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Discussions

EG

Interactive comment on "The influence of ocean acidification on nitrogen regeneration and nitrous oxide production in the North-West European shelf sea" *by* D. R. Clark et al.

Anonymous Referee #1

Review BG The influence of ocean acidification on nitrogen regeneration and nitrous oxide production in the North-West European shelf sea D. R. Clark, I. J. Brown, A. P. Rees, P. J. Somerfield, and P. I. Miller

This is a very interesting paper on N-cycling and the impact of OA on microbial processes based on an extensive data set from European shelf, a 8000km long cruise track. The study provides a good understanding of N assimilation and N- regeneration in these waters in spring / early summer. Interesting results and conclusions are present. As such this is already a complete paper deserving publication and a more thorough/detailed discussion of rates and environmental constraints at the stations. However, the authors add another set of incubation experiments where they amended

the water with CO_2 to produce scenarios of OA at 5 selected stations during the cruise and put focus on this issue throughout the manuscript. From this data set, there is no significant impact to be seen on the N-cycle processes. Although a comparison of in-situ conditions along with OA experiments is a good approach, I would, in this case advocate for a separation of both or the omission of the OA study. Moreover, the focus of the paper and the title should be shifted away from the OA issue to the field data set (4 out of 11 figures are concentrating on the OA study- the others 7 deal with the field sampling). It would add a great deal of information and a good connection of both aspects if the authors could provide pH, DIC or TA data from the various cruise station sampled.

1) It would certainly be helpful for the reader who wants to understand the details of the method to give some introduction to the paragraphs and what they are about. For non-specialists the methods approach is confusing e.g. sentences like "The concentration and isotopic enrichment of NO_2- was determined by synthesizing sudan-1 in sample volumes of 100–200mL depending on ambient concentration, as described below." What exactly was done, what is sudan-1 and why not measure NO_2- concentrations with standards methods and the isotope enrichment with diffusion or denitrifier method? If the new sudan-1 method is used to be able to decrease the limit of determination, please add a sentence in the method section.

2) Also, why was the SPE method choosen - due to the low concentrations? And if the concentrations where too low for standard methods how can you be sure to have everything captured on the columns/resin (?) and how did you double-check? Please add a rate of rediscovery for the pre-concentration using the resin.

3) The statistic applied is all fine and suitable to detect patterns in large data sets. What is lacking here is clear hypothesis concerning the variables which are supposed to correlate with others for a specific reason. "an attempt to identify links between nitrogen 5 cycle process rates and environmental variables" is not specific enough.

4) Would it be possible that the low estimates of N2O saturation are a result of a steady state in the water column with production and consumption at an approximate balance? (page 3136 lines 11-21).

5) Can you say anything about the quantitative effect of the storm event – was more PON produced and was that related to the nutrient uptake. Moreover, which area was affected by the storm event? (page 3137)

6) The lack in statistically significant relationship between processes and the environment could also be due to missing variables? E.g. the light regime which may have been important was not measured at all stations...Please discuss this issue.

7) I am confused by the statement about the spectral light quality and that it may have differed so much in the field – usually bottles are neutral to light spectra. (page 3139 lines 19-269).

8) The authors used short term incubations (max. 96 hours) to investigate CO2 effects on nitrogen cycling. Please discuss the lack of pre-incubation time and the possible disadvantages of short term experiments which might explain the lack of significant effects (e.g. lag growth phase).

9) To link field data and the OA experiment a set of carbonate parameter from the field stations would be helpful (e.g. pH, DIC).

Minor details Typo line: Riebesell Figure 2 lacks readable color bar Figure 3 the x axis may have some indication of where the ship was and dates not just km.