Solid Earth Discussions

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Comment on se-2021-114

Philip Benson (Referee)

Referee comment on "Creep of CarbFix basalt: influence of rock–fluid interaction" by Tiange Xing et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-114-RC1, 2021

Creep of CarbFix Basalt: Influence of Rock-fluid Interaction

By Xing et al.,

- A review

This paper presents an innovative suite of experiments investigating the link between creep in basalts in the presence of pore fluids and dissolved CO2. It is a novel contribution to the literature and pertinent to the study of CO2 sequestration within basalt via chemical (carbonation) reactions. The paper is well written, comprehensive in scope, and a pleasure to read. I have only a small number of minor, mostly technical, queries:

- Line 72: Maybe reference Heap (2011) here as well? (it is in the reference list) as I don't think creep in volcanic rock is a particularly common laboratory case study.
- Line 167: Small edit required, Load is measured in kN, whereas MPa is stress, so I suggest a minor edit to used either one or the other.
- Line 199, figure 3 (and line 214). I panel (e) it would help me (and I hope the reader in general) with an annotation or two? Especially as some of those colours are similar – the fluid and conditions could usefully be added as a note on the plot.
- Section 3.3, in addition to the changes in permeability with effective pressure for the three samples (fig 6a-6c) can the authors say anything about the change in the initial permeability (at 0 MPa), which also seems to decrease as we move from 23C with just water, to water/CO2 (closed) and then to water/CO2 (open)?
- Section 3.4.2 and figure 9: the seismic *-b* value data is interesting, but with only a few data points per experiment for fitting the line of best fit, I do have a concern regarding the scatter and fit (in figure 9). Do the authors have any sense for the error of the *-b* value trends presented here? If so, they ought to be discussed as there seems visually to be some degree of overlap between the experiments.

- Line 425: The text references figure 14, but I think this refers to fig 13 on page 16?

Philip Benson, Portsmouth/UCL, September 2021