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A general BEST method predicting soil hydraulic parameters for any type of water retention and hydraulic conductivity curves

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Soil hydraulic characterization is crucial to describe the retention and transport of water in soil, but current methodologies limit its spatial applicability. This work presents a cost-effective general Beerkan Estimation of Soil Transfer parameters (BEST) methodology using single ring infiltration experiments to derive soil hydraulic parameters for any type of unimodal water retention and hydraulic conductivity functions. The proposed method relies on the BEST approach. The novelty lies in the use of Kosugi hydraulic parameters without need for textural information. Kosugi functions were chosen because they are based on physical principles (log-normal distribution for pore size distributions). A link between the Kosugi parameters (i.e., relationship between σ and h_{kg}) was introduced to reduce the number of parameters estimated and to avoid the need for information on the soil texture. This simplifies the procedures and avoids sources of errors related to the use of pedotransfer functions as for the previous BEST methods. Lastly, the method uses a quasi-exact formulation that is valid for all times, instead of the approximate expansions previously used, avoiding related inaccuracy and allowing the use of any infiltration data encompassing or not both transient and steady states. The new BEST methods were tested against numerically generated data for several contrasting synthetic soils, and the results show that these methods provide consistent hydraulic functions close to the target functions. The new BEST method is accurate and can use any type of water retention and hydraulic conductivity functions (Fernández-Gálvez et al., 2019).

Reference

Fernández-Gálvez, J., Pollacco, J.A.P., Lassabatere, L., Angulo-Jaramillo, R., Carrick, S., 2019. A general Beerkan Estimation of Soil Transfer parameters method predicting hydraulic parameters of any unimodal water retention and hydraulic conductivity curves: Application to the Kosugi soil hydraulic model without using particle size distribution data. Adv. Water Resour. 129, 118–130.

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