



Interannual to decadal summer drought variability over Europe and its relationship with global sea surface temperature

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Variability and predictability of European summer drought conditions during observational period is investigated. The dominant patterns of European drought and their associated large-scale climatic anomalies are identified through canonical correlation analysis (CCA) of the field of self-calibrating Palmer Drought Severity Index (PDSI) and global sea surface temperature (SST) anomalies.

At interannual time scales we identified patterns of drought variability which are optimally correlated with SST patterns from previous years. The time lag between drought and SST anomaly patterns can provide valuable skill for the prediction of drought conditions over Europe on interannual time scales. Significant lag-correlation between drought patterns and the North Atlantic Oscillation (NAO) suggests that NAO can be used also as a potential predictor of drought European patterns at interannual time scales.

The global trend in temperature, the North Atlantic Oscillation (NAO) and the Atlantic Multidecadal Oscillation (AMO) play a significant role in establishing the drought conditions over Europe at multidecadal time scales. The influences of these climatic patterns on drought conditions at multidecadal time scales were identified also through CCA. The first PDSI pattern (CCA1) shows a dipole-like structure between the central Europe and the northern part of the Scandinavian Peninsula. The corresponding SST pattern is a mixture between the global SST trend and the abrupt shift in the 1970s. Wet (dry) conditions over central Europe (Scandinavia) are associated with a strong positive SST center south of Greenland and a strong negative center over the European coast and the North Sea. The third mode (CCA3) identifies a multidecadal scale variation, strongly related to summer drought conditions over the southern part of the Scandinavian Peninsula, the south-eastern part of Europe and the western part of Russia. The corresponding SST pattern shows SST anomalies in the Atlantic basin similar to those associated with AMO. The AMO index and the canonical time series associated to CCA3 are significantly correlated.

Possible drought conditions over Europe in the next decades based on the relationships between large-scale SST patterns and drought conditions over Europe, established in our study, are discussed.