Linking drought indicators with impacts: Insights from a case study in Germany and the UK

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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 vulnerability to drought, including the development of drought monitoring and early warning (M&EW) systems. To improve drought M&EW systems we need to better understand the link between physical drought indicators and impacts on the environment, the society, and the economy. There is a vast range of published drought indicators available, but very little consensus on the most appropriate variables and indicators for M&EW; in part this is because indicators have rarely been linked to observed impacts, so the meaningfulness of hydro-climatic indicators is typically far from clear. What does a certain SPI or streamflow indicator value actually mean regarding the occurrence of drought impacts? Answering such questions is a challenging task due to the complexity of how a prolonged precipitation deficit propagates though the hydrological cycle and interacts with environmental and socio-economic factors. There have been very few attempts to systematically characterize the relationship between drought indicators and impacts owing to the sparse and patchy information on drought impacts. The Belmont Forum funded project "DrIVER" (Drought Impacts and Vulnerability thresholds in monitoring and Early warning Research) is aiming to fill this gap by conducting analysis of the indicator-to-impact link in Europe, North America and Australia. This study is a first step on the road to exploring indicator-impact links in Europe for the DrIVER project, using the newly established European Drought Impact Report Inventory (EDII). The aim is to explore the link between drought impacts and different commonly used drought indicators for two countries well covered in the EDII: Germany and the UK. Specifically, we investigate which drought indicators best explain impact occurrence, and whether this depends on impact type and/or drought event. The focus of the study is on data visualization and correlation analysis based on coarse-scale, major socio-economic regions (NUTS1 level), highlighting differences and commonalities in indicator-impact patterns between Germany and the UK. First results reveal interesting insights into the non-trivial relationship between drought indicators and impacts. The most suitable indicators for explaining drought impact occurrence are SPI/SPEI for intermediate accumulation periods but there is variation among events and geographies. This calls for more research on indicator-impact assessment as well as for further developing impact inventories. Next steps comprise augmenting EDII data for drought events currently not well covered and applying a similar methodology to further study areas in Europe and, eventually, in North America and Australia.