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Drought, flood and rainfall analysis under climate change in Crete, Greece

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In this study an analysis on the drought frequency and magnitude under climate change in Crete, Greece is performed. The analysis was performed for the time period from 1983-2100, divided into three sub-periods (1983-1999, 2000-2049 and 2050-2099) for inter-comparison. Two climate models were studied MPI-ESM-LR-r1-CSC-REMO and EC-EARTH-r12-SMHI-RCA4, following three possible representative concentration pathways (+2.6, +4.5 and +8.5 W/m2). In order to perform the analysis the results of a SWAT simulation which covered the entity of Crete using 352 subbasins, was used.
Drought events are recognized by using the Standardized Precipitation Index (SPI) to identify the meteorological drought events and Standardized Runoff Index (SRI) for hydrological droughts. SPI and SRI drought indices, were used in order to identify the number of drought events for each climate model and scenario. In all cases, an increase in both severity and number of drought events was calculated for the future periods, compared to the baseline period 1983-1999. This increase was smaller for the +2.6 W/m2 scenario and largest for the +8.5 W/m2. The magnitude of events with 10 and 100 years return period was calculated for the subbasins of Crete and the most vulnerable were identified, both in terms of severity and the change throughout the years in index magnitude.
Next a flood frequency analysis was performed for the entity of Crete Island in order to calculate the magnitude of events with 10 and 100 years return period. In order to perform the flood frequency analysis, the results of the SWAT simulation in terms of runoff in each subbasin are used. By calculating the magnitude of flood events with 10 and 100 years return period and the change in the magnitude throughout the time periods the most vulnerable subbasins are identified.
The same frequency analysis was performed for the precipitation at each subbasin, and the magnitude of extreme precipitation events with 10 and 100 years return period was calculated. In this case the most significant changes appeared in Chania prefecture, having a 25-50% increase in extreme precipitation magnitude for the 10 years and the 100 years return period until the end of the third study period.
Drought and flood frequency analysis can be proved a valuable tool in water management and infrastructure projects planning providing an integrated analysis for extreme event magnitude anticipation in Crete.

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