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Interactive comment on "Temperature response of denitrification and anammox reveals the adaptation of microbial communities to in situ temperatures in permeable marine sediments that span 50 in latitude" *by* A. Canion et al.

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This manuscript reports on measurements of denitrification and anammox rates and their temperature dependence in permeable marine sediments at 4 sites from subtropical, temperate and polar climates. The authors measured variable rates of fixed nitrogen removal in these sediments, with the highest rates in the temperate site under high nitrogen loading. A strong adaptation to cold temperatures is inferred for denitrifying and anammox communities based on the optimal temperatures and activation energies of respiratory activity. This is an interesting study, presenting the first

measurements of the temperature dependence of fixed nitrogen removal in permeable sediments. Moderate revisions are suggested below.

1. p. 14597, Abstract, line 22. Some earlier measurements of denitrification rates in sandy Arctic sediments may be available from Devol et al. (1997), for example.

2. It would be interesting to extend Table 2 with results from previous studies for a better comparison.

It seems that some of the denitrification rates measured in this study are quite a bit lower than previously reported rates in permeable marine sediments, some of which are cited in section 4.1. Particularly in the cores that were not perfused, what is the effect of non-homogeneous mixing of the added $^{15}NO_3^-$ (Ferguson and Eyre 2007) on the measured denitrification rates? To what extent might this have led to lower denitrification rates with the isotope pairing technique relative to other studies using the N_2:Ar method? Might a difference in methodology be responsible for some of the difference?

3. p. 14601. Very little detail was given on the core incubations. Particularly given that these are permeable sediments in which advection is important, it's important to provide some details on hydrodynamics in the overlying water (stirring rate? boundary layer thickness? porewater flushing rate due to stirring and perfusion?) As porewater advection is induced in permeable sediment cores even in response to a ship's motion or flow over very small (< 1 mm) mounds (Huettel and Webster 2001), then it's certain that there was some degree of flushing due to the stirring in these incubations, which needs to be better characterized.

line 15. "time points" – at what intervals?

4. Rates of D_{14} (denitrification of $^{14}NO_3^-$) coupled to in situ nitrification are included in Table 2 and discussed in the text. It would be nice to include a comparison with rates of D_{15}, or direct denitrification of overlying water $^{15}NO_3^-$. Does advection favor D_{14} or

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D_{15} more?

References

Devol AH, LA Codispoti, and JP Christensen. 1997. Summer and winter denitrification rates in western Arctic shelf sediments. Continental Shelf Research **17(9)**: 1029-1050.

Ferguson AJP and BD Eyre. 2007. Seasonal discrepancies in denitrification measured by isotope pairing and N2:Ar techniques. Marine Ecology Progress Series **350**: 19-27.

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