ENSO and seasonal predictability over Europe. Some case studies

M. D. Frias (1), S. Herrera (2), A. S. Cofino (3) and J. M. Gutierrez (3)

(1)Institute of Physics of Cantabria. Santander, (SPAIN). (2)Institute of Meteorology of Spain (INM). Santander, (SPAIN) (3)Applied Meteorology Group. Department of Applied Mathematics and Computer Science, University of Cantabria. Santander ,(SPAIN).

Several studies have shown the connection between El Niño phenomenon and the precipitation and temperature variability in different parts of Europe. In this study, particular attention is given to the predictability during strong El Niño and La Niña events. The teleconnection between precipitation and temperature variability in Europe and the ENSO events is analysed season by season using the dataset from the Joint Research Center with 50km ofresolution (JRC, http://agrifish.jrc.it/marsstat/). The connections are evaluated in terms of order statistics (terciles and quintiles) taking into account the strongest La Niña and El Niño events for the period 1975-2000. The frequency of, e.g., dry and wet terciles during El Niño (and La Niña) events are compared against climatology (uniform frequency of the terciles), obtaining the statistical significance of the observed anomalies. A particular study is developed over Spain using a higher resolution gridded dataset (20 km) which has been produced from the raw data of the Spanish INM pluviometric network (about 3000 stations).

According to these results, seasonal predictions are validated in different parts of Europe where a significant teleconnection signal was found. To this aim we used a combination of a multimodel ensemble system (DEMETER project) plus a statistical downscaling method. Nowadays, the most important meteorological institutions around the world have developed coupled atmosphere-ocean general circulation models which allow to predict climate anomalies at interannual time scales, such as El Niño phenomenon, several months in advance. Although certain predictability exists over the tropical Pacific at interannual time scale, there are some limitations at higher latitudes far from the influence of tropical Pacific. Therefore, the models should be

validated to provide end-users with accurate information about the value of the seasonal predictions at extra-tropical latitudes.

The goal of the study is twofold: The validation of seasonal forecasts from the DEMETER project at middle latitudes, and the need to provide local information in order to improve seasonal forecasts. Statistical donwscaling methods translate large-scale information to local or regional scale by means of empirical relationships between large-scale variables and the target local variables. The statistical downscaling method considered in this study is based on the search of analogs (Gutierrez et al 2004). The method differs from the standard analog approach by applying a clustering technique to the predictors. It allows the definition of meaningful subgroups (weather types) each associated with a reference pattern which represents a specific atmospheric scenario. This approach is applied to assess the DEMETER skill to forecast seasonal precipitation and maximum and minimum temperature over Europe taking into account the observed influence of ENSO events. Seasonal ensemble forecasts from the direct output from DEMETER and the downscaled values are verified against observations from a probabilistic point of view taking into account order statistics (terciles and quintiles). Some cases studies are reported in this work.

Bibliography

Gutierrez, J. M., A. S. Cofiño, R. Cano, and M. A. Rodriguez (2004), Clustering methods for statistical downscaling in short-range weather forecasts. Mon. Wea. Rev., 132: 2169-2183.