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Biogeosciences Discussions

Interactive comment on "The influence of hypercapnia and macrofauna on sediment nutrient flux – will ocean acidification affect nutrient exchange?" *by* H. L. Wood et al.

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Reply to referee 2

The authors would like to thank reviewer 2 for their recognition of the importance of the study area with respect to ocean acidification, and also for their comments which we have addressed in detail below.

Referee: In the discussion section, the authors mentioned that "rather the effect of hypercapnia and lowered pH on bacteria and microphytobenthos may have been greater significance in understanding the changes to nutrients fluxes seen here". I recommend that authors including bacteria and microphytobenthos abundance data. This data ex-

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ist? Could you tell me why the authors suggested that bacteria and microphytobenthos are important in the study, without data?

As is also picked up by the other reviewers, the discussion identifies MPB as playing an important role in our results; however, as we state in our response to reviewer 1, we have not measured this. We reiterate that, while we believe this to be the most probable 'missing link' in the explanation of our results, the response of the reviewers highlights that we have placed this explanation too centrally within our findings to the point where it appears as a conclusion of this experiment- and thus requires evidence. We did not measure MPB levels/activity, and unfortunately are not aware of any definitive publications on sediment from the area of this study. We reiterate that MPB is likely to be the missing link from the flux equations that we carried out however we will readdress and restructure the discussion so that this is highlighted as a possible explanation requiring further investigation. We do not feel that this detracts from the important and primary findings of this manuscript, namely the quantification of the role Amphiura filiformis plays in sediment nutrient flux, and how this may be impacted by ocean acidification.

Referee: It is known that change in the pH should be a great effect on the physiological rates, in particular on calcified organisms in the seafloor such as bivalve, ophiuroids and echinoids).AF is a well distributed and abundant brittlestar, which probably should be more sensible to pH change with the time. If so, under experimental conditions of this study, it is possible that nutrient fluxes rates were affected more due to bioirrigatory activity rather than physiological responses (oxygen uptake)?

If nutrient flux rates were solely a function of bioirrigatory activity then in each case there would be a relationship between animal density and flux rate. However the results were not this clear, and in several of the nutrients the effect of density was not significant, or was altered in conflicting ways with respect to different nutrients. In the case of nitrate there was an A.filiformis density dependant response, however this was only exhibited at lowered pH. Such conflicting responses do not suggest that purely

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bioirrigation was responsible for the results seen, nor that a change in bioirrigation as a result of pH had a blanket influence on the flux of all nutrients measured. We do agree with the reviewer though, particularly in light of previous work which found arm muscle wastage at low pH which is likely to impair bioirrigation, that changes to bioirrigation are likely to be partly the cause of our results as indicated by the sentences P.2400 L.4 – 17. We feel the reviewer has highlighted an important avenue of explanation that we have not utilised fully and we shall expand this in the revised version of the manuscript discussion.

Interactive comment on Biogeosciences Discuss., 6, 2387, 2009.