

Development and evaluation of pedotransfer functions for saturated hydraulic conductivity using an international soil database.

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Soil saturated hydraulic conductivity (Ks) is a key property in hydrological and environmental studies. The measurement of this property is cumbersome and the use of pedotransfer functions (PTFs) has been commonly developed to estimate Ks. The literature brings an extensive number of Ks PTFs, most of which were developed for temperate regions. The presence of soil structural variables in these models is more uncommon when compared to the use of granulometric fractions. The objective of this work was to develop Ks PTFs for a database of tropical and temperate soils that include soil texture and bulk density, as well as a strictly soil structural property, effective porosity [total porosity minus $\theta(300\text{-cm suction})$]. This study also evaluated the performances of the proposed PTFs using a testing database and comparing their predictions to those from seven Ks models used in the literature. The results showed that the proposed PTFs based on effective porosity were in general more accurate and reliable than the proposed PTF based on texture and bulk density, showing also greater reliability than the other models from the literature for different geographic/pedological scales and textural class groups. Soil texture and/or bulk density were generally poor predictors of Ks, particularly with fine textured soils. This study indicates the need to include new predictors in the Ks PTF formulation. In addition, standard and more representative Ks measurement methods, based on an adequate sample size as well, are also required to achieve more accurate Ks predictions.