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Spatiotemporal analysis of drought on various timescales in Syria over last five decades.

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Global warming is very likely to alter patterns of global air circulation and hydrological cycle that will change global and regional precipitation regimes. Because of the interactions of processes at a wide range of spatial and temporal scales, the climate of Syria (Eastern Mediterranean) is characterized by a great diversity of features, resulting in a variety of climate types and great spatial variability. Syria is considered as one of the most prominent "Hot-Spots" in future climate change projections over the Mediterranean Basin which suggest an increase in drought conditions that will be more frequent and intense. The variability of meteorological droughts in twenty-one Syrian weather stations was determined using the Standardized Precipitation Evapotranspiration Index (SPEI) and Standardized Precipitation Index (SPI). Theses drought indices allowed us to assess the intensity and frequency of meteorological droughts in the study area during the 1959-2008. To determine spatial and temporal patterns of droughts, a rotated principal component analysis (PCA) in a spatial mode (S-mode) was applied to the 1-3-9-12 month time scale. In this way, three heterogeneous and spatially well-defined regions with different temporal evolution of droughts were identified in Syria: 1) north-eastern (inland desert); 2) southern (mountainous landscape); 3) north-western (Mediterranean coast). The occurrence of abrupt changes and trends were examined applying cumulative sum charts (CUSUM), the Mann-Kendall non-parametric test and the Regime Shift Index (RSI) to the SPEI scores obtained in the PCA. Major change points in SPEI values occurred in 1998 in the three regions identified with a sudden decrease of the values. An increasing in drought frequency and duration was mainly illustrated in the southern region of Syria, where a statistically significant and negative trend was detected in the SPEI values. Southern Syria might be more sensitive to climate change due to the complex orography of this region. There is a need to implement regional adaptation strategies to reduce the risk of drought conditions in different parts of Syria. The regionalisation here presented might be useful to improve the effectiveness of the drought planning strategies in Syria.
Key words: adaptation strategies; climate change; climate regionalisation; drought; Eastern Mediterranean; SPEI, SPI, time trends.