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A meteo-hydrological prediction system based on a multi-model approach for ensemble precipitation forecasting

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Streamflow forecasts issued for medium-sized watersheds, characterized by short response times, need predicted rainfall fields as input to allow for timely warning and civil protection actions. Therefore, a quantitative precipitation forecast (QPF) accurate in terms of both intensity and distribution is fundamental to build a reliable meteo-hydrological forecasting system. However, the precipitation forecasted by a numerical weather prediction (NWP) model, even at high resolution, suffers from errors which can be considerable at the scales of interest for hydrological purposes. In the present study, the uncertainty related to the meteorological model error is taken into account by implementing a multi-model forecasting approach, aimed at providing multiple future precipitation scenarios driving the same hydrological model. Therefore, the estimation of the uncertainty associated with the meteorological prediction can be exploited by the hydrological model, propagating the error into the hydrological forecast. The proposed meteo-hydrological forecasting system is implemented in a real-time configuration for several episodes of intense precipitation affecting the Reno river basin, located in northern Italy (Apennines). All the episodes are associated with flood events of quite different intensity. The coupled system seems promising in order to provide useful information concerning the discharge peaks (amount and timing) for warning purposes, although the skill of the prediction changes significantly accord-

ing to the event. Finally, a comparison between the error associated to the forecasted rainfall and discharge is shown.