Geophysical Research Abstracts
Vol. 16, EGU2014-11062, 2014
EGU General Assembly 2014


# Numerical study on the potential impact of different bottom boundary conditions on the water balance of lysimeters

Jannis Groh, Jan Vanderborght, Thomas Pütz, and Harry Vereecken
Forschungszentrum Juelich, Institute Agrosphere (IBG-3), Jülich, Germany (j.groh@fz-juelich.de)

The SOILCan lysimeter network is a large scale climate feedback experiment and is embedded in the four long term observatories of TERENO (TERestrial ENvironmental Observatories). The focus of the SOILCan-project is to observe the impact of climate change on water and matter budgets in different grass- and arable-land lysimeters. The monitoring infrastructure was established across a rainfall and temperature transect along which lysimeters were transported from wetter to drier conditions.

The lysimeters in SOILCan have a controlled bottom boundary condition using a rack of suction candles that enables upward and downward flow of water. This pressure head at the bottom is controlled by measured soil water potentials in undisturbed soil in the close vicinity of the bottom of the lysimeter. For transported lysimeters this controlling approach no longer works as the surrounding soil profile and both its upper climatic boundary conditions and lower boundary conditions related to its hydrogeological setting differ from the place where the lysimeter was taken from. In order to evaluate these artefacts and to derive a suited approach to control the lower boundary of transported lysimeters, water balance simulations were run. We analyzed three different approaches to impose bottom boundary conditions for transported lysimeters. A 'zeroth-order' approach is to define the bottom boundary at the bottom of the lysimeter and use the pressure heads measured at the location from which the soil lysimeter was taken. However, this approach is prone to artefacts since these bottom boundary conditions are determined by the climate at the site where the lysimeter was taken from. A 'first-order' approach is to define a bottom boundary condition at a certain hydrogeological boundary that can be defined deeper in the soil profile such as a seepage face or a groundwater table. However, for shallow groundwater tables, this approach may also lead to artefacts since the depth of the groundwater table may change with changing climate. In a 'second-order' approach, the effect of changing climate conditions on these bottom boundaries is evaluated. Therefore, other hydrogeological properties that determine lateral groundwater flow such as the depth of an impermeably layer and the distance between surface water structures that drain groundwater have to be considered in the approach as well. We will present a comparison of these approaches using water balance results derived by numerical simulation with the software HYDRUS 1-D.