

COMMENTS ON SOLID EARTH SE-2017-8

by Paul Glover

Comment

The author should be congratulated on an interesting paper which promises to be very useful. I have a few points to make, which I hope will improve it further.

1. The Kozeny-Carman relationship is an interesting place to start considering that it suffers the considerable deficiency that it cannot take account of the effect of isolated and dead-end pores on rock permeability. Walker and Glover (2010) discusses this problem in detail, while comparing the KC approach with a number of other approaches. This paper should be cited in any revision.
2. It could be argued that a brief cited discussion of alternative base models (listed in Walker and Glover (2010)) should be inserted into the first part of the paper such that the reader knows that other and better models than the KC model now exist, especially the various versions of the RGPZ model (Rashid et al., 2015a;b; Glover et al., 2006). Nevertheless, I do not think that the choice of the KC model invalidates the paper – it is true that this model is still widely used despite its failings, and any modification that attempts to improve it should be welcomed.
3. The author compares the model against a number of datasets. A table of the main properties of each of these datasets should be inserted before the results such that the reader knows its main properties (mean and standard deviation porosities, grain sizes and grain sizes).
4. The results and discussion of results is fairly meagre and could be expanded.
5. The new model contains 8 parameters. The large number of parameters goes a long way to making the fits to data much easier to achieve. Consequently, it is really important to use the new equation only when all or most of the input parameters are known – if you vary too many parameters until the best fit is observed it is possible to obtain a fit with unrealistic parameters. I feel that this danger should be discussed towards the end of the paper.
6. As this model contains 8 parameters, I think that it would be reasonable to carry out a sensitivity analysis in a section of its own (just before the Results section). In this section there should be a figure or figures that show how the resulting permeability varies as each of the parameters is varied between physically reasonable limits, while the other parameters are held constant at a reasonable value. This section will help the reader understand how the equation works as well as testing the equation's limiting values. The section should also discuss which, if any, parameters have less effect on the resulting permeabilities, and which parameters affect the permeabilities most.

References

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