



Analysis of single-ring infiltrometer data: comparison of BEST and Wu method

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Soil hydraulic properties are important for hydrological processes and related contaminant transport. The single-ring infiltrometer provides an easy and low-cost way to measure the field infiltration process, and together with some analysis methods it is often used to inversely estimate soil hydraulic properties. However, the analysis methods for this kind of infiltration data are still poorly understood. This study selected 68 cases within 4 soil texture classes of sand, sandy loam, medium loam and clay loam in Irish grasslands to conduct single-ring infiltration experiments. BEST (only for transient flow state) and Wu (including Wu1 for transient flow state and Wu2 only for steady flow state) analysis methods were used to inversely estimate saturated hydraulic conductivity (K_s), sorptivity (S) and van Genuchten α . Compared with other studies (Clapp and Hornberger, 1978; Schaap et al., 2001) under the same soil texture class, the values of K_s , S and α estimated from Wu1 are reasonable. In addition, Er (the relative errors between fitted infiltration curves and the observed ones) of Wu1 is lower than 10% for all soil texture classes and all of the cases and it is also lower than the corresponding ones of BEST. Er of BEST increases with an increase of initial soil water saturation. Especially for some cases with very high initial soil water saturation $> 99\%$, K_s , S and α presented negative values. It seems BEST is not suitable for very wet environments. From a practical point of view, Wu 1 is also better than BEST because the Wu1 method can work for more cases than BEST does. For many cases especially in sandy soils, BEST can not work due to few data points under transient flow state. Overall Wu1 method is preferred, and Wu2 can be a supplement once cases invalid for Wu1.