

Comment on soil-2021-99

Anonymous Referee #2

Referee 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-RC2>, 2021

The manuscript describes the results of a set of virtual experiments involving the simulation of water flows through a "soil" with different amounts of spherical impermeable fragments, aiming to correspond to coarse fragments, in order to get data that are then used to assess the characteristics of unsaturated water flow and hydraulic conductivity of a "stony" soil compared to what is defined as the "background soil" (the same soil without coarse fragments).

This approach is smart and makes it possible, at the same time, to test the different models proposed to relate these parameters in stony soils vs. their corresponding background soils, and to confirm the already observed fact in other previous studies, that the simple correction using the proportion of stones is not valid in for hydraulic properties. In this sense, this work adds and supports previous research, and provides solid evidence of the relevance of rock fragments and stones in soil functioning.

In general, my impression is that the manuscript is very well written (both in terms of organization and clarity of the speech), goes to the point without leaving important details aside, and provides a clear description of the process.

My only concern when reading it was related to the possible limitations of the transposition of the results of this work to real soil and field conditions. Authors have considered this topic at many points in their discussion and description of the approach. In particular, two points seem especially relevant to me, from my experience, deriving from the same fact: that the soil matrix in many cases is not "solid" and can expand and contract when being moistened and dried (and therefore, its total and relative porosity can change with drying), and that the contact between the matrix and soil fragments is not

generally at 100% of the fragment surface, with lacunar pores usually existing in the contact. This has consequences in water flows. Authors acknowledge both facts in l. 405-407 and 268-271, respectively.

In this sense, some minor comments that can be done on this ms are:

- In some cases, the term "experiment" is used without the qualifier "virtual" (ex. line 278). This can be misleading, as in reality no true "experiment" was conducted in this study. This "virtuality" should be clear all along the text, as the conclusions derived from this study are in reality derived from simulations, not actual data.

- The discussion on the comparison of the results of the inverse modeling with other models, and in general, with previous studies, has to keep in mind that the data used are based on a set of virtual simulations, whereas it is possible that some of the models were developed based on empirical observations.

Other minor comments in relation to the organization of the ms are:

- The Results&Discussion section is usually easier to follow when split into Results and Discussion sections, but in this case I think it is still clear and easy to follow as it is.

- The conclusions seem more a summary or an abstract in their first half than actual conclusions or take-home ideas of this work. I'd suggest to shorten up this section a bit (or to move the text to the results or abstract section).

