

Interactive comment on “Revisiting ocean carbon sequestration by direct injection: A global carbon budget perspective” by F. Reith et al.

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Please see attachment for response to reviewer#2

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Response to Reviewer#2

Responses in Italic

First of all, the authors thank Prof. Christoph Heinze very much for his thoughtful and constructive comments and advice.

The manuscript investigates the effect of direct oceanic water column CO₂ injection on the redistribution of carbon under a high emission scenario following RCP8.5 its extension to 2300/2500 according to Meinshausen et al. (2011) and keeping emissions at a constant value until year 3020. The authors employ an Earth system model of intermediate complexity (UVic EMIC) and a standard protocol for prescribing the CO₂ injections. The study goes beyond the state-of-the-art by confronting not only an ocean biogeochemical model (with atmospheric reservoir) but a coupled Earth system model including also a terrestrial biosphere component (and a simple atmosphere representation) with ocean CO₂ injections. The model runs are carried out in a technically correct way as far as one can judge from the description. If I am not mistaken, the main result of the study is the following: CO₂ injection does not change the control run result for land carbon storage in a significant way for the forcing and injection protocol as applied. The last sentence in the conclusions (l. 348-350) maybe true in general but is hardly backed up by this particular study. The CMIP5 inter-model spread in land carbon storage change is much larger at year 2100 (Jones et al., J.Clim., 2013) than the amount discussed here as caused by ocean injection of CO₂. The manuscript confirms previous studies: A part of the injected CO₂ will outgas at a certain point in time, leading to less than 100% efficiency of the injection with respect to keeping anthropogenic excess CO₂ isolated from the atmosphere.

Yes, we agree with the reviewer that the universality of the last concluding sentence is not completely backed up by our study. This would have required the comparison of the injection simulations with and without the land module. We will rephrase the last sentence of the conclusion, accordingly.

The comment related to the CMIP5 inter-model spread in land carbon storage change is discussed below.

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Fig. 1. Response to reviewer#2

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