

Synoptic situations and occurrence of extreme temperatures in the Iberian Peninsula

Ali Mohammed (1,2) and Marta Alarcón (3)

(1) Universitat Politècnica de Catalunya. UPC, Barcelona, Spain (ali.jasim.mohammed.mohammed@estudiant.upc.edu), (2) Al-Mustansiriyah University, Baghdad, Iraq (alijas1977@gmail.com), (3) Universitat Politècnica de Catalunya. UPC, Barcelona, Spain (marta.alarcon@upc.edu)

The occurrence of hot waves and cold spells is having a particular attention in the last years due to their influence on human activities, health, agriculture, power supply, infrastructure and ecosystems (Bieli et al., 2015). In the context of climate change, there are evidences that extreme temperature episodes, and not only the mean temperature, are changing in response to the anthropogenic radiative forcing. The atmospheric large-scale circulation patterns are related to episodes of extreme temperature (Pfahl and Wernli, 2012). The distribution and intensity of high and low systems, and the meridional movement of their associated air masses configure the situations that lead to extreme temperature events in particular regions. This work focuses in the study of these events in the Iberian Peninsula in the recent 20-year period 1994-2013 and the relationship with the synoptic situations in Europe.

A Lagrangian approach is used to provide information about the pathways of the air masses causing the 0.1% most extreme hot and cold events for that period. The impact of climate variability is also investigated by computing the correlations between the frequency of extremes and the most influencing modes of climate variability affecting Western Mediterranean: North Atlantic Oscillation (NAO), Western Mediterranean Oscillation (WeMO) and Arctic Oscillation (AO). There is a significant ($p < 0.01$) negative correlation between the number of cold days and the NAO and AO annual indices, whereas that a significant ($p < 0.01$) positive correlation has been found between the annual average temperature for hot days and the WeMO annual indice. The relationship between the synoptic situations and extreme events has been studied in three vertical levels by applying principal component analysis (PCA) to the pressure fields and by using the Hess-Brezowsky (GWL) catalogue. The results showed that in 65% of hot extreme events the IP was affected by the presence of the Iberian thermal low, which also appeared in 90% of the cases highly correlated with the first component of the PCA. Furthermore, 45% of the hot extremes corresponded to zonal type circulation. On the other hand, the Atlantic anticyclone appeared in 50% of the cold events.