A simulation approach for the cooling effect of leaves

Sina Ackermann[1], Timo Koch[2], Lucian Kaack[3], Rainer Helmig[1], Steven Jansen[3]

[1]) University of Stuttgart, Department of Hydromechanics and Modelling of Hydrosystems, Pfaffenwaldring 61, 70569 Stuttgart, Germany
sina.ackermann@iws.uni-stuttgart.de
[2]) University of Oslo, Department of Mathematics, Moltke Moes vei 35, 0851 Oslo, Norway
[3]) University of Ulm, Institut für Systematische Botanik und Ökologie, Albert-Einstein-Allee 11, 89081 Ulm, Germany

Current global climate developments suggest that heat waves will occur more often and more intense than in the past, with severe impacts on citizens. Evaporation from leaves could reduce the impact of heat waves in cities ([1], [2]). In the scope of our project, we develop a micro-scale porous medium model to determine the evaporation rate at an individual leaf under different conditions. These single-leaf evaporation rates could then serve as a base for large-scale models, which include whole trees or canopies.

We collaborate with biologists who carry out measurements at individual European beech leaves. The anatomical data from these measurements is used to set up the simulation. Then, the resulting evaporation rates in experiment and simulation are compared. After validating the model, parameter studies can be carried out to determine the influence of varying surrounding conditions on the evaporation. Additionally, the micro-scale model is coupled to a macro-scale model for the vessel network of a leaf ([3]). The coupling allows to model the interaction between vessel and leaf tissue, i.e. the influence of the evaporation rate on the water transport within the plant and vice versa.

References

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