An Objective Synoptic Classification for Catalonia

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The establishment of cause-effect relations between precipitation/temperature anomalies in Catalonia and disturbances of the climate general circulation is bothering. North-eastern Iberia, with the exception of some northern valleys, is a geographical area poorly correlated with the low-frequency atmospheric patterns (NAO, AO, SNAO, ENSO) affecting the North Atlantic and the Mediterranean Basin. Only in the case of strong global or regional climate oscillations, the impact on surface meteorological records can be remarkable. In this context, the Meteorological Service of Catalonia has developed an Objective Synoptic Classification (OSC) in order to bind together past precipitation/temperature anomalies and synoptic-scale circulation patterns. Moreover, it also facilitates the achievement of climatic monthly and annual summaries for the Climatic Bulletin.

Daily weather patterns of sea level pressure and geopotential at 700 hPa from the 1948-2012 NCEP-NCAR reanalyses have been firstly classified with a Self Organising Map in a 4-D neural network with 35 nodes, which in further steps have been grouped using the U-matrix metrics and K-means clustering. This process is carried out each month separately, so as to obtain the seasonal evolution of each synoptic pattern. At the end, 33 weather patterns have been identified. The seasonality of cold spells, anticyclonic blocking or Mediterranean cyclogenesis, among others, has been also identified. The temporal evolution of each pattern from the OSC has revealed synoptic circulation changes in the last few decades, with an increase of the anticyclonic related patterns and decadal variability of cyclogenesis situations. These results have been also temporarily contextualised by means of classifying daily weather patterns from the NOAA twentieth Century Reanalysis Project v2 covering the period 1871-2012.