Geophysical Research Abstracts
Vol. 14, EGU2012-11909, 2012
EGU General Assembly 2012

A one year experience of an operationnal streamflow ensemble forecasting chain taking into account human expertise

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In the context of a national energy company (EDF : Electricité de France), hydro-meteorological forecasts are necessary to ensure safety of both power plants and dams, they also enables to meet environmental standards and to improve water resources management and decision making. Indeed, hydrometeorological ensemble forecasts allow a better representation of uncertainties from both meteorological and hydrological forecasts, which is essential to synthesize available information, coming from different meteorological and hydrological models and from human experience.

An operational hydrological ensemble forecasting chain has been developed at EDF since 2008 and has been in use since 2011: last year more than 1200 ensemble streamflow forecasts have been made on more than 30 watersheds covering different spatial scales. This chain is specific because in one hand it takes into account both meteorological and hydrological uncertainties by pre/post-processing, and on the other hand, the human expertise is encouraged : the forecasters can modify forecasted distributions of mean daily rainfall, mean daily air temperature and streamflow.

Firstly, this paper presents the different components of this operational hydrometeorological ensemble forecasting chain. Secondly, performances of this chain are assessed on some particular cases.

The main steps of this chain are the following: (1) Pre-processing of meteorological ensembles (temperature and rainfall bias and reliability correction), (2) streamflow forecasts using a rainfall-runoff model and streamflow data assimilation and (3) post-processing of streamflow ensembles. The pre-processing of meteorological input is based on the correction (bias and reliability) of EPS-ECMWF forecasts by statistical analog forecasts based on past observed geopotential fields. The post-processing of streamflow forecasts is based on a simple statistical modelisation of the empirical model error by streamflow class and lead-time. The performance of this operational hydrological ensemble forecasting chain is illustrated on a sample of watersheds where it has been calibrated and tested with EPS-ECMWF archive (2004-2008). Then, some case-studies of the 2011 year will be presented to illustrate (i) the interest of this forecasting chain compared to classical deterministic forecasts still used operationnaly (ii) the impact of human expertise on ensemble forecasts.