Pseudo-observations assimilation in numerical weather forecasting

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The Multimodel SuperEnsemble technique (Krishnamurti et al., J. Climate, 13, 2000) is a powerful post-processing method for the estimation of weather forecast parameters. Several model outputs are combined, using weights calculated during a training period. This technique has been already tested and implemented in many works on limited-area models in order to obtain good parameter forecasts in complex orography regions (Cane and Milelli, Meteorologische Zeitschrift, 15, 2, 2006). On the other hand, it has been demonstrated (Sanna et al., ICAM 2007) that the assimilation of non-GTS stations from the ARPA Piemonte very high-resolution network into a limited-area model is of crucial importance in the forecast.

The purpose of this work is to join the two approaches by assimilating the forecast given by the Multimodel SuperEnsemble technique into the COSMO-LAMI, the Italian implementation of the COSMO model, developed by the COnsortium for Small-scale Modelling, an over-national consortium coordinating the cooperation of the national and regional weather services of Germany, Italy, Switzerland, Greece, Poland and Romania (see http://www.cosmo-model.org/ for a more comprehensive description). In details, we assimilated into the model the 2 m temperature, the 2 m dew point temperature and the sea level pressure forecasts given by the Multimodel SuperEnsemble technique in all the available stations of the ARPA Piemonte network as if they were observations.

The selected test case is the 1-2 May 2007, when a cold front, associated to a deep low, affected Piemonte region determining great instability and strong precipitation especially in the northern part. The forecast given 24 hours before the event was affected by an error in the localization of the main precipitation pattern. Therefore the considered run starts the 20070501 at 12UTC for 36 hours, during which the model assimilates the Multimodel SuperEnsemble technique forecast obtained by using the previous runs (20070501 00UTC and 20070430 12UTC, respectively) of IFS model, COSMO-LAMI and other two implementations of the COSMO model which are available at ARPA Piemonte for research purposes: the COSMO-LM from Deutscher Wetterdienst (DWD) and COSMO-aLMo from MeteoSwiss.

The results, although preliminary, showed an improvement of the precipitation and of the surface parameters in a statistically significant way compared to the operational run, according to the bootstrap method.