

Interactive comment on “Flexible parallel implicit modelling of coupled Thermal-Hydraulic-Mechanical processes in fractured rocks” by Mauro Cacace and Antoine B. Jacquey

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My sincere apologies for the extremely late comment. I have read the manuscript with great interest and I think it does fit the scope of the journal and should be published following some minor to moderate revisions. My main comment concerns the presentation of the mechanical model, with the detailed emphasis given in the algorithmic implementation of the plasticity algorithm without being used at all in this manuscript. This confuses the reader who expects to see an application using the return map described in detail without delivering it.

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i would recommend the authors to remove the discussion about plasticity, keep the model elastic and put more emphasis in the excellent geothermal example of paragraph 4.5. In its present form, the paper is weak in the sense that most of the benchmarks described already exist in the tensor mechanics module of MOOSE and as such they do not really deserve to be in the main text of a novel contribution. The geothermal example however, is novel and impressive and deserves its own section and some more detail to be added.

On a minor note, it would be nice to acknowledge other modules that are doing fully coupled THMC with thermo-hydro-chemically sensitive plasticity, like REDBACK. We have just released the first works that I think deserve to be mentioned in the literature review section of this contribution:

1. Poulet T. and E. Veveakis, 2016. A viscoplastic approach for pore collapse in saturated soft rocks using REDBACK: an open-source parallel simulator for Rock mEchanics with Dissipative feedBACKs, *Computers and Geotechnics*, 74, 211-221, doi:10.1016/j.compgeo.2015.12.015
2. Poulet T., M. Paesold and E. Veveakis, 2017. Multiphysics modelling for fault mechanics using REDBACK: A parallel open–source simulator for tightly coupled problems, *Rock Mech. Rock Eng.*, 50(3), 733-749, doi: 10.1007/s00603-016-0927-y

I do not expect the authors to need more than a few weeks to address these points. Other than that the manuscript is very well written and should get published in *Solid Earth*.

Regards, Manolis Veveakis

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