Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2017-417-RC1, 2017

Biogeosciences Discussions

Interactive comment on "Functional trait responses to sediment deposition reduce macrofauna-mediated ecosystem functioning in an estuarine mudflat" *by* Sebastiaan Mestdagh et al.

Anonymous Referee #1

Received and published: 29 November 2017

Mestdagh and co-workers conducted a laboratory experiment with intact, field-collected cores of intertidal mud to investigate the effects of freshly deposited layers of inert (devoid of organic matter) mud on the structure of the mud's macrofaunal assemblage and the mud's total oxygen consumption. To link the structural with the functional effects of these layers, the authors assessed additional variables: the contributions of species' particle displacement and burrow irrigation to the overall bioturbation of the mud, the oxygen flux across the diffusive boundary layer of the visible mud surface, and the infaunal respiratory oxygen demand. They found that depositing a layer of

inert mud on the surface of mud cores altered the structure of the resident macrofaunal assemblage and so the fauna mediated supply of oxygen to the mud core. They then stress that measures of taxonomic diversity fail to explain the observed functional changes whereas considering species behaviour (functional traits) can lead to mechanistic understanding.

I enjoyed reading this manuscript. Below, please find few requests for clarification.

Page 3, line 22: I understand that a deposit of fine, cohesive sediment will decrease the supply of dissolved oxygen to the deposit-underlying sediment and so decrease the decomposition of organic matter in this sediment with oxygen as electron acceptor. If so, the contribution of anaerobic pathways to the overall decomposition will increase and the upwards diffusing reduced soluble end-products of this decomposition will likely be oxidised with oxygen at the oxic–anoxic boundary somewhere inside the deposit or in the deposit overlying seawater. That is, the re-oxidation of reduced substances (line 24) is not inhibited but simply relocated. Of course, this would not apply for reduced solid phases, but this perhaps needs to be clarified.

Page 4, line 5: In my book, bioturbation includes the displacement of particles and the irrigation of burrows. In line 5, it reads 'bioturbation or bioirrigation', so I assume that the authors do not consider burrow irrigation as a form of bioturbation. Perhaps this needs to be clarified as well.

Page 4, line 27. The authors state that their control (T0) did not receive a layer of pre-treated sediment. In line 30, however, they explain that the control did receive a 0.5 cm frozen mud cake, which consisted of pre-treated sediment and luminophores. How did this layer affect the mud–seawater solute exchange and the behaviour of macroinfauna? I feel the authors should discuss this.

Page 5, line 3. The deposit was free of organic matter, so its oxygen demand must have been low increasing the penetration of oxygen into the layer. How do the authors know that this deposit 'prohibited (passive) exchange of dissolved oxygen between

the sampled community and the water column'? Did you measure the penetration of oxygen into the freshly deposited layers with microelectrodes and did you find the oxic–anoxic boundary somewhere inside the layer? If so, how did the four different deposits (0.5, 1, 2, 5 mm) perform in regard to this penetration?

Page 5, line 33. Here, BMU is defined as 'biological-mediated oxygen uptake'. I found this misleading because biological mediated oxygen consumption is also included in estimates of DOU, that is, the consumption by bacterial processes, micro- and meio-fauna. I believe that this contribution to the overall sediment oxygen consumption should be termed 'macrofauna mediated oxygen uptake'.

Page 8. Please consider moving numbers in parentheses to a table; this would improve the readability of your text.

Page 8, line 37. 'biotic-mediated oxygen consumption'. See comment above and please use terms consistently.

Page 9, lines 14–28. I recommend moving this section to the introduction, so the discussion starts with your results.

Page 9, line 31. Please show the oxygen penetration data in the Results section.

Page 23, line 6. 'benthic-mediated oxygen uptake (BMU)'. See comment above and please use terms consistently.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2017-417, 2017.