

HS4.3/AS4.13/NH1.12 Towards practical applications in ensemble hydro-meteorological forecasting





Pre-operational use of a meteorological and hydrological/hydraulic ensemble approach

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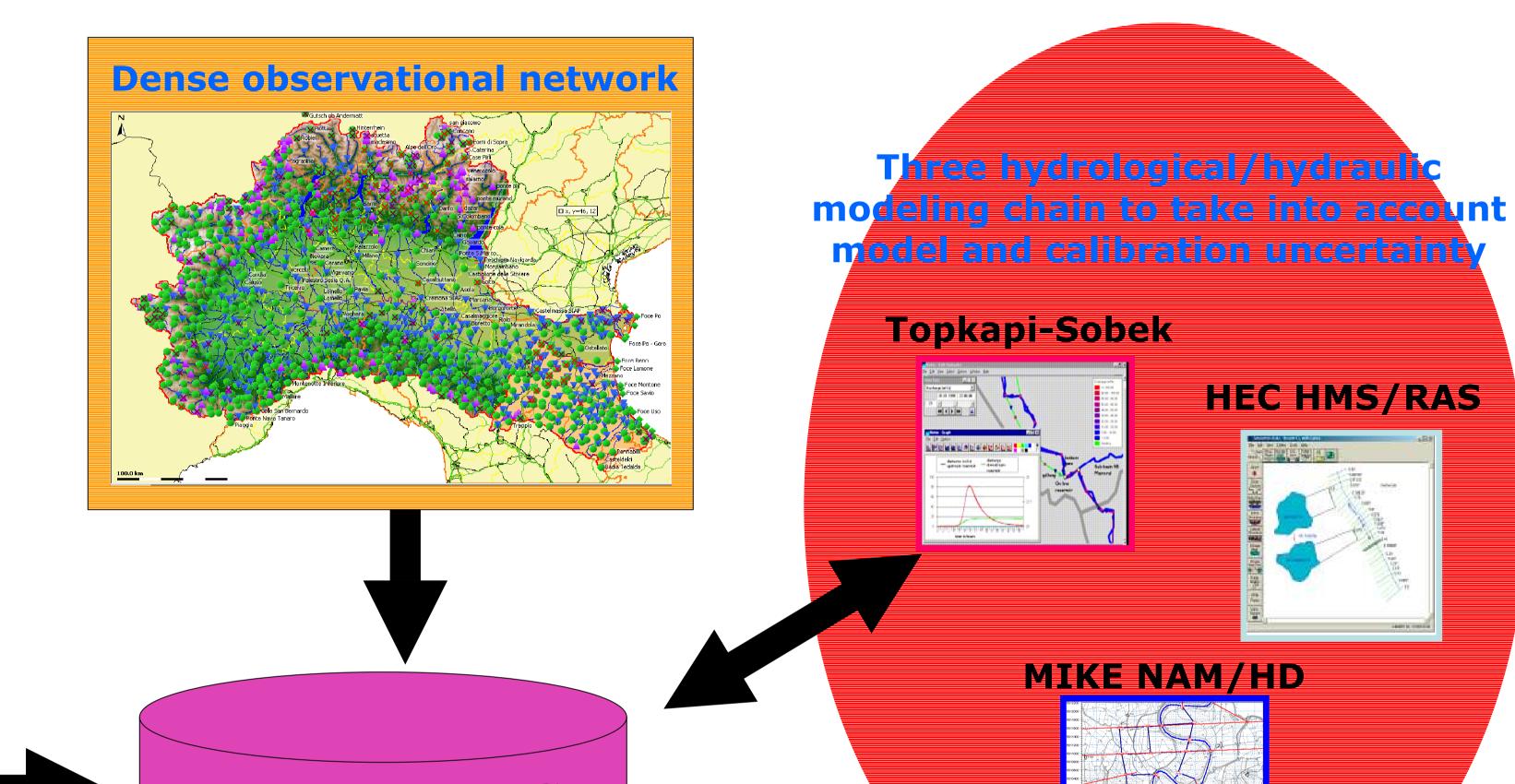
The objectives of the Po project

- > an adequate modeling system for planning and management
- > a suitable forecasting system in real time applications
- > an organization in advance of flood control services and of the whole soil defense actions, including civil protection measures to manage emergencies.

Italian Department of Civil Protection Interregional Agency for the Po river basin Po river basin Authority Emilia-Romagna Region Lombardia Region Piemonte Region Valle d'Aosta Region

>The purpose of the system is to provide a number of tools for the Po floods to be controlled and managed objectively by any civil protection unit and local/regional authority concerned, where the objective approach is a general consensus among all users concerning the validity of the methodology.

