



EGUsphere, referee comment RC2
<https://doi.org/10.5194/egusphere-2022-161-RC2>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on egusphere-2022-161

Anonymous Referee #2

Referee comment on "Benthic alkalinity fluxes from coastal sediments of the Baltic and North seas: comparing approaches and identifying knowledge gaps" by Bryce Van Dam et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-161-RC2>, 2022

The authors measured alkalinity fluxes and other related geochemical parameters in North Sea and Baltic Sea sediments. A key strength of the study was the use of a wide variety of approaches to estimate alkalinity fluxes. The work is interesting and topical given the possible role of alkalinity production in mediating CO₂ uptake in the coastal ocean. Overall, although the text was generally well written, this work felt like a rough draft rather than a polished manuscript ready for submission. The tables and figures were generally poor quality in terms of their visual appeal and ease of interpretation. The methods were incompletely described and the results and discussion unfocused.

Specific comments

Ship board incubations – I don't understand why fluxes of DO, TA and DIC (and nutrients) were not measured in these incubations? This is probably one of the most common approaches (along with chambers) for measuring fluxes.

Methods what was the precision of the TA analysis and all other methods?

I don't think the fluxes presented for Fe, Mn, Ca, H₂S, K and HSO₄ (SO₄²⁻) were meaningful as these solutes either oxidise (H₂) and precipitate (Fe, Mn), or the small concentration differences between the sediment and the water column are probably random (especially without information on precision).

Figure 2 and others. Label the x axis!

Figures 3 and 4 are a bit overwhelming and hard to interpret. Can the authors find a way to present the data more clearly (this will be easier when the analytes noted above are dropped).

Results and Discussion

I would suggest that results and discussion be separated. This will allow a more focused discussion on the key points of interest. At the moment there is a lot of focus on details and jumping across different ideas. What are the key factors controlling alkalinity production based on your data set? It might be helpful to separate muds and sands into different sections.

I don't think the PCA plot helped us understand the geochemistry here. This approach is useful when the a-priori mechanistic links between variables is unclear. I think the links between the geochemical variables here are well known and understood and the interpretation of the PCA plots just re-iterates this understanding.

The miller-tans plots suggest carbonate dissolution is important, particularly in the North Sea sands. It is noted this contradicts low porewater Ca concentrations, but I doubt if the method has sufficient precision to really make this assessment. Also, it is likely dissolution and precipitation are occurring simultaneously?

Conclusion

Pyrite burial is suddenly mentioned as a factor in alkalinity production with no prior mention in results or discussion.