

This is a review of the paper “Modifications to Kozeny–Carman model to enhance petrophysical relationships” by Amir M. S. Lala. It presents an interesting study where a modification of the famous Kozeny–Carmon equation is given to estimate the absolute permeability from porosity, tortuosity and grain or pore size distributions. Below are my comments and suggestions to improve this paper.

General Comments:

1. One major criticism is that the paper needs to include recent studies in the topic. There are many important and relevant papers that have investigated the KC model and proposed alternative forms. For this, the author needs to bring out clearly what is new in his work. For instance, Nooruddin and Hossain, 2011 did modify the tortuosity in the KC model making it a function of porosity and other parameters. The author here needs to explain his new idea very clearly and distinguish it from previous work.

Specific Comments:

- Eqs 2, 3, 4: citations are needed here.
- In Eq.2 : change q to Q
- Line 72: use the mathematical symbol used in Eq.2 to clearly indicate the definition of tortuosity – it looks as L^{-1} , while you mean (ℓ/L)
- Line 91 – 93: This depends on how you define porosity in the KC model in which it is most likely nothing but the effective porosity which - by definition - accounts for connected pores only (see for instance Nooruddin and Hossain, 2011). However, you define porosity in the KC model as total porosity, including isolated pores, which I don't think is correct, since isolated pores do not contribute to the permeability of the sample.
- Line 118: The idea that tortuosity changes with porosity is not new; other researchers have addressed this point specifically (e.g., Wyllie and Rose, 1950; Winsauer et al., 1952). Other researchers (e.g., Nooruddin and Hossain, 2011) have modified the KC model by specifically modifying the tortuosity term to include the impact of porosity. Please be clear in distinguishing your work from previous studies and show clearly your new contributions.
- Eqs. 10 and 11: indicate why you choose these models over other tortuosity models in the literature.
- Line 134: you mentioned Rudies data but did not give any description of it. I recommend having a separate section on the description of this dataset, especially if it has not been published before, showing main geological features, and including statistical measures. If the dataset has been published, then you need to cite that paper.
- Line-190: from where did you get model's parameters; did you use curve fitting?
- Line – 197: What d value did you use in the normalization? is it a constant value or a distribution? And if it is a distribution, from where did you get it?

- Line-206: As I mentioned previously that the effective porosity should be used in the KC model to be consistent with its derivations which explicitly accounts for connected pores only.
- Line193 – remove “the” before Figure 2.
- Finally, in addition to the above comments, I encourage the author to consider the comments made by Paul Glover in his se-2017-8-SC3-suplement.pdf document. All his comments are valuable; especially comments # 3,4,5, and 6.