Geophysical Research Abstracts
Vol. 13, EGU2011-6952, 2011
EGU General Assembly 2011


# Characterizing surface energy fluxes with the aid of measured soil temperature profiles

Gabriele Schenk and Kurt Roth
University of Heidelberg, Institute of Environmental Physics, Germany (gabriele.schenk@iup.uni-heidelberg.de)

Looking from inside the soil towards the surface, soil temperature and water content become increasingly linked to each other and to the atmospheric conditions. Therefore, time-series of depth profiles of these quantities contain information about the ground heat flux as well as the evaporation at the soil surface which are crucial components of the soil-atmospheric coupling. Direct measurements of the evaporation flux are usually done in the atmosphere, e.g., via flux towers, but they are expensive and elaborative. This is why fluxes at this boundary are often determined indirectly based on gradient or energy budget calculations at the soil surface. An example is the Penman-Monteith method, which requires a number of heuristic approximations.

We analyze synthetic and measured time-series of soil temperature profiles in terms of Fourier transforms to extract frequency information in different depths. From this, (i) the apparent thermal soil diffusivity is estimated and (ii) the back-projection of the frequency components towards the soil surface is studied. Ideally, this yields a reconstruction of the temperature signal right at the soil surface. The combination of this reconstruction with measured soil surface temperature data from an infra-red sensor above the soil can be used to calculate the energy flux components at the soil-atmosphere interface.
We will present the performance of the method for synthetic and lab-measured data and discuss the required assumption and approximations. Furthermore, we will demonstrate its application to local field-scale data.