

Interactive comment on “Uncertainty in fault seal parameters: implications for CO₂ column height retention and storage capacity in geological CO₂ storage projects” by Johannes M. Miocic et al.

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This paper makes a useful contribution to the discussion around the security of CO₂ storage sites. Its findings that the fault seal calculations approaches conventionally applied to leakage of CO₂ through faults that are based on those developed for hydrocarbon systems are actually not entirely suitable for CO₂ should be modified. The author's findings that the influence of fault rock composition and depth (CO₂ phase) have a greater impact on fault seal calculations for CO₂ leakage certainly should be accounted for. I have a few minor comments:

In your abstract your statement of your findings around line 15 is not as clearly stated

C1

as it could be – especially with regards to your finding that fault composition is important and it may be worth moving your sentence beginning “In contrast to hydrocarbon systems higher phyllosilicate...”. To before your sentence beginning “However, the wettability of the carbon dioxide system is highly sensitive...” only to make your point that increasing phyllosilicate may not result in the expected increase in fault sealing for a CO₂ system.

Page 2 line 2 – while I agree that faults are ubiquitous in sedimentary basins, I would like to see a little more information provided on their extent, distribution, and scale, especially the impact of faults that are below seismic resolution. Page 2 line 10 – faults can provide fault parallel flow for impermeable units as well? fig 1c if you are suggesting flow through the fracture – if you are not suggesting fault flow then you may need to reword this section and figure.

Page 2 line 28 – “will accumulate underneath the flow barrier until breakthrough occurs due to the increase in pressure within the reservoir” what do you mean by breakthrough? Capillary, spill point, induced fracturing? Can you be clearer with this statement? Page 3 line 30 – perhaps add the word seal before “rocks.” Page 4 line 6 – you slightly contradict your statements at the end of page 3 where you infer fine grained rocks have small pore as page 4 states “Due to the heterogeneous nature of rocks the size of pores within the sealing rock (fault rock or cap rock) varies” Page 8 line 5 – I would remind the reader that equations 5 to 9 are the three different author approaches (Bretan etc) as that is how you refer to them in the subsequent modelling discussions. Discussion section – I would like to see a clearer statement of your findings and a more logical layout to your discussion as it is quite challenging to pick out the pertinent information- rather than saying it “strongly influences” – I would like to see clearer statement of what the influence such as increasing phyllosilicate fault rocks results in one third less CO₂ stored - to make your findings clear from the start of this section which can then lead onto the detailed discussion of the reasons why.

C2

