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Exploring hydrological uncertainties and thresholds of a drought vulnerable region in Austria

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In the region of South-Eastern Styria, Austria, a strong increase of summer temperature over the last decades was recognized by Kabas et. al. (Meteorol. Z./ 20 (3), 277-289, 2011). With climate change the temperature will further increase, so that the possibility for more frequent droughts in summer will rise. This leads to the question if, for example, a steppe climate similar to that in the neighboring Hungarian Pussta can evolve in this region. Drastic climatic changes will be accompanied by strong changes in the hydrological balance. Since the region is strongly influenced by agriculture and other non-climatic factors as well, these human impacts on the water cycle must be considered.

The Wegener Center, University of Graz is studying the Raab catchment in South-Eastern Styria, Austria, as an example of a small catchment of the climate-sensitive southern Alpine foothills. The available data indicate that the region is vulnerable to droughts in summer, signalled by a strong temperature increase over the recent decades and a tendency of precipitation decrease. The main goals of this study are to explore how the water balance in the region is going to change in the future, what the most significant uncertainties are and where there might be thresholds towards drastic changes.

In this poster we report on the first steps, which is to build up a hydrological model for the Styrian Raab valley based on the Water balance Simulation Model (WaSiM) of ETH Zurich, Switzerland. Within the calibration the focus is on low flow conditions in summer. Given that the model shows good results for the well observed recent decades, a sensitivity analysis for changes in specific (control) parameters of the surface water balance is conducted. This will include anomalies of temperature and precipitation, water use for irrigation, and others. This enables to explore how warmer temperatures or changes in irrigation and crops affect the catchment. Model analyses do not only focus on flow conditions but also on internal variables, such as the soil moisture, which has a significant impact on the water balance and the drought vulnerability of the region.