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# Sorptivity of dual-permeability soils

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Sorptivity is a crucial parameter for modeling water infiltration into soils. Many works have related sorptivity to the soil hydraulic functions, i.e., the water retention and unsaturated hydraulic functions. Parlange's (1975) formulation is one of the most used to relate sorptivity to the soil hydraulic functions, allowing the direct computation of sorptivity as a function of the soil hydraulic parameters and initial and final water contents. On this basis, several works investigated the possibility of direct analytical relationships between sorptivity and the hydraulic shape and scale parameters (e.g., Lassabatere et al., 2021). So far, most of the studies have focused on single permeability soils with monomodal water retention and unsaturated hydraulic functions. However, the use of dual- or multi-permeability approaches is increasing in relation to the necessity to account for preferential flows in soils. The approach developed by (Gerke and van Genuchten, 1993) or (Pollacco et al., 2017) are examples of dual-permeability approaches and allow the modeling of preferential flows in soils. In the proposed study, we apply the formulation proposed by Parlange (1975) for the computation of sorptivity for dual-permeability soils, considering the approaches proposed by Gerke and van Genuchten (1993) and Pollacco et al. (2017). Our developments lead to a relation between the bulk sorptivity of the dual permeability soils to those of the matrix and the fast-flow compartments, plus additional terms. We end with the scaling of the proposed relation for investigating the effects of the matrix and fast-flow shape and scale parameters and the volumetric content occupied by the fast-flow compartment.

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