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Reply on RC1

Mahyar Naseri et al.

Author comment on "Effective hydraulic properties of 3D virtual stony soils identified by inverse modeling" by Mahyar Naseri et al., SOIL Discuss., https://doi.org/10.5194/soil-2021-99-AC1, 2021

Referee1 Comment

Understanding the hydraulic properties of stony soils is a valuable research topic. I recommend authors add some laboratory or field-based experimental data to verify the modeling results and strengthen the paper.

Reply to anonymous referee 1

Dear referee 1,

We thank you for the time to review the MS and for your recommendation.

Both, investigating synthetic data obtained from numerical process modeling and investigating real measurements is required to enhance our understanding of the water dynamics in soils containing large amounts of rock fragments. The two approaches are complementary and are necessary to improve our overall understanding of water flow in such systems and the existence and nature of effective hydraulic properties. Investigating 3D numerical models has the big advantage that we know the underlying structure exactly, that we can vary parameters and properties, and that we can realize a multitude of different variants with limited effort, as e.g. shown by Schlüter et al. (2012) [*Schlüter, S., H.-J. Vogel, O. Ippisch, P. Bastian, K. Roth, H. Schelle, W. Durner, R. Kasteel, and J. Vanderborght (2012): Virtual soils: Assessment of the effects of soil structure on the hydraulic behavior of cultivated soils, Vadose Zone Journal 11(3), doi:10.2136/vzj2011.0174.*]. This is the approach that we followed in this study.

Real measurements on the other hand, as performed in previous studies of our group in the lab, are laborious and still of limited significance concerning process understanding. Producing highly reliable data from such systems is a big challenge as e.g. shown by Naseri et al. (2019) [*Naseri, M., Iden, S.C., Richter, N. und Durner, W. (2019): Influence of stone content on soil hydraulic properties: experimental investigation and test of existing model concepts, Vadose Zone J. 18:180163. doi:10.2136/vzj2018.08.0163*]. Obtaining meaningful measurements from field-based experimental data of soils with high rock fragment contents is even more difficult, and involves a huge effort that requires time, resources, and innovative methods to place sensors in the soil, as illustrated e.g. by Stevenson et al. (2021) [*Stevenson, M., M. Kumpan. F. Feichtinger, A. Scheidl, A. Eder, W. Durner P. Blaschke, and P. Strauss (2021): Innovative method for installing soil*

moisture probes in a large-scale undisturbed gravel lysimeter, Vadose Zone Journal 2021; 1–7. DOI: 10.1002/vzj2.20106].

So, in our opinion both, investigating synthetic data and investigating real measurements, are required to enhance our understanding of the soil water dynamics in soils with appreciable content. However, it cannot be treated all in one single publication.