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A coupled hydrometeorological modelling approach for flood forecasting: a case study

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The use of a reliable flood forecasting model can be very beneficial for water resources management; especially to reconcile the contrasting needs of flood mitigation, power production and water supply uses. This study presents the results obtained from coupling a Limited Area Model (LAM) to the hydrological model of the alpine Piave river basin (North-East Italy, with an area of about 3500 km^2), with reference to two extreme events occurred in October 1993 and November 2002. The Piave alpine basin is characterized by the presence of some of the most important hydroelectric reservoirs in Italy, the largest of which has a volume of more than 70 millions m^3. A geomorphological model of the hydrologic response is applied to estimate the Piave river basin hydrological contributions on the basis of the catchment morphological features. The approach is based on the geomorphological theory of the hydrologic response. Runoff production is modelled with the Green-Ampt approach, which allows the description of Horton and Dunne runoff with a physically-based model. The hydrological model is calibrated and validated on the basis of three of the most relevant events recorded since 1990 and properly describes the characters of the hydrologic response of the Piave river. The hydrological model is then coupled to a Limited Area Model with a spatial resolution of 0,1°*0,1° ($\sim$ 11 Km) which is applied to produce five-day forecasts generated once a day at 12 UTC (the forecasted meteorological variables are precipitation, temperature, pressure, relative humidity and wind velocity). We present an analysis of the performance of the meteorological model alone and of the coupled hydrological-meteorological models for two intense rainfall events. The meteorological model shows a tendency to underestimate the rainfall volume over the basin for

both the storms considered, while the timing of the rainfall pulses is quite well reproduced. As a consequence, the coupled hydro-meteorological model also yields an overall underestimation of the discharge volume. However, the comparison between observed and forecasted discharges for the events available shows the possibility to quite accurately predict the main characters of the flood hydrograph several days in advance. This is an encouraging result which requires to be verified for several events and, possibly, for several basins.