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Real-time hydrometeorological ensemble for flash-floods forecasting within HYMEX

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Mediterranean flash floods (FF) are quite devastating. So increasing the lead time of FF forecasts is crucial to better anticipate their impact. FF forecasting is thus one of the issues addressed within HYMEX (Hydrological cycle in the Mediterranean Experiment http://www.cnrm.meteo.fr/hymex/). The first special observing period of HYMEX (SOP1) served as a test-bed for some real-time hydrological prediction systems dedicated to FF forecasting. One of them is an ensemble discharge forecasting system based on the ISBA-TOP hydrological model. It has run every day of SOP1 and during the autumn 2013 within HYMEX EOP+ (Extended Observing Period). It forecasted hourly streamflow time series up to a 30h range, on several watersheds of the French Mediterranean regions.
ISBA-TOP proved to be efficient for simulating hourly discharge of Mediterranean fast responding rivers. It fully takes benefit of high-resolution spatial rainfall fields. So, to obtain a deterministic discharge forecast, ISBA-TOP has to be driven with quantitative precipitation forecasts (QPF) from a kilometric-resolution meteorological model. Two different QPF ensembles, both based on AROME, have been used for that purpose to produce two distinctive hourly discharge ensembles.
The first ensemble is based on the deterministic outputs of AROME. Using rainfall forecast errors and PDFs of errors in term of amounts of rain and location of the heaviest rains previously established, perturbations have been tuned and applied to the AROME QPF so as to obtain a rainfall ensemble. Finally, 30 scenarii of precipitation have permitted to produce an ensemble of 30 members of streamflow forecasts.
In the second ensemble, ISBA-TOP has been driven with the 8 members of AROME ensemble prediction system. The latter is a prototype of a meteorological ensemble at convective scale based on AROME model running on a limited area. It has been run in real time during SOP1. So we had another hourly discharge ensemble of 8 members.
The combination of both methods has also been evaluated.
Another step toward a complete hydro-meteorological ensemble forecasting system is to take into account the hydrological modelling uncertainty. A preliminary work is ongoing to add this component in the ensemble forecasting system.