



## Exploring the link between drought indicators and impacts through data visualization and regression trees

Sophie Bachmair, Kerstin Stahl, Veit Blauthut, and Irene Kohn

University of Freiburg, Institute of Hydrology, Freiburg, Germany (sophie.bachmair@hydrology.uni-freiburg.de)

Drought is a complex natural hazard with severe environmental and socio-economic impacts. Although little can be done in the short term to prevent a drought, actions can be taken to reduce the societal vulnerability to drought, including the development of drought monitoring and early warning systems. Such systems are commonly based on different drought indicators or indices, which are metrics describing drought conditions derived from predominantly meteorological or hydrological data. Due to the complexity of how a prolonged precipitation deficit propagates through the hydrological cycle and interacts with environmental and socio-economic factors a simple indicator-impact relationship does not exist. Nevertheless, information on the occurrence, timing, and severity of a drought impact usually is what matters most for stakeholders. There have been very few attempts to characterize the relationship between drought indicators and impacts owing to the sparse and patchy information on drought impacts. The newly established European Drought Impact report Inventory (EDII) offers the possibility to further investigate the link between drought indicators and impacts. The aim of this study was to better understand this linkage using data visualization and non-parametric multivariate regression. A test dataset was selected comprising different drought indicators (SPI, SPEI, and others) and impacts for the drought event 2003 in Germany to learn about the potential of these methods for an application to larger datasets. To fully explore the causality of drought impact occurrence, several vulnerability factors were incorporated into the analysis, assuming that the spatially variable vulnerability of a system buffers or intensifies the effect of a sustained precipitation shortfall. First results reveal interesting insights into the non-trivial relationship between drought indicators and impacts. Meteorological indicators alone do not adequately explain the spatial variability of impact occurrence. The applied data visualization and regression tree approach proved to be a valuable methodology for exploring the link between indicators and impacts. Nevertheless, the results are influenced by the uncertainty of identifying and quantifying drought impacts and vulnerability factors at a suitable spatial and temporal scale. This calls for more research on methodological issues of drought impact and vulnerability assessment, as well as for further developing impact inventories and exploiting the link between drought indicators and impacts.