EGU22-8703
https://doi.org/10.5194/egusphere-egu22-8703
EGU General Assembly 2022

Testing effects of deviations from theory for beerkan infiltration experiments

Massimo Iovino[1], Vincenzo Bagarello[1], Michal Dohnal[2], and Jianbin Lai[3]
[1]Department of Agricultural, Food and Forest Sciences, University of Palermo, Palermo, Italy (massimo.iovino@unipa.it, vincenzo.bagarello@unipa.it))
[2]Department of Hydraulics and Hydrology, Czech Technical University in Prague, Prague, Czech Republic (michal.dohnal@cvut.cz)
[3]Yucheng Comprehensive Experimental Station, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China (laijianbin@igsnrr.ac.cn)

The beerkan infiltration experiment is carried out by inserting the ring a short depth into the soil and establishing a positive head of water on the infiltration surface for at least a part of the run. Nevertheless, the data are analyzed by assuming a fully unconfined infiltration process (ring insertion depth, d = 0) and a null ponded depth of water (H = 0). The influence of ring insertion and ponded water on an infiltration process of 2 hours sampled every minute was tested in this numerical investigation. Five soils varying from sand to silt loam, three ring radii (5 - 15 cm) and the beerkan specific range of values for both d and H, that is between 0 and 1 cm were considered. The differences between the theoretical (d = H = 0) and the practical (d = H = 1 cm) setups varied from -10.4% and +8.6% for the mean infiltration rate and from -10.2% to +8.3% for the final cumulative infiltration. These differences were small and they decreased by considering a soil dependent ring radius. In particular, nearly negligible differences were detected using a small ring in coarse-textured soils and a large ring in fine-textured soils. In the coarser soils, inserting the ring and establishing a ponded depth of water did not alter appreciably the estimated coefficients of the two-parameter infiltration model with the Cumulative Linearization method since these coefficients differed between the theoretical and practical setups by no more than 9.2%; while in fine soils, linearization could not be possible regardless of the considered setup or it was the use of d = H = 1 cm instead of d = H = 0 that impeded a convincing linearization of the data. In conclusion, the satisfactory correspondence, in many circumstances, between the theoretical and the practical beerkan infiltration experiment reinforced the interest for this simple experiment as a practical means to collect infiltration data in the field. Other numerical tests should be carried out to reach more general conclusions, also considering heterogeneous soil conditions. The numerical results should represent the first step of a wider investigation that also includes laboratory and field experiments.