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Ensemble-derived precipitation forecasts for flash-flood events prediction

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Short-term precipitation forecasts can be used for flood prediction, as inputs in hydrological models to get forecasts at various lead times. Rare events such as intense precipitations leading to flood yet may be particularly difficult to predict, and, in this context, the use of ensemble instead of single deterministic forecast brings valuable information about the uncertainties of the forecast and can be used to determine probabilities or risks related to particular events. Ensemble forecasts however often show bias or dispersion issues and have to be processed in order to increase their reliability, resolution, or predictive power. In addition, meteorological ensemble prediction systems are often computationally expensive, therefore the number of their members is limited (typically around ten), whereas hydrological ensemble systems, usually lighter, can work with more than a hundred of simulations at a time. The work presented here addresses these difficulties in the context of flash-flood prediction in Mediterranean France. In this area, where watershed response time typically doesn't exceed a couple of hours, we aim at producing a number of precipitation scenarios over the year 2018 which should be optimized for lead times between 1 and 6 hours and able to catch occurrences of rare events. We work with the French national weather service (Météo France) 12-member ensemble prediction system Arome. We add to it some deterministic predictions of another Arome model-based system called AromePi, originally designed for rapidly refreshed short-term predictions. Our method can be separated into three steps. First, we increase the initial ensemble size by creating new members thanks to a perturbation scheme focusing on amplitude and location. Then, we apply calibration methods in order to increase some qualities of the ensemble such as its reliability, resolution or discrimination power. Finally the resulting ensemble is filtered in order to keep the members that perform best regarding the latest available observations. All these treatments should lead to an ensemble of greater size than the original one, with good performance over the first lead times and usable for hydrological ensemble forecasting of flood events. This presentation will go through the different steps, presenting their impact on scores for a training dataset of forecasts and observations over France, from May to December 2018.