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Grand European and Asian-Pacific multi-model seasonal forecasts: maximization of skill and of potential economical value to end-users

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Multi-Model Ensembles (MMEs) are powerful tools in dynamical climate prediction as they account for the over-confidence and the uncertainties related to single-model errors. Previous works suggested that the potential benefit that can be expected by using a MME amplify with the increase of the independence of the contributing Seasonal Prediction Systems. In this work we combine the two Multi Model Ensemble (MME) Seasonal Prediction Systems (SPSs) independently developed by the European (ENSEMBLES) and by the Asian-Pacific (APCC/CliPAS) communities. To this aim, all the possible multi-model combinations obtained by putting together the 5 models from ENSEMBLES and the 11 models from APCC/CliPAS have been evaluated.

The grand ENSEMBLES-APCC/CliPAS multi-model enhances significantly the skill in predicting 2m temperature and precipitation compared to previous estimates from the contributing MMEs. It is shown that the marginal performance contribution tends to be higher when adding one model from ENSEMBLES to APCC/CliPAS MMEs and vice versa, confirming that the benefit of using MMEs amplify with the increase of the independence the contributing models. Indeed, our results show that, in general, the better combinations of SPSs are obtained by mixing ENSEMBLES and APCC/CliPAS models and that only a limited number of SPSs is required to obtain the maximum performance. The number and selection of models that perform better is usually different depending on the region/phenomenon under consideration so that all models are useful in some cases.

To verify the above results for a real world application, the Grand ENSEMBLES-APCC/CliPAS MME is used to predict retrospective energy demand over Italy as provided by TERNA (Italian Transmission System Operator) for the period 1990-2007. The results demonstrate the useful application of MME seasonal predictions for energy demand forecasting over Italy. It is shown a significant enhancement of the potential economic value of forecasting energy demand when using the better combinations from the Grand MME by comparison to the maximum value obtained from the better combinations of each of the two contributing MMEs. The above results demonstrate for the first time the potential of the Grand MME to contribute in obtaining useful predictions of electricity load at the seasonal time-scale.