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Calibration of seasonal forecasts over Euro-Mediterranean region: improve climate information for the applications in the energy sector

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Accurate and reliable climate information, calibrated for the specific geographic domain, are critical for an effective planning of operations in industrial sectors, and more in general, for all the human activities. The connection between climate and energy sector became particularly evident in the last decade, due to the diffusion of renewable energy sources and the consequent attention on the socio-economical effects of extreme climate events .The energy sector needs reliable climate information in order to plan effectively power plants operations and forecast energy demand and renewable output. On time-scales longer than two weeks (seasonal), it is of critical importance the optimization of global climate information on the local domains needed by specific applications. An application that is distinctly linked with climate is electricity demand forecast, in fact, especially during cold/hot periods, the electricity usage patterns are influenced by the use of electric heating/cooling equipments which diffusion is steadily increasing worldwide [McNeil & Letschert, 2007]. Following an approach similar to [Navarra & Tribbia, 2005], we find a linear relationship between seasonal forecasts main modes of temperature anomaly and the main modes of reanalysis on Euro-Mediterranean domain. Then, seasonal forecasts are calibrated by means of a cross-validation procedure with the aim of optimize climate information over Italy. Calibrated seasonal forecasts are used as predictor for electricity demand forecast on Italy during the summer (JJA) in the period 1990-2009. Finally, a comparison with the results obtained with not calibrated climate forecasts is performed.
The proposed calibration procedure led to an improvements of electricity demand forecast performance with more evident effects on the North of Italy, reducing the overall RMSE of 10% (from 1.09 to 0.98).
Furthermore, main principal components are visualized and put in relation with electricity demand patterns in order to have a better understanding of the effects of the calibration procedure.
This approach makes a step further on the use of seasonal climate forecasts for applications on energy sectors, coping with the necessity of extract the informative signal for a specific domain.

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Navarra, A., and J. Tribbia. "The Coupled Manifold." Journal of the atmospheric sciences 62.2 (2005): 310-330.