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Estimating the macroscopic capillary length using steady state infiltration

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The macroscopic capillary length is a critical parameter for the modeling of infiltration in single-ring experiments. Current methods to quantify this parameter either require multiple infiltration experiments, thus increasing effort and potential for error, or laboratory characterization that does not reflect field condition. We propose a simple field method for the estimation of the macroscopic capillary length, λ_c, from Beerkan runs (single-ring infiltration experiment with measurements of initial and saturated soil water contents). In the proposed method, we use the final portion of the cumulative infiltration, corresponding to the steady state of the water infiltration, to develop a reliable predictor of λ_c. The proposed model was validated using analytically generated data along with an experimental database that included 433 Beerkan runs from a wide range of conditions and types of soils. The analytical validation demonstrated the reliability of the proposed λ_c estimates for different soil textures and initial soil water contents. Altogether, the proposed method constitutes a simple solution for estimating λ_c, and it can improve our ability to estimate K_s in the field.