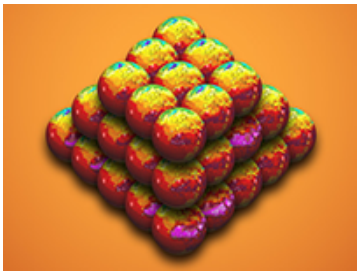

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Performance of ECMWF ENS and COSMO-based ensemble systems for cases of high-impact weather over Italy

The deterministic approach to weather prediction does not allow to establish a-priori the degree of skill of an individual forecast; instead, probabilistic forecasts provide a more complete, reliable and accurate view of what could happen in the future, ideally providing information on the relative frequency of an event occurring.
Therefore, they bring definite benefits for decision-makers.
Forecast users can exploit such information, for example, when they want to weight the losses associated with adverse weather events against the costs of taking precautionary actions.
The aim of this work is to assess the added value of enhanced horizontal resolution in the probabilistic prediction of upper-level and surface fields.
In particular, the performances of three different ensemble systems were compared: ECMWF-ENS (51 members, 18 km horizontal resolution), COSMO-LEPS (20 members, 7 km horizontal resolution) and COSMO-2I-EPS (20 members, 2.2 km horizontal resolution).
While the first 2 ensemble systems are operational, COSMO-2I-EPS is still in a development phase.
The intercomparison window covers two separate periods, characterised by different weather types:
- the former one (20-27 June 2016) presents convective precipitation events with weak synoptic forcing,
- the latter one (15 October-15 November 2018) is mainly dominated by large-scale forcing, with stratiform precipitation.

In both cases, high-impact weather events affected different areas of Italy.

In this work, both upper-level and surface variables are analysed.
As for the surface, 2-metre temperature and precipitation cumulated over six hours were verified against the non-conventional station network provided by the National Civil Protection Department.
The ensemble spread and the root mean square error of 2-metre temperature were computed, while a number of probabilistic scores (Brier Skill Score, Ranked Probability Score, ROC-Area, Outliers Percentage and others) were considered for precipitation.
The best scores were mainly obtained by the COSMO-based ensemble systems which have higher horizontal resolution and lower ensemble size; in particular, the newly implemented COSMO-2I-EPS often achieved the best performances.

Although these results are based over two relatively short periods, they show the added value of high resolution in mesoscale ensembles, which turn out to be more skillful in the probabilistic prediction of atmospheric fields at all levels.

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