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Joint modes of air temperature and precipitation related to atmospheric circulation over Greece.

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Air temperature and precipitation are the two major meteorological variables having been modified by climate change. According to IPCC 2014, the surface temperature is projected to rise over the 21st century and the mean precipitation will likely to decrease in mid-latitude dry regions, such as Greece. Towards this direction, we study the impact of atmospheric circulation on the joint modes of these two meteorological variables over Greece, because they reflect climate conditions better than temperature or precipitation statistics taken separately.

The four combined extreme climate indices, based on joint modes of air temperature and precipitation, concern Cold/Dry days (CD), Cold/Wet days (CW), Warm/Dry days (WD), Warm/Wet days (WW) and are defined by the exceedances of the joint modes of temperature and precipitation using the 25th and 75th percentile levels in order to capture a larger number of events. More specifically, the CD index is defined as the number of days as with the daily mean air temperature (T) below the 25th percentile of the daily mean temperature (T25) and simultaneously the daily precipitation (P) below the 25th percentile of the daily precipitation (P25). Accordingly, the other indices are defined; namely, CW index (T<T25 and P>P75), WD index (T>T75 and P<P25) and WW index (T>T75 and P>P75).

The objective of this study is to analyze the influence of atmospheric circulation on joint modes of air temperature and precipitation over Greece. The atmospheric circulation is examined in terms of specific climatic indices, such as the North Atlantic Oscillation index (NAOI), the Mediterranean Oscillation index (MOI) and the North Sea Caspian Pattern Index (NCPI).

In this work, representative stations from sub regions of Greece with different climatic characteristics have been selected for the interpretation of the aforementioned joint distribution extreme climate indices and their correlation with the atmospheric circulation. The findings revealed significant patterns between the examined joint distribution variables and the atmospheric circulation over Greece, during the examined period (1959-2004).