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Discharge prediction based on multi-model precipitation forecasts

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The methodology proposed and adopted in this work is based on a hydrological ensemble forecasting approach that uses multiple precipitation scenarios provided by different high-resolution numerical weather prediction models, driving the same hydrological model. The purpose is to improve both the accuracy of forecasts and the reliability of uncertainty estimates in hydrological predictions. The result conveyed by the ensemble gives an indication of the forecast spread. In this way, the uncertainty associated with the meteorological forecasts can propagate into the hydrological models and be used in warnings and decision making procedures relying upon a probabilistic approach. In the framework of RISK AWARE, an INTERREG III B EU project, a detailed analysis of two cases of intense precipitation affecting the Reno river basin, a medium-sized catchment in northern Italy, has been performed. One case study has been performed using lateral boundary values derived from analysed fields, the other simulating a real time forecast, i.e. using forecasted boundary conditions. Four different meteorological models (Lokal Modell, RAMS, BOLAM and MOLOCH), operating at different horizontal resolutions, provide QPFs which are used to force the hydrological model. The discharge predictions are obtained by means of the physically based rainfall-runoff model TOPKAPI. The results provide examples of the uncertainties inherent in the QPF and show that the hydrological response of the Reno river basin, as simulated by the TOPKAPI model, is highly sensitive to the correct space-time localization of precipitation, even if the total amount of rainfall is, on average, well forecasted. The system seems able to provide useful information concerning the

discharge peaks (amount and timing) for warning purposes.