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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A new technique using the aero-infiltrometer to characterise the natural soils based on the measurements of infiltration rate and soil moisture content" *by* M. A. Fulazzaky et al.

M. A. Fulazzaky et al.

fulazzaky@gmail.com

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Response to Referee #1 Comments

Response to General comments

Even if many research studies may be provided statistical analysis to ensure that data used are valid, it is not always necessary to perform the similar analysis for some cases of such as in this study when time was used as variable. However, the use of

certain models to follow trends in field and laboratory data can be used for reasonable descriptions. In this case study, the measurements of air pressure drop and decreasing water level would be the important considerations to having a good explanation of empirical knowledge and thus the number of location could be not so important when the tests were conducted only at three natural soils. Therefore, I am sure that this manuscript is scientifically sound.

Response to Specific comments

1) Due to the use of aero-infiltrometer to characterise the natural soils is still very rare, the theory and applicability of such device are still not much available in the literatures. However, this study has tried to state some explanations in Introduction related to general assessment of theory of air diffusion into the ground (P. 12721, L. 11-20). 2) The following statement could be inserted into the text, such that: ..... valleys and hilly areas. The effort of extending the applicability of infiltrometric techniques using the Beerkan estimation of soil transfer parameters has been proposed to facilitate the determination of both the water retention curve and the hydraulic conductivity curve (Lassabatère et al., 2006). Still, an alternative measuring device ..... (P. 12720, L.2) and the following reference needs to be inserted into the list of reference, such that: Lassabatère, L., Angulo-Jaramillo, R., Soria Ugalde, J. M., Cuenca, R., Braud, I., and Haverkamp R.: Beerkan estimation of soil transfer parameters through infiltration experiments-BEST, Soil Sci. Soc. Am. J., 70, 521-532, doi: 10.2136/sssaj2005.0026, 2006. It clear that once the aero-infiltrometer has been calibrated for any specific characteristics of the soil, the use of such device can be useful for the determination of infiltration rate and soil moisture content at anywhere of either a flat or a slanted land (P. 12735, L. 12-14). 3) In our opinion, it is not necessary to include much more theoretical support for Eq. (4) since the objective of this research is not extending the applicability of double-ring infiltrometer. The following statement might clarify the questionable message of the sentence, such that: Theoretically, the value of θ can range from 0% when a soil is completely dry to 100% when a soil is fully saturated

(van Genuchten, 1980; Dingman, 2002; Lawrence and Hornberger, 2007) (P. 12725, L. 29 to P. 12726, L. 2). 4). Experimental support for validating the relationship between P and θ in Eq. (5) has been provided in the text. The measurements of air diffusion and water infiltration into the ground were carried out independently (P. 12721, L. 21 to P. 12722, L. 6). 5). This study focused on the use of aero-infiltrometer as a new device applicable for the measurements of f and θ; however, any double-ring infiltrometers used for the measurements of f and θ would be of similar behaviours of water infiltration into the ground since the texture and structure of the soil tested are similar. In addition, typical air pressure dropping rate of the tested natural soils would be useful for characterising the different types of the soil, as one of the objectives of this study. 6). Even if the infiltration tests were conducted from three locations of the natural soil with its different spatial variability, the results obtained show a data trend that is able of tracing the empirical evidence for an experimental infiltration rate curve. Moreover, the typical behaviours influencing by the initial soil moisture content have been discussed (P. 12733, L. 1-12) and validated with the artificial soils of laboratory testing as mentioned, for example, in the discussion (P. 12734, L. 1-23). The results show that some inconsistencies between infiltration rates and pressure dropping rates are evidently true. It is one of the important observations during this study to having a good explanation that air diffusion is quite different comparing with water infiltration into the ground. 7). According to Eq. (3), ïĄą is air diffusion coefficient depended on depth of air movement into the ground per unit of pressure (P. 12725, L. 2-3) and thus variant ïĄą may typify the depth of air movement into the ground per unit of air pressure (P. 12730, L. 15-17). The laboratory test data were conducted to validate that hypothesis made of using parameter ïĄą and β to interpret the properties of the natural soils is still reliable. It appears that this study does not take into account statistical analysis due to time as variable is of the major issues in conducting this research study; however, the use of power models to follow trends in field and laboratory data is useful for reasonable descriptions including the conclusion drawn based on the data of parameters ïĄą and β presented in this manuscript. 8). Discussion is excessively

long due to a need of the detailed explanations on hydrological behaviours must be provided for assessing the different natural soils. The pedant repetition of some results reported in tables and figure captions might be more precise and clear in understanding the messages of the paper.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/10/C6712/2013/hessd-10-C6712-2013-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 12717, 2013.