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Trends and variability of joint distribution extreme climate indices over Greece

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The objective of this study is to assess and analyze the trends and variability of joint distribution extreme climate indices over Greece. Taking into consideration that the surface temperature is projected to rise over the 21st century and the mean precipitation will likely to decrease in mid-latitude dry regions according to IPCC 2014, we confronted the challenge to study the joint distributions of the two meteorological variables over Greece, because they reflect weather conditions better than temperature or precipitation statistics taken separately,
The four combined climate indices ,based on air temperature and precipitation, concern Cool/Dry days (CD), Cool/Wet days (CW), Warm/Dry days (WD), Warm/Wet days (WW) and are defined by the exceedances of the joint quantiles 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)
Representative stations from sub regions of Greece with different climatic characteristics have been selected for the interpretation of the annual and seasonal variability of the aforementioned joint distribution extreme climate indices The findings revealed significant spatial and temporal patterns of the examined joint distribution variables over Greece, during the examined period (1955-2010). It is worth noting that even in a small spatial scale with complex topography and land sea interaction, local factors and mechanisms combined with the observed climate change contribute in the configuration of the spatiotemporal variability of the combined air temperature and precipitation. This kind of analysis could help more stake holders to take action towards mitigation of the impacts of extreme weather conditions.