Modeling and analysis of evaporation from porous media coupled with free flow

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Evaporation from partially saturated soils includes a variety of complex interacting processes and may depend on various parameters of the soil, the fluids, and may also be influenced by an adjacent free flow (wind). For a detailed examination of such systems, a coupled model that comprises two interacting domains is applied.

The numerical simulation of the transport phenomena in the porous region is based on a model utilizing Darcy's law, whereas for the free flow a Stokes model is used. We develop a coupling concept that allows the combined simulation of a single-phase free flow and two-phase porous media, including the transport of mass, momentum and energy. We present the model concept and all necessary coupling conditions. The influence of different parameter sets is examined on the basis of this model.