



Comparison of different drought indices based on modeled crop yield for Hungary

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Abstract

Climate change may have various impacts on agriculture and environment Carpathian/Pannonian basin. In the last decades extreme weather events has been intensifying in the region. Hungary is situated in the center of the Pannonian basin. Heavy rainfalls and lack of precipitation leading to severe drought, both occurred in our region recently. As a result of the climate change the agriculture and water intense sectors suffers more frequently from drought. Severe drought events cause significant impacts on crop yield and thus on the economy as well.

The damage of drought due to lack of precipitation can be quantified by using various drought indices. Many drought indices are applied in agrometeorology, however, the overall verification of these indices does not exist, although it would be crucial. The main aim of this work is to determine the drought index or indices amongst the widely used indicators that characterize the effect of a drought event on the crop yield the best.

Modeled yield of maize and wheat are investigated in this work. We analyze the widely used drought indices (e.g. Standardized Precipitation Index, SPI and Palmer Drought Severity Index, PDSI) to identify the effect of drought on the crop yield. The difference of modeled crop yield with and without water stress data is correlated to some drought indices in this paper. The time period of the modeled crop yield is 2002-2017. The 4M crop simulation model were applied for these purposes. The M4 model is a deterministic model, which simulates the water and nutrient balance of the soil, the soil-plant interactions and plant growth. The 4M model is a further development of the Ceres (Crop Environment REsource Synthesis) model. The model simulations were performed by experts at the Research Institute of Agriculture. The results will be displayed in tables and on maps.

Our motivation for this study is that one of the flagship questions were identified in PannEx (the Pannonian Basin Experiment) Regional Hydroclimate Project (RHP) of the Global Energy and Water cycle Exchanges project (GEWEX) Hydroclimatology Panel (GHP) is the „Adaptation of agronomical activities to weather and climate extremes”. Possibly this study will increase the knowledge on drought and will support the adaptation capacity in the face of climate change in the Pannonian Basin.