Operational flood-forecasting in the Piemonte region: development and verification of a fully distributed phisically-oriented hydrological model.

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As far as the operational implementation of real time flood forecasting systems to Civil Protection is concerned, the hydrological model main requirements are: reliability and rapidity. The present computational capabilities offer the chance to overcome the rapidity needs even adopting a fully distributed hydrological model for a large river catchment as the Upper Po river basin closed at Ponte Becca (nearly 40000 km2). This approach allows simulating the whole area obtaining the responses of large as well as of medium and little sized sub-catchments. The FEST-WB hydrological model (Mancini, 1990; Mancini et al., 2000, Rabuffetti et al., 2007) is implemented. The model mainly focuses on the flood processes, such as infiltration and run-off and hypodermic flow propagation, but accounts also for a continuous water-budget, by a simplified scheme for percolation and evapotranspiration calculations, to obtain a reliable estimate of the initial soil-water conditions. The calibration and verification activities are based on more than 100 of flood events, occurred along the main tributaries of the Po river in the period 2000-2003. More then 300 meteorological stations are used to obtain the forcing fields, 15 cross section with discharge time series are used for calibration while verification is performed on about 40 monitored cross sections. Furthermore, since it is important to have a forecast horizon as long as possible to allow effective action by the Civil protection structures, meteorological models are coupled with the hydrological simulations, i.e. the hydrological model is forced with rain observations till the time of forecast and with Quantitative Precipitation Forecasts (QPFs) for the 36 hour successive time interval. The use of the FEST-WB model is then analysed in operational set experiments. Particular care is devoted to understanding how the reliability of QPF affects the accuracy of the Quantitative Discharge Forecasts (QDFs) and to assessing how QDF uncertainty can affect the warning system reliability. Result are presented either in terms of reliability of QDF either in terms of alert issues.