Estimating sphagnum peat hydraulic properties from laboratory evaporation experiments

Tobias K. D. Weber and W. Durner | Technische Universität Braunschweig | Institut für Geökologie
to.weber@tu-bs.de | phone +49 (0) 531 392-5930

Introduction
Until today, the water flux dynamics in peat soils have not been adequately described. In a first step, we estimate the peat hydraulic properties. In order to obtain these, various methodological challenges need to be overcome. Understanding the water flux dynamics is a decisive step towards an understanding of the role it plays on decay and production of peat.
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Methodological Challenges ...
- Extremely fragile samples
- Shrinkage during evaporation ...
- ... and, hence, induced relative translocation of measuring location
- Indistinct Soil–Vegetation–Atmosphere boundaries
- Hysteric properties due to the peat's partial hydrophobic and shrinking/swelling nature

... and a Frozen Solution

Research Questions
- Is the Richards equation able to describe the water transport in the vadose zone of peatlands?
- Considering shrinkage behaviour: Can hydraulic properties of peat be estimated by evaporation experiments?
- Which hydraulic model yields the best result with regard to water balance simulations?

Peat Hydraulic Properties
Method
Evaporation method of Schindler (1980, Arch. Acker- u. Pflanzenbau u. Bodenkld., 24:37), the soil hydraulic properties are derived as:

Evaporation

Peat Soil Shrinkage Characteristic Curves
Method
Approximation by eq. 7

\[ \eta = \frac{V_v - V_p}{V_p} \]

\[ V_p = \frac{V_0}{1 - \eta} \]

Results

- Typical course of weights and suctions exemplified for one sample
- The peat groups show distinct multi-modal pore size distributions

Outlook
- In situ measurement of water budget and tensions in 2013
- Inverse modelling and parameter estimation for the laboratory and field

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