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Observed spatial and temporal variability of precipitation and drought in the Eastern Mediterranean

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The aim of this study is to investigate the spatio-temporal variability and trends of precipitation and droughts across the Eastern Mediterranean. For this purpose, we used daily and monthly precipitation data from 70-103 meteorological stations, respectively, covering the common period of 1961–2012. At seasonal and annual time scales, an S-mode principal component analysis (PCA) was performed to identify the main patterns of precipitation variability. At daily time scale, 70 precipitation series were used to compute the daily concentration index (CI).For droughts analyses, we calculated the standardized precipitation index (SPI) and modified China Z index (MCZI) at 3, 6, 9, 12 and 24 month time scales for all 103 precipitation series. In addition, we applied an S-mode PCA to these drought indices in order to identify the spatial patterns of drought over the Eastern Mediterranean. The results obtained for SPI and MCZI are so coherent between them at all time scales with higher negative values detecting by MCZI in the southern parts. The results revealed five sub-regions relative to both precipitation regimes and drought variability: (North-eastern, North-western, South-eastern, south western, and the central area. The analysis of time variability (using the PCs scores derived from PCA) of precipitation and drought indices allowed us to verify a drought aggravation in all regions (except for northern parts of the Eastern Mediterranean), especially in spring and winter. These results show that all regions suffered several extreme droughts along the last decades especially the southern and south-western parts, starting in the beginning of the 1970s. The most outstanding dry periods took place during mid-1980s, 1990s and at the end of 2000s. The spatial distribution of the precipitation CI trends indicates that the statistically significant increases of CI mainly occurred in the northern and north-western parts of the Eastern Mediterranean, making these areas at risk for extreme precipitation events.
Keywords. Eastern Mediterranean - Drought indices - Precipitation variability - Climate regionalization - Temporal trends.