed discharges and skill scores are computed for two lead times (24h and 48h). To investigate the impact of data assimilation, both models are run with and without their own data assimilation procedure. The results suggest good performance of both hydrological models forced by the PEARP ensemble predictions and demonstrate the benefit of streamflow data assimilation for ensemble short-term forecasting.