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Characterizing Germany's 2018 drought in the context of wet and dry spells since 1901

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In 2018, large areas of central and northern Europe were affected by an extreme drought. The water deficit propagated through the hydrologic cycle causing precipitation, soil moisture and, towards the end of 2018, streamflow and groundwater deficits. In Germany many socio-economic sectors were severely affected by the drought, e.g. the forestry sector has still not recovered. Main drivers for drought propagation are precipitation deficits. However, the natural variability of dry and wet precipitation patterns over time and space make characterization of droughts and predictions of impacts still challenging.

This study investigates German meteorological drought characteristics within general wet and dry spells since 1901 using station based daily precipitation data. Daily, monthly and seasonal aggregated indices such as the Standardized Precipitation Index (SPI) were used to characterize duration, severity and spatial extent of the 2018 drought. These characteristics were then compared with events of extreme droughts since 1901. Even though the meteorological drought of 2018 was extreme considering only precipitation data, we found comparable extremes in the past, for instance 1949 or 1964. However, based on what we observe in the SPI-12, clusters of extreme dry years in the 20th century were often followed by clusters of above average wet years, probably leading to a reduction of impacts in the following years. Since 2003, however, dry patterns predominate. Even though annual precipitation amounts are predicted to increase slightly in the study region this analysis shows the importance of analyzing sub annual as well as multi-year characteristics of precipitation patterns.

Including both wet and dry conditions when characterizing the severity of current drought events may improve our understanding of extreme meteorological drought events causing severe and long lasting impacts.