Numerical Analysis of Mass and Energy Transport in Subsurface and at the Soil-atmosphere Interface using HYDRUS

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It is broadly accepted that mass and energy fluxes in the subsurface in general, and in arid and semi-arid regions in particular, are closely coupled and cannot be evaluated without considering their mutual interactions. While the subsurface processes are commonly implemented in existing models, which often consider both isothermally and thermally induced water and vapor flow, the effects of slope inclination, slope azimuth, variable surface albedo and plant shading on incoming radiation and spatially variable surface mass and energy balance, and consequently soil moisture distribution, are rarely considered. These factors have been recently implemented into the HYDRUS model. In this presentation, the effect of soil heterogeneity and surface roughness on mass and energy fluxes in the subsurface and at the soil-atmosphere interface is evaluated numerically with the HYDRUS model. Additionally, we will demonstrate the use of the HYDRUS model to simulate processes relevant to the ground source heat pump systems.

キーワード：HYDRUS、地表面境界
Keywords: HYDRUS, Soil-atmospheric interface

