

Interactive comment on “Impact of bottom trawling on sediment biogeochemistry: a modelling approach” by Emil De Borger et al.

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General comments The manuscript by De Borger et alii addresses the still debated (partially controversial) issue of bottom trawling impacts on sediment biogeochemistry. Using a modelling approach based on the implementation of an early diagenesis model (OMEXDIA), parametrized for five different settings in the North Sea, this study provides evidence that increasing bottom trawling frequency can result in increased oxygen and nitrate concentrations in surface sediments, counterbalanced by a net loss of ammonium and organic C down to 10 cm depth in the sediment. The model output showed also a net decrease (up to 28%) of total mineralization rates because of bottom trawling, even in the case of trawling gears penetrating just the top few centimetres of the sedimentary column. Sediment resuspension and C removal associated with bot-

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tom trawling were identified as the most probable putative causes for the decrease of mineralization rates in trawled sediments.

The authors have been successful in providing a clear background of the available knowledge on the topic and gave an honest and complete credit to previous studies dealing with the same issue. This allowed them to provide a clear identification of the aim of their study, starting from the to-the-point and concise title. Also, the abstract is informative and mirrors accurately the contents of the manuscript and its main conclusions. The structure of the manuscript is clear and the language fluent as well (at least for a not-mother language speaking reader like me). The initial assumptions are valid, the modelling methods and tools used for data analysis are also appropriate and properly used. All figures are clear and necessary and the tables are all informative ((but see below the technical suggestions).

Overall, this elegant study represents an important contribution to the specific topic, which definitely fits the scope of BG. The paper provides robust cues which, altogether, allow to (partially) unravel the contradictory results obtained by different studies addressed to identify the effects of bottom trawling on sediment biogeochemistry.

Specific comments Overall, the results support the interpretation of the differences in biogeochemical responses to bottom trawling carried out with different gears, in different environmental contexts and with variable frequency.

Despite this, I guess that the authors should make an effort to better explain how the bioturbation rates were calculated. As far as I can see, this information is not fully included in the manuscript and this could be crucial to understand how much and whether the abundance, biomass and (functional) diversity of the benthos in the parameterisation sites have been taken into account. In my opinion, this information is also necessary because the results, though contextualized according to the different sediment granulometry of the experimental sites and C fluxes, do not seem to have been analysed eliminating the covariate effect of water depth, which controls benthos

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abundance, biomass and diversity, which, in turn, could respond differentially to bottom trawling disturbance (as indeed postulated in the discussion).

As mineralization rates, as correctly postulated in the manuscript, are dependent also on the relative importance of refractory and labile/semi-labile fractions of OC, it could be interesting to see addressed the effects of bottom trawling on the two fractions, though this could be the object of a “sister” manuscript.

Technical suggestions: Despite all of the figures are necessary and informative, a (qualitative) graphic panel of differences and tendencies of mineralization rates along the trawling frequency gradient in the different environmental contexts (sediment type and depth) would help a lot the general reader to recap the results.

The number of tables could be reduced, moving some of them in the supplement material.

Figures' and Tables' numbering (and their order of reference in the main text) need an accurate check and correction.

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