

Interactive comment on “Development of a numerical workflow based on μ -CT-imaging for the determination of capillary pressure-saturation-specific interfacial area relationship in two-phase flow pore-scale porous media systems: A case study on Heletz sandstone” by Aaron Peche et al.

Anonymous Referee #1

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Authors Peche et al. have submitted the manuscript (ms) entitled “Development of a numerical workflow based on μ -CT-imaging for the determination of capillary pressure-saturation-specific interfacial area relationship in two-phase flow pore-scale porous media systems: A case study on Heletz sandstone” to Solid Earth Discussions.

The authors present a finite element numerical model to describe and simulate fluid-

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fluid interfaces using μ -CT obtained pore geometries for multiphase flow problems. The model is applied to a study area of a sandstone environment in Heletz, Israel. It is concluded that this model may be applied to CO₂ injection operation planned in the Heletz reservoir, and to apply the new model to other larger areas.

This ms is very well and clearly written. The approach and methodology are thoroughly explained. The model is validated and applied to a real field study. Figures are of good quality. That being said, I would like to see more discussions on prior studies in the Introduction. A one-page intro is not able to adequately set the scene for this new research. The authors should more thoroughly discuss relevant prior studies and more clearly articulate the objective of this ms including the novelty of this ms. For these reasons, which I will outline in the General Comments below, I recommend acceptance of the ms with minor revisions.

General Comments

1. Introduction. The authors almost always point to existing work without giving a brief overview of already existing findings. This should be changed so that the reader understands the knowledge gap that the authors will be filling. The ms is not too long, therefore adding another page or two to the introduction will increase the value of this ms.
2. There are numerous commas missing, which should be corrected. The authors are using punctuation in equations, which should be avoided for clarity. Some equations (e.g. (7)) are not referenced, which should be added. Check all “whereas”, which should mostly be “where”.
3. Eq. (1). I think there is something wrong in Eq. (1): You are adding nabla u and its transposed form, which does not work. The result is added to pI, which is a matrix. F is a vector, so the expressions on the RHS are all vectors? Is this consistent with the LHS?

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4. Eqs. (3) and (4). Please clarify in the text before, which equation does what.

5. P15L13. u is a vector, therefore a “velocity gradient” does not exist. Do you mean velocity difference? How do you calculate that difference when u is a vector?

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