Supplementary Material 1 for Paper

Anammox, denitrification and dissimilatory nitrate reduction to ammonium in the East China Sea sediment

G. D. Song[1], S. M. Liu[1], H. Marchant[2], M. M. M. Kuypers[2], G. Lavik[2]

[1]{Key Laboratory of Marine Chemistry Theory and Technology, Ministry of Education, College of Chemistry and Chemical Engineering, Ocean University of China, 238 Songling Road, 266100 Qingdao, China}

[2]{Department of Biogeochemistry, Max Planck Institute for Marine Microbiology, Celsiusstrasse 1 D-28359 Bremen, Germany}

Correspondence to: S. M. Liu (sumeiliu@ouc.edu.cn)

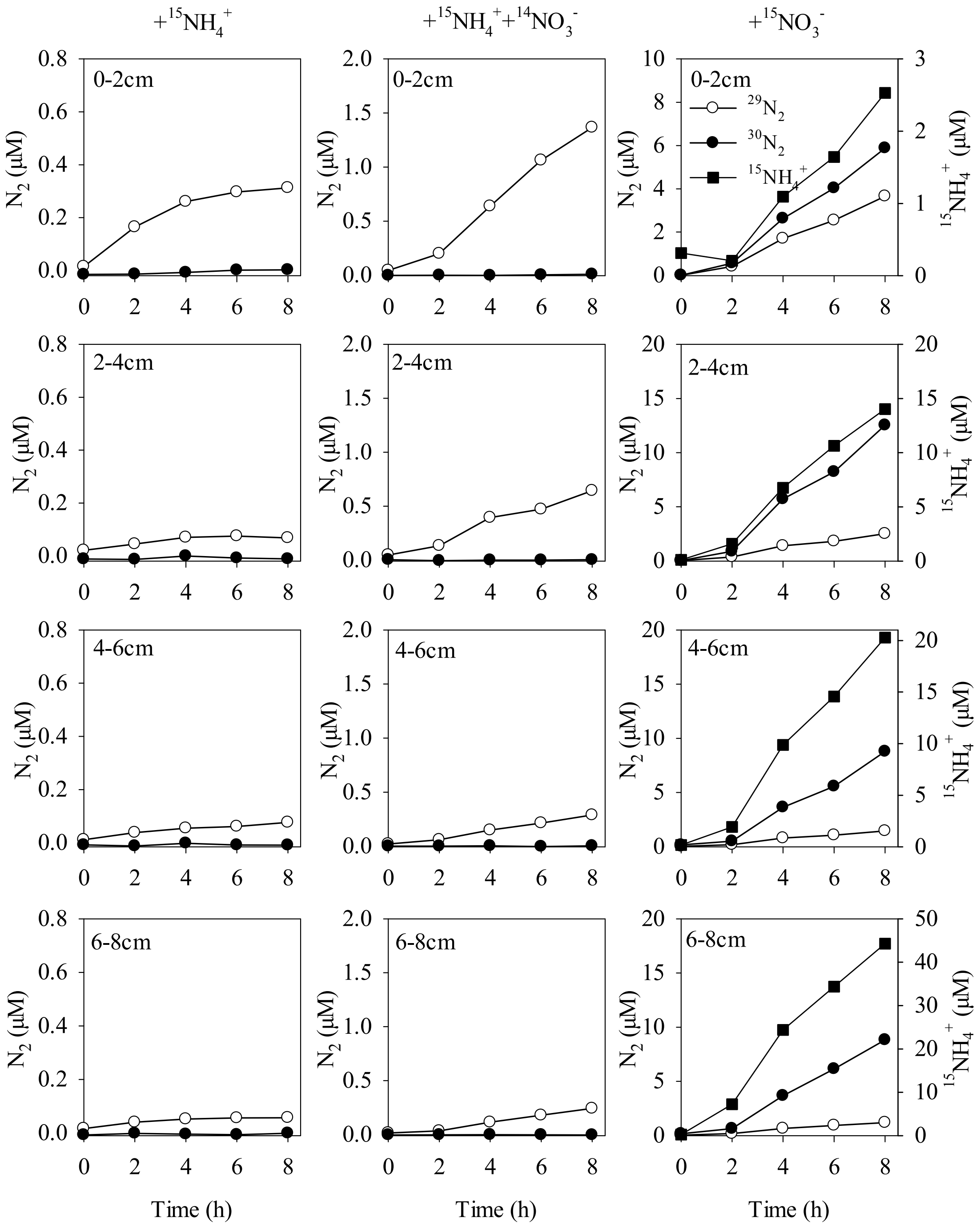

Fig. S1 Production of $^{29}N_2$, $^{30}N_2$ and $^{15}NH_4^+$ against time in slurry incubation at DH31.

