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Transpiration of maize in a pannonian climate

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The climatic water balance of an area, defined as rainfall minus potential evapotranspiration, is a very important factor regarding agricultural production. Evapotranspiration is the sum of plant transpiration and evaporation, the unproductive water losses through the soil surface. The annual water balance can be positive (humid climate) or negative (arid climate). Under semi-arid conditions evapotranspiration exceeds rainfall at least temporarily. In agricultural areas suffering from water scarcity, irrigation may be necessary in order to guarantee appropriate yields and a good quality for agricultural products. Reducing evaporative losses and increasing the water use efficiency at the same time can be another strategy for saving water. Knowing the proportion of evaporation and transpiration, respectively, is a precondition for further studies. However, these factors cannot be measured directly within the vegetation.

Therefore, an experiment on separating the components of evapotranspiration was carried out at the lysimeterstation in Groß-Enzersdorf, Austria. A lysimeter with soil water content probes was used to determine evapotranspiration. Furthermore, sap flow measurements were done in order to determine the transpiration rate of the planted maize. In this regard, the heat ratio method was applied, measuring the sap velocity within the plant using a short pulse of heat as a tracer. Therefore, sensor sets containing a heater needle and two temperature probes were installed in three maize stems. Multiplication of the gained sap velocity and the cross sectional area of the stem delivered the flow volume per plant. The number of plants as well as the surface area was well defined; hence, the transpiration rate of the maize on the lysimeter could be calculated. Evapotranspiration was calculated from the water balance equation, knowing soil water change and percolation water from lysimeter measurements. Results will be shown.