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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Sensitivity and identifiability of hydraulic and geophysical parameters from streaming potential signals in unsaturated porous media" *by* Anis Younes et al.

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We thank the reviewer for his/her detailed comments that helped us clarify the manuscript and avoid misinterpretations.

The authors performed modelling of fluid flow in a charged porous media. They used Global Sensitivity Analysis (GSA) and parameter estimation to assess the effect of hydraulic and geophysical parameters on the streaming potentials. The subject is interesting, important and useful and deserves to be published. We thank the reviewer for his/her positive appraisal of the subject of our work. However, there are still some key points need to be addressed. This reviewer recommends to do some revision

taking into account the below comments.

1. A section should be added for the numerical how to solve Eqs. (1-7), such as grid strategy, discrete method and converge criteria. If use a commercial software, the software needs to be cited. We agree and add a new section describing the numerical solution of the Eqs (1-7). The solution is based on the Finite volume method coupled to a higher time integration scheme. The temporal discretization of the obtained nonlinear ODE/DAE system is performed with the method of lines (MOL) using the DASPK (Brown et al., 1994) time solver. The MOL is suitable for strongly nonlinear systems since it allows high order temporal integration methods with formal error estimation and control (Miller et al., 1998; Younes et al., 2009; Fahs et al., 2009, 2011). In the current study, the relative and absolute local error tolerances are fixed to 10-6. A mesh sensitivity analysis is also performed to ensure a mesh independent solution.

2.Line 141, this section is the test case, and therefore, this should not be called conceptual model. Furthermore, a schematic of the test case should be added to show main dimensions and boundaries

We agree, change the title of the section and add a schematic figure of the test case.

3. Line 162, what is "the standard finite volume method"? Finite volume method is a big family to solve partial differential equations, such as a first-order and second-order approximation/discretion. This sentence is removed from the revised version since a new section is added dealing with the finite volume discretization of the system of equations (see comment 1).

4. Although the authors have performed a good review of literature of streaming potential signals, other literatures of unsaturated porous media should be introduced, such as Deng and Wang, Saturated-unsaturated groundwater modelling using 3D Richards equation with a coordinate transform of nonorthogonal grids, Applied Mathematical Modelling 2017, 50: 39–52. We agree and add new references related to numerical solution of Richards equation in the revised version.

Please find attached the revised version of the paper.

Please also note the supplement to this comment:
https://www.hydrol-earth-syst-sci-discuss.net/hess-2017-730/hess-2017-730-AC1-supplement.pdf

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