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When does a drought end? Monitoring the duration and recovery of soil moisture droughts in Germany

Friedrich Boeing[1], Julian Schlaak[1], Luis Samaniego[1,2], Rohini Kumar[1], Martin Schroen[1], Stephan Thober[1], and Andreas Marx[1]

[1]UFZ-Helmholtz Centre for Environmental Research, Department Computational Hydrosystems,, Leipzig, Germany
[2]Institute for Environmental Science and Geography, University of Potsdam, Potsdam, Germany

The impacts of drought events in recent years have demonstrated that monitoring droughts is essential even in generally water-rich countries such as Germany. In particular, the persistence of long-lasting, multi-year drought conditions [0] has increased awareness of drought risks. However, information on the current duration of droughts and the regional characteristics of historical drought duration is mostly not routinely presented in existing monitoring systems.

The UFZ German Drought Monitor (https://www.ufz.de/droughtmonitor/) [2] provides near-real-time information on current drought conditions in Germany through maps of a simulation-based soil moisture index [3] and plant-available water at a spatial resolution of approximately 1 km. While this information captures current drought intensity, drought impacts depend not only on prevailing conditions but also on drought duration and the cumulative water deficit.

To enhance the relevance of this information for water management during drought events, we derive two operational metrics addressing the following questions: (i) how unusual is the current drought in terms of its duration, and (ii) how much water is required to terminate drought conditions? Duration is computed as consecutive days below a percentile-based threshold relative to a long-term reference period at each grid cell. The required recovery water is expressed as the cumulative soil-water input needed to raise plant-available water back to the termination threshold, accounting for current seasonality and antecedent deficit.

We demonstrate the derivation of indicators describing current and historical drought durations, as well as the water amounts required for drought recovery. Using past drought events in Germany, we illustrate their added value and show how these metrics can be integrated into an operational drought monitoring system developed within the MOWAX project [3] to improve the assessment and communication of ongoing drought conditions. Furthermore, coupling these indicators with seasonal forecasts such as provided in the will enable probabilistic assessments of drought recovery, directly supporting timely management decisions regarding water restrictions.

References:

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