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Solid Earth
Discussions

Interactive comment on "Modifications to Kozeny–Carman model to enhance petrophysical relationships" *by* Amir M. S. Lala

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RESPONSE TO REFEREE REPORT(S):

Eqs 2, 3, 4: citations are needed here. Done the following expression for the volumetric flow rate Q through an individual pipe (Faber 1995):

. . . . . (2) can be expressed in terms of the properties of the pipe by the following relations (Mavko et al., 2009): ðİŚ§2 . . . . . (3) Where ï£¡ is the tortuosity (defined as the ratio of total flow path length to length of the

In Eq.2 : change q to Q Done 28 Line 72: use the mathematical symbol used in Eq.2 to clearly indicate the definition of tortuosity – it looks as Lˆ-1, while you mean (\ell/L)

Done

Line 77 Where ï£¡ is the tortuosity (defined as the ratio of total flow path length (ï£¡) to length of the sample (ï£¡)) .

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. Yes sir, The porosity in the original form of the K-C model is the total porosity so I follow the Mavko and Nur 1997 to introduce the term of the percolation porosity.

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. The new of my work is that both equation 16 and 17 which I can use to describe the permeability of tight formations at lower porosity range. Eqs 16 and 17 give a best fit at the lower porosity range (tight formations) 29

Line-190: from where did you get model's parameters; did you use curve fitting? All the model parameters included in the equation 24 by the mathematical derivation and success after that in measured permeability description as shown in figure 6

Line 223: I argue that eqs 16 and 17 give a better match than eq 6 in the lower porosity range. Eqs. 10 and 11: indicate why you choose these models over other tortuosity models in the literature. Because the first one is derived from laboratory experiment and the second from the theoretical and for me I am trust of both models too much.

Line 134: you mentioned Rudies data but did not give any description of it. I recom-

mend 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. Done I provide the table

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 with grain diameter d = 0.250 mm is the best representative value for Rudies formation obtained from the sieve and microscopic analysis.

30 I appreciate for Editors/Reviewers' warm work earnestly, and hope that the correction will meet with approval. Once again, thank you very much for your comments and suggestions.

Please also note the supplement to this comment:
http://www.solid-earth-discuss.net/se-2017-8/se-2017-8-AC2-supplement.pdf

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