Geophysical Research Abstracts
Vol. 19, EGU2017-5662, 2017
EGU General Assembly 2017

Modeling Coupled Movement of Water, Vapor, and Energy in Soils and at the Soil-Atmosphere Interface Using HYDRUS

Jiri Simunek (1), Giuseppe Brunetti (2), Hirotaka Saito (3), and Keith Bristow (4)

(1) University of California Riverside, Department of Environmental Sciences, Riverside, United States (jiri.simunek@ucr.edu), (2) Department of Civil Engineering, University of Calabria, Rende, CS 87036, Italy, (3) Department of Ecoregion Science, Tokyo University of Agriculture and Technology, Fuchu, Japan, (4) CSIRO, Townsville, QLD, Australia

Mass and energy fluxes in the subsurface are closely coupled and cannot be evaluated without considering their mutual interactions. However, only a few numerical models consider coupled water, vapor and energy transport in both the subsurface and at the soil-atmosphere interface. While hydrological and thermal processes in the subsurface are commonly implemented in existing models, which often consider both isothermally and thermally induced water and vapor flow, the interactions at the soil-atmosphere interface are often simplified, and 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 on soil moisture and temperature distributions, are rarely considered. In this presentation we discuss these missing elements and our attempts to implement them into the HYDRUS model. We demonstrate implications of some of these interactions and their impact on the spatial distributions of soil temperature and water content, and their effect on soil evaporation. Additionally, we will demonstrate the use of the HYDRUS model to simulate processes relevant to the ground source heat pump systems.