Veneto Region	
Catchment Area 70.090 km ²	
•Main river length 652 km	
•Minimum daily discharge at Pontelagoscuro 168 m³/s	
•Maximum discharge at Pontelagoscuro	12.300 m ³ /s
•Mean annual discharge at Pontelagoscuro	1.510 m ³ /s
·Basin average quote	740 m a.s.l.
·Delta area	380 km²

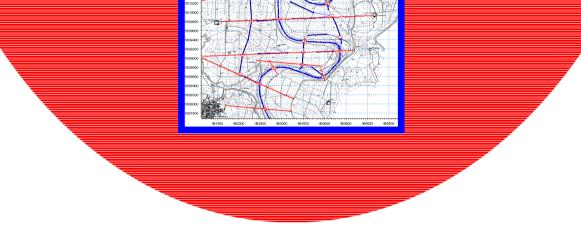


One deterministic and 17 probabilistic meteorological forecasts (COSMO-LAMI and COSMO-LEPS) to take into account meteorological uncertainty







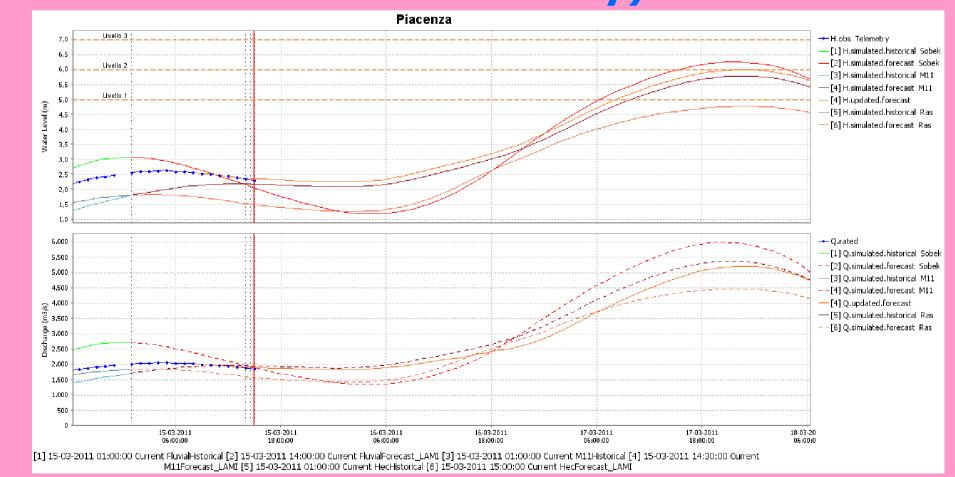


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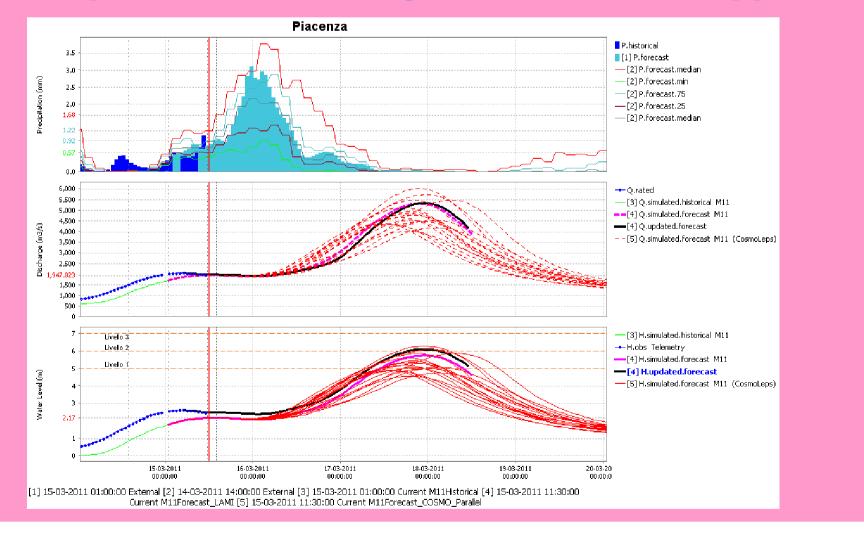
Forecast results

54 hydrological/hydraulic runs every 3 hours (grid computing)

Three deterministic flood forecast (from 0 to 24 hour – model and calibration uncertainty)



51 probabilistic flood forecast (from 1 to **5 days – meteorological uncertainty)**



- The "Po project" is based on a multi-model approach and uses three different hydrologicalhydraulic chains coupled with deterministic and probabilistic weather forecasts
- The big amount of information is an important added value of the system but it also imposes important challenges. For the complete operational use of the system we need to:
- The three deterministic chains are used to take into account the model and calibration uncertainties
- The probabilistic forecasts are used to try to take into account meteorological forecast uncertainty that are very important for tributaries for short to medium lead times (one to three days) and also for the main river for longer lead times. This use is now in a preoperational phase and probabilistic forecasts are not distributed but only used internally.
- Also, the probabilistic forecasts are used to extend the forecast to longer lead times (5 days – pre-operational) and to take into account meterological what-if schenarios
- 1. Increase our understanding on model performances doing more post-event analysis (which model is the best in certain sections or discharge ranges; which kind of error is domininant at a certain lead time)
- 2. Add robust post-correction and predictive uncertainty estimation algorithms (for now an ARMA model is applied to the Mike11 deterministic chain only on the main Po river water-level gauges)
- 3. Develop smart instruments to help in compiling forecast reports



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