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Earth Observation Data for Agricultural Drought Monitoring in the Pannonian Basin

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The Pannonian Basin is a region in the southeastern part of Central Europe that is heavily used for agricultural purposes. It is geomorphological defined as the plain area that is surrounded by the Alps in the west, the Dinaric Alps in the Southwest, and the Carpathian mountains in the North, East and Southeast. In recent decades, the Pannonian Basin has experienced several drought episodes, leading to severe impacts on the environment, society, and economy. Ongoing human-induced climate change, characterised by increasing temperature and potential evapotranspiration as well as changes in precipitation distribution will further exacerbate the frequency and intensity of extreme events. Therefore, it is important to monitor, model, and forecast droughts and their impact on the environment for a better adaption to the changing weather and climate extremes. The increasing availability of long-term Earth observation (EO) data with high-resolution, combined with the progress in machine learning algorithms and artificial intelligence, are expected to improve the drought monitoring and impact prediction capacities.

Here, we assess novel EO-based products with respect to drought processes in the Pannonian Basin. To identify meteorological and agricultural drought, the Standardized Precipitation-Evapotranspiration Index was computed from the ERA5 meteorological reanalysis and compared with drought indicators based on EO time series of soil moisture and vegetation like the Soil Water Index or the Normalized Difference Vegetation Index. We suggest that at resolution representing the ERA5 reanalysis (~0.25°) or coarser, both meteorological as well as EO data can identify drought events similarly well. However, at finer spatial scales (e.g. 1 km) the variability of biophysical properties between fields cannot be represented by meteorological data but can be captured by EO data. Furthermore, we analyse historical drought events and how they occur in different EO datasets. It is planned to enhance the forecasting of agricultural drought and estimating drought impacts on agriculture through exploiting the potential of EO soil moisture and

vegetation data in a data-driven machine learning framework.

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