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Drought in a changing climate – a pan-European view

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Hydro-climatic extremes occur on different spatial and temporal scales, ranging from local, short term events, such as heavy storms and flash floods, to large-scale (regional to continental scale), long duration (weeks to years) events, such as drought and heat waves. Extremes affect every aspect of our society and to meet the societal need for preparedness and hazard management, the research community is challenged by underlying, critical science questions, including the need for improved knowledge on governing processes in a changing climate. In 2018, northern and parts of central Europe experienced a severe summer drought and record-breaking, persistent high temperatures led to severe impacts across a wide range of sectors. Wild fires destroyed vast areas in northern Europe, and the drought led to significant impacts on agricultural production and terrestrial ecosystems. Record low river levels disrupted inland waterways and low groundwater levels led to regional water restrictions. As illustrated by the 2018 event, drought effects all components of the hydrological cycle as it propagates from its origin as a meteorological anomaly, to a deficit in soil moisture and finally - if sustained - to below normal streamflow and groundwater levels (hydrological drought). Furthermore, a drying soil affects the partitioning of latent and sensible heat at the land surface, leading to higher air temperatures and thus, a reinforcement of the warming signal (positive feedback). Due to the diverse nature of drought, a large number of drought indicators exists, representing different time scales and type of drought. Simple indices may not be sufficient when applied to the complex and cumulative nature of drought. Often it is a combination of variables or events that leads to extreme drought impacts (compound event). A better understanding of the links between physical drought indicators and key drivers of drought is vital for drought prediction, whereas a better understanding of the links between physical indicators and drought impacts is critical to improve drought preparedness and support drought mitigation. This presentation highlights key achievements in drought research with a special emphasis on the identification of drought events, detection of recent changes, and our ability to model drought, including their spatial and temporal footprint. Focus is on Europe, and it will start introducing some recent extreme drought events – their main drivers, key characteristics, and wider environmental and societal impacts, and will close with an assessment of what the future may bring.