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Implementation of the Brunswick model system into the Hydrus software suite

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The modular framework for modelling unsaturated soil hydraulic properties over the full moisture range of Weber et al. (2019) and Streck and Weber (2020) was implemented in the Hydrus Suite. Users can now additionally choose between four different variants of the Brunswick model: i) van Genuchten-Mualem (van Genuchten, 1980; Mualem, 1976), ii) Brooks-Corey (Brooks and Corey, 1964), iii) Kosugi (Kosugi, 1996), and iv) modified van Genuchten (Vogel and Cislerova, 1988). For demonstration purposes, simulation results of bare soil evaporation and root water uptake with Hydrus are presented, along with a comparison of the original van Genuchten-Mualem model and its Brunswick variant. Results show that the original van Genuchten-Mualem model underestimates the simulated cumulative evaporation and cumulative transpiration due to the inconsistent representation of the soil hydraulic properties in the dry moisture range. We also implemented a two-step hydro-ptf into the Hydrus Suite that converts the parameters of the original van Genuchten-Mualem model to the Brunswick variant (Weber et al., 2020). In that way, physically comprehensive simulations are ensured in case no data on soil hydraulic properties are directly available, but information on physical soil properties (e.q., texture, bulk density) exists.