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Measurements and simulations of water transport in maize plants

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In Central Europe climate change will become manifest in the increase of extreme weather events like flash floods, heat waves and summer droughts, and in a shift of precipitation towards winter months. Therefore, regional water availability will alter which has an effect on future crop growth, water use efficiency and yields. To better estimate these effects accurate model descriptions of transpiration and other parts of the water balance are important.

In this study, we determined transpiration of four maize plants on a field of the research station Scheyern (about 40km North of Munich) by means of sap flow measurement devices (ICQ International Pty Ltd, Australia) using the Heat-Ratio-Method: two temperature probes, 0.5 cm above and below a heater, detect a heat pulse and its speed which facilitates the calculation of sap flow. Additionally, high resolution changes of stem diameters were measured with dendrometers (DD-S, Ecomatik). The field was also situated next to an eddy covariance station which provided latent heat fluxes from the soil-plant system.

We also performed terrestrial laser scans of the respective plants to extract the plant architectures. These structures serve as input for our mechanistic transpiration model simulating the water transport within the plant. This model, which has already been successfully applied to single *Fagus sylvatica L.* trees, was adapted to agricultural plants such as maize. The basic principle of this model is to solve a 1-D Richards equation along the graph of the single plants. A comparison between the simulations and the measurements is presented and discussed.