Some Hints about COSMO–LEPS Verification

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COSMO–LEPS is a probabilistic system for weather forecasts which combines the probabilistic information coming form the ECWMF global ensemble system with the mesoscale information given by Lokal Modell. Therefore the two main features of the system are the probabilistic approach and the capability of forecasting surface parameters with a greater detail with respect to global ensemble systems, leading to a better representation of mesoscale–related processes. The verification package is designed keeping in mind these characteristics, in order to retain and to evaluate the information coming from both of them.

The necessity of understanding the behaviour of the probabilistic forecasts has determined an intense use of probabilistic verification tools. Among them, Relative Operating Characteristic (ROC Curves), Brier Score and Brier Skill Score, Cost–Loss Analysis are the most widely used. These scores will be computed for the COSMO-LEPS verification, together with Reliability diagrams and Percentage of Outliers. Though the computation of these scores is rather simple, their interpretation is not straightforward, different indices describing different features of the forecast system. In addition to this, the relationship between these scores is not a linear one. Therefore, a global evaluation of the forecast system should rely on a set of indices.

The verification of the former LEPS system, whose configuration was rather different from that of COSMO–LEPS, was made by interpolating the gridded forecast values (20 km of horizontal resolution) on station points where observations were available. This approach was chosen also because the observational network used was very dense (MAP database), making comparable the distributions of forecasts and observations. The scores were also re–computed by averaging both forecast and observed values over boxes of fixed size and no significant differences were noticed. For the verification of COSMO–LEPS we have for the moment a less dense observational network, covering northern Italy only and, furthermore, Lokal Model resolution is 10 km. In the future, the observational database will hopefully enlarge, thank to the COSMO community. In order to accomplish this, an international agreement is being established. This considerations lead us to formulate the verification problem in different terms: the aggregation of both forecast and observed values over boxes seems to be very important in order to properly compare the two. The boxes are built in a way that permits a partial overlapping between them, in order to avoid sharp and somewhat artificial boundaries between one box and the other. The underlying idea is that the very detailed information given by Lokal Modell contains a non–negligible stochastic component that has to be removed. This has already been expressed by Theis et al. (see COSMO Newsletter No. 2).

The simplest way to aggregate points in a box is via averaging, but also other methods are explored. For example, we are interested in testing the occurrence of an event in a box, by comparing the frequency of the event with the probability assigned to the same event in that box by the 5 COSMO–LEPS runs. Some attention is needed when comparing forecast and observed values that have very different densities in a box. A technique has to be developed to overcome this problem.

Finally, for we are mainly interested in intense precipitation events and, generally speaking, in extreme eventw, we also plan to verify maximum values of some surface parameters. The maximum value observed in a box will be compared with the maximum forecast value, in order to estimate the usefulness of the system in forecasting extreme values. This evaluation can be useful to the forecaster, when he has to decide whether or not to trust in a very high precipitation value forecast by COSMO–LEPS in a few points of a certain region.

The size of the boxes is still an open problem. Every box has to be large enough to contain a number of points that permits a robust statistics, both for observations and forecasts, but the box size has to be also related to the characteristics of the model we are using, if we accept the idea that aggregating Lokal forecasts on a certain scale will lead to more robust and reliable estimate of surface parameters. In order to understand the scale at which it make sense to aggregate Lokal grid points, depending on the forecast variable, on the season and possibly on the weather type, we will study this problem with the use of the operational deterministic Lokal Model, in cooperation with WG5. In this way, we hope to be able to give to the forecasters some guidances to better interpret the model output, both the deterministic and the COSMO–LEPS ones.

Following these hints and other possible suggestions we are going to evaluate the COSMO–LEPS and the results will be shown in forecoming publications.