



## **The POLIMI forecasting chain for real time flood and drought predictions**

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Nowadays coupling meteorological and hydrological models is recognized by scientific community as a necessary way to forecast extreme hydrological phenomena, in order to activate useful mitigation measurements and alert systems in advance.

The development and implementation of a real-time forecasting chain with a hydro-meteorological operational alert procedure for flood and drought events is presented in this study.

Different weather models are used to build the POLIMI operative chain: the probabilistic COSMO-LEPS model with 16 ensembles developed by ARPA-Emilia Romagna, the deterministic Bolam and Moloch models, developed by the Italian ISAC-CNR, and nine further simulations obtained by different runs of the WRF-ARW (3), WRF-NMM (2), ETA2012 (1) and the GFS (3), provided by the private Epsos Meteo Center and Terraria companies.

All the meteorological runs are then implemented with the rainfall-runoff physically-based distributed FEST-WB model, developed at Politecnico di Milano to obtain a multi-model approach system with hydrological ensemble forecasts in different areas of study over the Italian country.

As far as concerning drought predictions, three test-beds are monitored: two in maize fields, one in the Puglia region (South of Italy), and another in the Po Valley area, (northern Italy), and one in a golf course in Milan city. The hydrological model was here calibrated and validated against measurements of latent heat flux and soil moisture acquired by an eddy-covariance station, TDR probes and remote sensing images.

Regarding flood forecasts, two test-sites are chosen: the first one is the urban area northern Milan where three catchments (the Seveso, Olona, and Lambro River basins) are used to show how early warning systems are an effective complement to structural measures for flood control in Milan city which flooded frequently in the last 25 years, while the second test-site is the Idro Lake, located between the Lombardy and Trentino region where the POLIMI hydro-meteorological chain is performed to forecast the hydrometric lake level for a better management of the upstream and downstream basin. The same hydrological model has been here calibrated and validated with observed data coming from local bodies: ARPA Lombardy, Meteonetwork and Meteo Trentino.

Reliability of the forecasting system and its benefits are assessed with skill scores on some cases-study occurred in the recent years and through the real-time visualization of the implemented dashboards.