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Identification of droughts from monitored and modelled vegetation condition for improved water management in semi-arid areas

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Semi-arid areas suffer from small amounts and a large variability in rainfall combined with an increasing risk of droughts under climate change. These long and short-term changes in water availability directly affecting regional livelihoods are depicted in the condition of the rather sparse vegetation. In this study, seasonal and long-term trends in indicators of the vegetation condition related to water availability and droughts (NDVI vs. fAPAR, NPP, soil water content, excess water) are identified from remote sensing data (MODIS) and a process-based dynamic vegetation model (LPJ-GUESS) for at least two semi-arid river basins. Identified trends of both methods are compared and evaluated based on the underlying processes and related to knowledge of past drought events. Finally, we answer the question, which methods and indicators are suitable to identify changes in the vegetation condition preceding a drought and during drought phases considering the methods and indicators as above plus simple precipitation-based drought indicators (e.g. standardized precipitation index, SPI) and enhanced drought indicators applying multiple indicators themselves (e.g. combined drought indicator, CDI). The study is imbedded in the SaWaM project (Seasonal Water Management for semi-arid areas) and contributes to improved water management in the project regions by the integrated analysis of remote sensing and ecosystem modelling results that are made available to regional stakeholders tasked with water management in an online tool .