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Comment on hess-2021-588

Anonymous Referee #2

Referee comment on "Experimental study of non-Darcy flow characteristics in permeable stones" by Zhongxia Li et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-588-RC2, 2022

In this manuscript the authors perform experimental study of non-Darcian flow in four rock samples with different pore size distribution determined by mercury injection experiment. The authors determine the critical specific discharge and pre-Darcian flow regime using q-K curves for the rock samples. The Forchheimer coefficients are also determined form the experiments. It is an interesting work and, in my view, should be accepted after fixing the following minor issues:

1-The effective diameter (d10) of the pores is usually used to predict the permeability. As stated by Hazen (1892), the influences of the finer grain of the soil is more significant on pore space size and hydraulic conductivity comparing to that of coarser grain. In this work, however, mean grain size is used to draw a relation between hydraulic gradient and specific discharge. The authors should comment on this.

2-Lines210-213: The particle size distribution of each sample should be given.

3-Line 238: Izbash (1931) model is commonly used to simulate the pre-Darcy flow (Dejam et al., 2017). The authors should comment on this.

4-Lines 240-245: As another explanation: The pre-Darcy flow may also be due to an influence of the stream potential which generates the small countercurrent along pore walls in a direction opposite that of the main flow (Bear, 1972; Dejam et al., 2017).

References

Bear, J., 1972. Dynamics of ï¬□uids in porous media. American Else-vier, New York.

Dejam, M., Hassanzadeh, H., Chen, Z., 2017. Preâ□□Darcy flow in porous media. Water Resour Res, 53(10): 8187-8210.

Hazen, A., 1892. Some physical properties of sand and gravel, with special reference to their use in filtration, Massachusetts State Board of Health, 24th annual report, Boston, 539-556.