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Parallel session on predictability, 3rd October 2018

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Chairperson and minutes: Chiara Marsigli

The meeting started with a short report on the status of the SRNWP-EPS II Project of EUMETNET, which is going to end this year. The application task is slightly delayed due to a change of the code developers both at AEMET and COMET. Nevertheless, both the SW package for calibration of temperature and wind and the SW codes for generating products for thunderstorm and fog prediction from the ensembles will be delivered in the next month, together with the corresponding User Manual. The forth and last Workshop of the project will take place in Barcelona at the end of October.

Then a scientific discussion took place, based also on the presentations given in the morning in the predictability session.

The first topic was the expected impact on the scores of the increase of the number of members of an ensemble. In the presentation by IL Frogner it was highlighted that their experiments on increasing the number of ensemble members from 10 to 20 in HarmonEPS at 2.5 km showed only little improvement of the scores. Results were compared with analogous works of the Met Office (Hagelin et al, 2017) and of MeteoFrance (Raynaud and Bouttier, 2017), where an improvement, even if slight, was evidenced. In the discussion it was highlighted that:

- the impact is expected to depends on the perturbations applied (Boundary Conditions, Initial Conditions, physics)

  e.g. in HarmonEPS no physics perturbations were applied

- the impact is expected to depend on the forecast range

  e.g. in former studies with COSMO-LEPS, it was noticed that improvement of scores with increasing the ensemble size was mainly for longer forecast ranges. This is likely due to the increase of ensemble spread (and member diversity) of ECMWF ENS, on which the ensemble is based.

- It is asked if the impact is different for ensembles where convection is explicit or parametrized. At the moment there is not enough evidence on this point.
- High resolution LAM ensembles likely behave differently from global ensembles, particularly with respect to the spread (BC to be considered). Until now the experience indicates that going from 10 to 20 members in a LAM ensemble matters in terms of score increase, but likely not so much with further increase of the ensemble size.

  A work is reported by M Bellus, where it was studied the impact of ensemble size in ALADIN-LAEF (11km res., BC from ECMWF ENS), showing that the biggest qualitative gap in relevant statistical scores (particularly in the outliers) is between the ensembles containing 10 and 20 members, while for more populated ensembles, up to 50 members, there is very little improvement of the system performance.

  A study was performed by Marsigli et al (2014), showing that ensemble scores for precipitation tend to saturate at an ensemble size of 13-14 members, for two different 7km ensembles up to a 48h forecast range.

  N Roberts illustrated a recent work with the CP ensemble, showing limited benefit from 24 compared to 12 members even for more localised rainfall provided appropriate neighbourhood processing is applied. If there is no neighbourhood processing there are larger differences except for larger scale rain events.

The second topic was the role of the clustering for member selection from the driving ensemble. In the discussion some considerations were made:

- Recent studies at MeteoSwiss indicated that clustering is beneficial for enhancing the score of the reduced size ensemble, with respect to a random choice (Walser and Westerhuis)
- The method needs to be adapted to the desired forecast range, depending on the behavior of the spread of the driving ensemble with time. If the spread is not enough, are the resulting clusters really meaningful?
- The plenary talk by C Fisher showed that MeteoFrance has changed the clustering method to make the clusters more homogeneous in size, due to a request of the forecasters (Bouttier and Raynaud, 2018). Are these clusters still representative of scenarios?
- Should the cluster size be taken into account for the downscaling? Should larger clusters be considered “more”? No definite statistical results are available on the subject.

While discussing these topics, it was raised the problem of having an appropriate verification for the performance of the convection-permitting ensembles. D Majewski suggested that verification of the performance of the convection-permitting model should take into account characteristics like how convection is structured and organized, and not only e.g. amounts of

precipitation. In the SRNWP-EPS Workshop of Madrid (October 2017) it was concluded that CP ensemble verification should ideally be performed on collection of cases studies, in order to highlight the behavior of the ensemble perturbations in specific weather situations, since often in a standard statistical evaluation interesting behaviours are hidden. In general, it was noticed that a more "diagnostic" type of verification is needed when CP ensembles have to be evaluated, otherwise their abilities will not be rewarded by the score measures.

Other topics have been mentioned:

- The issue of timeliness of availability of the CP ensembles is very important, particularly when sophisticated (and expensive) techniques for initial perturbations are applied (impact only in the very short range)
- Investment should still be made in better understanding the modeling at the sub-km scale
- Is perturbation of the model dynamics needed? Is it really desirable or it is too "dangerous"?

References

Bouttier F. and Raynaud L., 2018: "Clustering and selection of boundary conditions for limited area ensemble prediction". Q. J. R. Meteorol. Soc., accepted. DOI: 10.1002/qj.3304.

Hagelin S., Son J., Swinbank R., McCabe A., Roberts N. and Tennant W., 2017: "The Met Office convective-scale ensemble, MOGREPS-UK". Q. J. R. Meteorol. Soc. 143: 2846–2861, DOI:10.1002/qj.3135.

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