Geophysical Research Abstracts
Vol. 13, EGU2011-8583, 2011
EGU General Assembly 2011

Frequency, persistence and transitions of seasonal Weather Types affecting the Iberian Peninsula

Juan Pedro Montávez (1), Juan Andrés García-Valero (2), Juan José Gómez-Navarro (1), Sonia Jerez (1), Raquel Lorente-Plazas (1), and Pedro Jiménez-Guerrero (1)

(1) Universidad de Murcia, Physics, Murcia, Spain (montavez@um.es), (2) AEMET, Murcia, Spain

The classification of the atmospheric circulation over a region in a discrete set of atmospheric patterns may result an unrealistic task if we take into account the chaotic nature of the atmospheric dynamics. Nevertheless, from a synoptic point of view, the atmospheric patterns defined by large-scale variables (generally sea level pressure or geopotential at a determined level) present recurrent spatial configurations that could be considered as the attractors of the system. They are usually named Circulation Types (CT). Traditionally, the CTs have been used for the analysis of the regional climatic variability of elements such as precipitation, temperature and wind so that their influence in these variables has been used to develop conceptual models or empirical-statistical relations useful for weather prediction. Nowadays its use has been extended to other interesting climatological applications like the validation of climate models or the possible changes in the circulation under different limate change scenarios.

Therefore, in this work we obtain a CT seasonal classification based on the daily data of SLP and Z500 over a window containing the whole Iberian Peninsula (IP) extracted from ERA40 reanalysis and ECMWF analysis for the last 50 years. Several methods were tested. The most satisfactory results where obtained by using the K-means method applied to main principal components of the correlation matrix in S mode of sea level pressure and 500mb geopotential height. The K-means clustering procedure was initialized using the weights of the rotated PC (varimax) coming from a PC analysis of the correlation matrix in T mode. Twelve WTs were obtained for each season. Later the frequency, persistence and transitions of WTs were analyzed, as well as the seasonal trends in frequency and persistence throughout the Mann-Kendall test.

Although some CTs appear in all seasons, some others are characteristics of a given season. In fact, summer and winter CTs present several differences while spring and autumn show a mixed behavior. Some significant trends (negative) in the frequency of appearance were identified in cyclonic CTs, related to precipitation events, in winter and spring, and positive trends in most of the anticyclonic types in winter. Regarding the persistence, an increase of the days with blocking situations, characterized by a high pressure system with meridian axis located in the western IP in spring was identified. This can be related to the observed decrease of precipitation, specially in March. Finally, the analysis of the CTs transitions, performed only with the WT of a first level of probability, revealed the existence of anticyclonic CTs transitions loops, i.e. transitions between several CTs starting and ending in the same WT, which tends to be longer in winter. Despite there is no evidence of cyclonic CT loops, an important seasonal dependence in the probability of transition between cyclonic transitions is depicted.