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Discharge ensemble forecasts based on the COSMO-LEPS quantitative precipitation forecasts

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In the last fifteen years the meteorological community has made a progressively larger use of the ensemble prediction technique in order to add probabilistic information to the forecasts, especially with respect to risk-related events. Nowadays, it looks more and more feasible to use meteorological ensemble systems as forcing of hydrological forecasts in order to improve both the accuracy of forecasts and the reliability of uncertainty estimates. In the present study it is under evaluation the usefulness and the skill of the meteorological mesoscale ensemble prediction system COSMO-LEPS to operationally supply quantitative precipitation forecasts driving a meteo-hydrological coupled system aimed at providing reliable real-time discharge ensemble forecasts for the Reno river basin, a catchment in northern Italy whose dimension is about 5000 km2. The hydrological simulations are performed by means of the distributed rainfall-runoff model TOPKAPI. COSMO-LEPS is a 16-member ensemble system based on the non-hydrostatic limited-area model COSMO, running regularly at ECMWF since November 2002. The ensemble members are differentiated mainly in the initial and boundary conditions by which they are driven: the different model runs are nested on some selected members of the ECMWF Ensemble Prediction System (EPS), chosen by means of an ensemble-size reduction technique based on a Cluster Analysis algorithm. The model is run at a 132-hour forecast range, the horizontal resolution is of about 10 km and 40 layers are used in the vertical. The system has repeatedly been updated by increasing the layers in the vertical (from 32 to 40) and the number of members (from 5 to 16). The performance of the proposed meteo-hydrological coupled system is evaluated by means of a statistical analysis concerning the discharge ensemble predictions driven by the COSMO-LEPS forecasts for the autumn seasons

from 2003 to 2006; in addition, few selected case studies concerning the most important flood events for the selected watershed are highlighted as simulated by the TOPKAPI driven by the COSMO-LEPS forecasts.