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Five years of operational limited-area ensemble activities at ARPA-SIM: the COSMO-LEPS system

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This contribution shows the most relevant results obtained after five years of experimental-operational activity carried out by ARPA-SIM in the field of limited-area ensemble forecasting. It is presented the main features of COSMO-LEPS, the limited-area ensemble prediction system based on the non-hydrostatic ‘‘COSMO-model” (formerly known as ‘‘LM”) and developed within the COSMO consortium. This system aims at improving upon the early and medium-range predictability of extreme and localised weather events, especially when orographic and mesoscale-related processes play a crucial role. The present status of COSMO-LEPS, based on 16 integrations of the non-hydrostatic "COSMO-model" (10 km of horizontal resolution, 40 vertical levels, 132 hours of forecast range) and running as a ‘‘time-critical application” at ECMWF, is illustrated with the different upgrades which took place in the past years. The impacts of increasing the ensemble size and the vertical resolution of the model integrations are assessed. Verification results are shown in terms of both seasonal and monthly scores from December 2002 onwards. In addition to this, the performance of the system is investigated for case studies of particular interest. The attention is mainly focused on the probabilistic prediction in the early and medium-range of surface parameters (e.g. total precipitation, surface winds, positive and negative temperature anomalies...) so as to assess the possibility to issue severe weather alerts on the basis of COSMO-LEPS products. Finally, the future developments of COSMO-LEPS are outlined with special emphasis on some modifications of the methodology which would make the system more performing.