

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.

Anonymous Referee #3

Received and published: 11 May 2009

General comments.

In another recent paper (Wood et al. 2008) the authors have detected a very interesting and significant negative impact of elevated CO₂ on the physiology of *Amphiura filiformis*. As this species is well known as an important “ecosystem engineer”, the present study was undertaken to investigate how sediment-water nutrient fluxes might be affected by acidification directly or indirectly via the impact on *A. filiformis*. In general the impact of animal density and pH was surprisingly modest, considering that the highest densities applied compared with the highest ever recorded in situ (16 animals in a 10 cm core makes 2037 m⁻² to compare with max 3000 m⁻² in situ (p.2390, l. 23))

C369

and that the lowest applied pH (6.8) was way below the forecasted marine pH of 7.3 in year 2300 (p. 2388, l. 13).

I am not familiar with the chosen statistical approach (Table 2), and my evaluation is therefore based on the underlying data, which are all shown in Figures 1-3. Except for ammonium, a net sediment uptake of the nutrients was observed many times (Fig. 1-3), meaning that the inlet water must have contained nutrients. Without knowing these concentrations it is difficult to fully discuss the observed net sediment-water fluxes. The weak impact of the animals was surprising when compared to other studies. Could it be due to starvation, as this suspension feeder was served nothing but filtered sea water for more than 40 days?

The complete change of the sediment from a nitrate sink to a nitrate source at the lowest pH (Fig. 2) was the most significant and also a most unexpected result, as nitrification should be the more acid sensitive process (p. 2402, l. 10). To explain that, the authors introduce microphytobentos (MPB) in Discussion as some possibly more sensitive organisms, which at the higher pH values might have masked nitrification by their nitrate assimilation (p. 2400, l. 3-6). In Materials & Methods and in Results, however, there is no indication of any presence and activity of MPB in this experiment! Other much less significant and consistent trends found in the data set - and lacks of expected trends - are discussed in a similar way (p. 2396 – p. 2404). There are simply all too many unmeasured processes at hand which can generate or consume nutrients, and thereby provide an assortment of explanations to the observed net fluxes. The conclusions of the study are therefore weakly supported by the presented data.

To reach solid conclusions about the importance of ocean acidification to sediment biogeochemistry it is probably required making experiments which both simulate realistic, complex conditions and monitor single processes and key community members.

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

C370