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Evaluating current convection-permitting ensembles for past high-impact weather events in Italy: results from the SPITCAPE Special Project

The main goal of the ECMWF Special Project SPITCAPE 2016-2018 is to understand the information content of the current ensemble systems both at global and meso scales in re-forecasting past high-impact weather events. In particular one of the main questions addressed in the project is: what is the added value of running a high-resolution (namely convection-permitting) ensemble for high-impact weather events with respect to global ones?

Running operational Ensemble Prediction Systems (EPS) at the convection-permitting (CP) scale is currently on the agenda at a number of European weather forecasting services and research centres: UK Met Office, Météo France and DWD to mention a few. Moreover, in the framework of the activities of the forthcoming ItaliaMeteo agency, it is foreseen the development of a regional EPS at CP scale for the Italian domain.

Recently, it has been demonstrated that the baseline approach of dynamical downscaling using CP models nested in a global ensemble with a coarser horizontal resolution (e.g. 20 km) provides valuable information. Since the introduction of the IFS model cycle 41r2 in March 2016, the horizontal resolution of the ECMWF ensemble forecasts (ENS) is about 18 km. Thus, these higher-resolution global ENS data allows us to estimate the technical feasibility and value of the simple dynamical downscaling method to initialise a limited-area and CP model (the WRF model in the present case) directly nested in the new ECMWF global ensemble.

We applied this pragmatic approach in re-forecasting three high-impact weather events occurred in Italy in recent years (the Cinque Terre flooding in October 2011 and two flash floods occurred in Genoa in November 2011 and October 2014) with both the ENS and the WRF-ENS forecasts. The skills of the forecasts in the short-range are evaluated in terms of Probability of Precipitation exceeding predefined rainfall thresholds. In the medium-range we report and discuss the forecast uncertainty (i.e. ensemble spread) of ENS at different starting dates. Besides the fact that both ENS and WRF-ENS data under-estimate rainfall maxima in the area of interest, results demonstrate that CP ensemble forecasts provide better prediction regarding the occurrence of extreme precipitations and the area most likely affected. We present also the activities planned for the years 2019-2021 in the framework of the SPITCAPE continuation.

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