



Long-term spatiotemporal patterns of European hydroclimate: a 1000-year long case study

Yannis Markonis and Filip Strnad

Czech University of Life Sciences Prague, Water Resources and Environmental Modeling, Prague, Czech Republic
(markonis@fzp.czu.cz)

In last decades, the available amount of data in earth sciences has been exponentially increasing providing an undeniable opportunity in advancing the current state of hydrology. At the same time, there has been a significant progress in empirical data-driven techniques, widely known as machine learning. In this study, we apply one of the best-established classification techniques, the Self-Organizing Map (SOM) algorithm to the gridded palaeoclimatic reconstruction of Old World Drought Atlas and we study the spatial patterns in Europe's hydroclimate during the last one thousand years. Our aim is not only to detect the areas with substantial homogeneity during European droughts and pluvials, but also provide a comprehensive demonstration for the application of data-driven classification method so that it can be further implemented in other hydrological classification problems. This is performed in both spatial and temporal domains; in the former case we determine homogeneous regions of hydroclimatic variability (regionalization), whereas in the latter we identify groups of years with similar spatial hydroclimatic patterns across Europe. Our findings shed some light on spatiotemporal properties of European drought, which can lead to improvements in large-scale hydrological modeling through better determination of the homogeneous areas in various spatial scales.