Abstract

Evaluation of the performances of ensemble hydrometeorological strategies for flash flood forecast and alert

Submitted by Helene.Roux@imft.fr for Oral presentation
Contact email(s): Helene.Roux@imft.fr
Presenter: Roux, Hélène, Helene.Roux@imft.fr
Hélène Roux (1), Arnau Amengual (2), Romu Romero (2), Ernest Bladé (3), Marcos Ramos (3)
(1) Institut de Mécanique des Fluides de Toulouse (IMFT), Université de Toulouse, CNRS - Toulouse, France, (2) Grup de Meteorologia, Departament de Física, Universitat de les Illes Balears, Palma, Mallorca, Spain, (3) Institut FLUMEN, E.T.S. d'Eng. De Camins, Canals i Ports de Barcelona, Universitat Politècnica de Catalunya, Barcelona, Spain

A better forecasting of hydrometeorological extremes over the flood-prone Western Mediterranean region is one of the milestones of the HyMeX program. Hydrologic forecasts increasingly use meteorological short-range ensemble prediction systems with lead-times well beyond the time of concentration of the catchments of interest. Several studies indeed suggest that probabilistic forecasts are able to improve decision-making when appropriately handled. This study addresses the topic of evaluating flash flood forecasts issued from deterministic and ensemble meteorological forecasts.
Two distinct hydrological EPSs have been tested. They are specifically designed to explicitly cope with uncertainties in the initial and lateral boundary conditions of the meteorological state and mesoscale model physical parameterizations. Deterministic and probabilistic 48-h quantitative precipitation forecasts (QPFs) have been generated by the Weather Research and Forecasting model. The hydrological model MARINE, specifically developed for flash flood simulations, is forced by these QPFs to issue the hydrological forecast.
The study focuses on the Agly catchment of the Eastern Pyrenees and three sub-catchments exhibiting different rainfall regimes as a test case for implementing the ensemble hydro-meteorological predictions. As recommended by several authors, different evaluations of the performance of the hydrometeorological strategies have been performed: (i) visual inspection of individual hydrographs, useful for a better understanding of how forecasts behave, (ii) usual measures derived from a contingency table approach, useful to test an alert threshold exceedance, and (iii) overall view of the modelling performances using the Continuous Rank Probability Score.
Results show that globally the modelling performances of the ensemble strategies are better than the deterministic forecasts. There are no substantial differences between both ensemble strategies on these test cases in terms both of the issuance of flood warnings and the overall performances. However, when an ensemble strategy performs the best for a statistical score at a particular sub-catchment, the same ensemble strategy always performs the best for the remaining skill indices. This fact may be related to the distinct rainfall regimes and hydrological behaviors of the different sub-catchments, suggesting that it would be possible to find the most relevant ensemble strategy given the hydrometeorological behavior of the catchment.