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Interactive comment on "Vertical activity distribution of dissimilatory nitrate reduction in coastal marine sediments" *by* A. Behrendt et al.

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We would like to thank the referee for his/her comments and suggestions on our manuscript. Below we provide a point-by-point response to the reviewer' comments and indicate how and where we will modify the manuscript.

SPECIFIC COMMENTS

Anonymous Referee #2: 1) 8066, Line 4: It would be nice to list the different marine sites in the abstract so that the readers already see that this manuscript is covering a wide range of habitats. Otherwise, people might just assume 5 different sites within a given location.

Authors: Information was added in line 30/31.

Anonymous Referee #2: 2) Ex. 8066, Line 23; 8067, Line 3: The words "they, them, their" should never be used unless speaking about a person or group of people. I know that many authors do this incorrectly, but it's a bad habit that one should try to break.

Authors: We changed the sentence and removed "they" from it. See changes in line 57 and additional changes on this (line 98, line 340).

Anonymous Referee #2: 3) 8069, Line 18: Why was 15 deg C used when some cores come from temperatures of 2.9 and other 30.5? Wouldn't it have been best to store cores at in situ temperature prior to sampling, especially overnight and not just an hour or so?

Authors: You are right in stating that the storage under this huge temperature changes would not have been the best choice. Reviewer #1 also notices that in his/her revision. However, as the storage over night at 15°C only occurred for the sediment from the Limfjord, which thereafter was anyway incubated at 15°C because the in situ temperature was 16.6°C, we removed this misleading sentence in the revised manuscript version (line 129).

Anonymous Referee #2: 4) 8070, Line 24: Many scientists are no longer trusting the acetylene inhibition technique, saying that the inhibition is not complete and therefore does not provide accurate rates. Personally, as incomplete inhibition would simply mean an underestimate of rates, I don't fully see the problem. However, I think it would be advantageous to the authors if they included a small section here stating the limitations of this technique and how that may or may not impact the results of this study.

Authors: We deal with the limitations of this method both in a newly added paragraph in the M+M part (line 202-211), and in the discussion part (see line 467-469).

Anonymous Referee #2: 5) 8071, Line 22: I am guessing that sulfide levels were low enough as to not interfere with microsensor measurements (as sulfide is know to

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disrupt the N2O microsensor).

Authors: Please see coming answer on this for question to page 8077, line 19.

Anonymous Referee #2: 6) 8073, Line 10: Was it too difficult to press porewater or to use rhizons to collect porewater? I'm guessing it's because the slices are so thin.

Authors: As you already assume right, we wanted to have a vertical profile resolution higher than can be achieved by using rhizons. Additionally, in sandy sediments like those collected at Dorum and Janssand, not enough porewater was available for using a porewater press. The method of cutting the subcores into thin slices and adding nutrient-free water of the respective salinity seems to be the more appropriate method for our purposes.

Anonymous Referee #2: 7) 8077, Line 19: Sulfide concentrations this high surely would have messed up your microsensor readings. Did you do something to help counter this that perhaps I missed in the methods section?

Authors: To overcome the problem of possible interference of sulfide in the sediment cores with the microsensors, especially NOx and N2O, we first measured the H2S concentration profiles in the samples. Only in sediment collected at Limfjord and Janssand, high H2S concentrations were encountered. Here, NOx measurements were immediately stopped when the profiles indicated that NO3- was completely depleted; at these depths, sulfide concentrations were still quite low (26 $\pm$ 57 μmol L-1) and the NOx microsensors were not harmed (checked by calibration). N2O profiles were measured down to a depth of 8 mm where the H2S concentration was only 98 $\pm$ 140 μmol L-1. These concentrations had no negative effect on the microsensors. We include a brief statement concerning the possible interference of sulfide with the functioning of the microsensors in the M+M section (line 191-193).

Anonymous Referee #2: 8) 8081, Line 10: Any other explanations? Did you see the topography of the sediment bottom at each place you sampled? Did you see the relative

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abundance of burrowing organisms or sulfide-oxidizing mats?

Authors: Inspired by Reviewer #1, we added the possible occurrence of anammox activity at this field site (line 461-465) which unfortunately was not measured in our study. Wherever possible, we took care to avoid macrofauna burrows and shell debris during coring (Dorum, Janssand, Limfjord). For the other sites (Aarhus, Mississippi), the sediment cores were critically evaluated after collection and discarded if not suitable for profiling. At none of the sampling sites, excessive bioturbation activity or visible patches of large sulfur bacteria were noted.

Anonymous Referee #2: 9) 8083, Line 10: Did you try making slurry incubations that you did not rotate, essentially allowing microniches to reform within the slurry?

Authors: No, we did not run experiments without rotating the sediment slurries. The idea was to avoid concentration gradients to develop in the slurred sediments and to compare this scenario to the natural gradients in the intact sediment cores. Your suggestion might be picked up in future experiments on the partitioning of DEN and DNRA in marine sediments.

Anonymous Referee #2: 10) I'm not quite sure how to express this, but I find that the discussion starts with a bang and then just slowly dwindles away. I was taught to think of the discussion as a pyramid where you start with the most specific details at the beginning and slowly get larger and larger until you reach the end where you have your big "why do we care" sentence. Even your conclusion section doesn't really address this. I would just reevaluate your discussion and make sure you think it gets all the necessary information to the author – especially keeping in mind many people just read the ïňĄrst and last paragraph of the discussion when time is limiting.

Authors: We appreciate very much your helpful advice to improve our discussion and manuscript. We designed our discussion in the way to indeed start with a statement pointing out the key findings in our study. The following paragraph is then discussing the dissimilatory nitrate reducing processes with respect to all sampling sites, high-

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lighting Janssand as the sediment with the highest DNRA activity. Then the findings of the two different experimental designs (whole core vs. slurry) is discussed, ending with a point by point evaluation of possible environmental factors influencing the partitioning of DNRA and DEN in sediments. We reevaluated our discussion and especially the conclusion part with respect to whether we properly discuss all key findings of our study and we think that the structure of our discussion is substantiated. Moreover, Reviewer #1 did not have any objections against the general structure of the Discussion. Nevertheless, we picked up your suggesting to end the manuscript more in the style of "Why do we care?" and slightly rewrote the conclusion part. Additionally we corrected a wrong assignment in the discussion (see line 510-513). As this did not include any changes in the conclusion we only rearranged the sentence.

Anonymous Referee #2: 11) Is there any thought that someone from the group may used these same samples to look at DNA and RNA to see if in fact this microbes are where you think and if those microbes are truly active? This is obviously a question for the future and not something I am asking you to add in to this manuscript.

Authors: We actually took sediment samples for DNA- and RNA-based microbial community analysis from some of the sites. It may be that some of our colleagues will use the samples for further analysis and publications.

Interactive comment on Biogeosciences Discuss., 10, 8065, 2013.