

***Interactive comment on* “Dissolution of calcium carbonate: observations and model results in the North Atlantic” by K. Friis et al.**

K. Friis et al.

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We thank Prof. Dr. Anderson for his review in response to which we have added more information in the text, and reworded some sentences for greater clarity. We hope that we have properly addressed all of Dr. Andersons’ comments as follows:

We basically agree that the model study is not the main argument for our findings in the open subpolar North Atlantic. We have clarified this now in the abstract and the main text. We also note in the conclusions section: “However, as pointed out before, the results of our model study could be improved in terms of the strength of the excess alkalinity signal. We believe that the excess alkalinity distribution would change if the model circulation was improved, and we suggest that further model studies are conducted with other circulation models.”

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Following the recommendation of Prof. Anderson we also clarify in the introduction that our investigation is not addressing CaCO₃ dissolution in the sediments of the continental margins: “We want to note that our study does not investigate calcium carbonate dissolution in marginal sediments of the continents, which is a different topic.”

Prof. Anderson asks with regard to Page 1721, line 14: “The model balances the buried carbonate particles by a source of alkalinity in the surface water. How does this impact the model dissolution state of the water column?” - We actually do not know about this. The saturation state would also change over time because more and more alkalinity would be removed from the oceans. Hence the saturation state for CaCO₃ would become higher everywhere in the water column with time. Without having a re-supply of the surface ocean with alkalinity by this mechanism the total amount of ocean alkalinity would decrease and ocean alkalinity could never reach steady-state. The mechanism we are using in our model is, literally speaking, an easy way to balance for riverine input of alkalinity to the ocean. Rivers are not included in the model (for more details see Friis et al. 2006).

Friis, K., Najjar, R. G., Follows, M. J., and Dutkiewicz, S.: Possible overestimation of shallow-depth calcium carbonate dissolution in the ocean, *Global Biogeochem. Cycles*, 20, GB4019, doi:10.1029/2006GB002727, 2006.

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