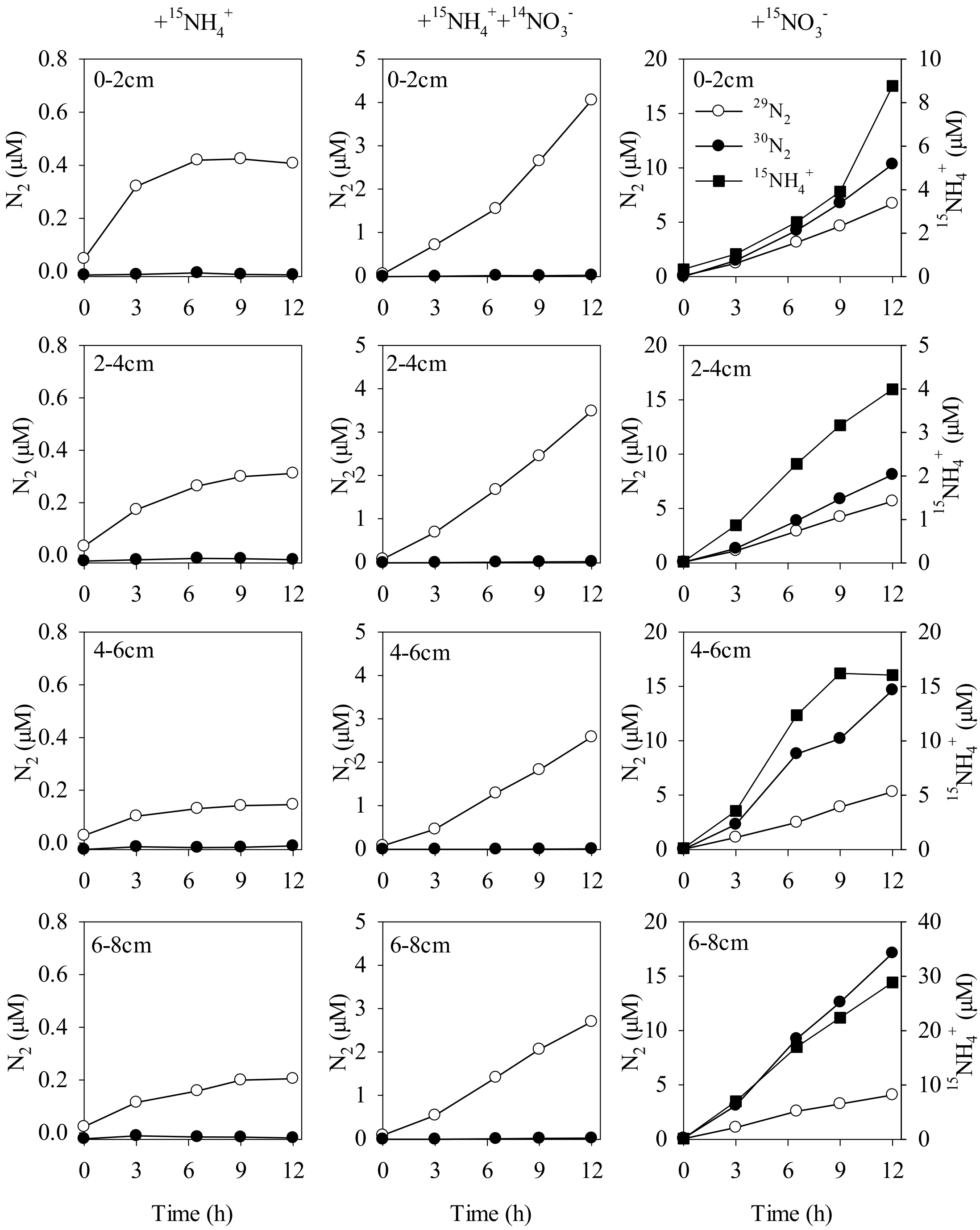

Fig. S2 Similar to Fig. S1 but at DHa2.

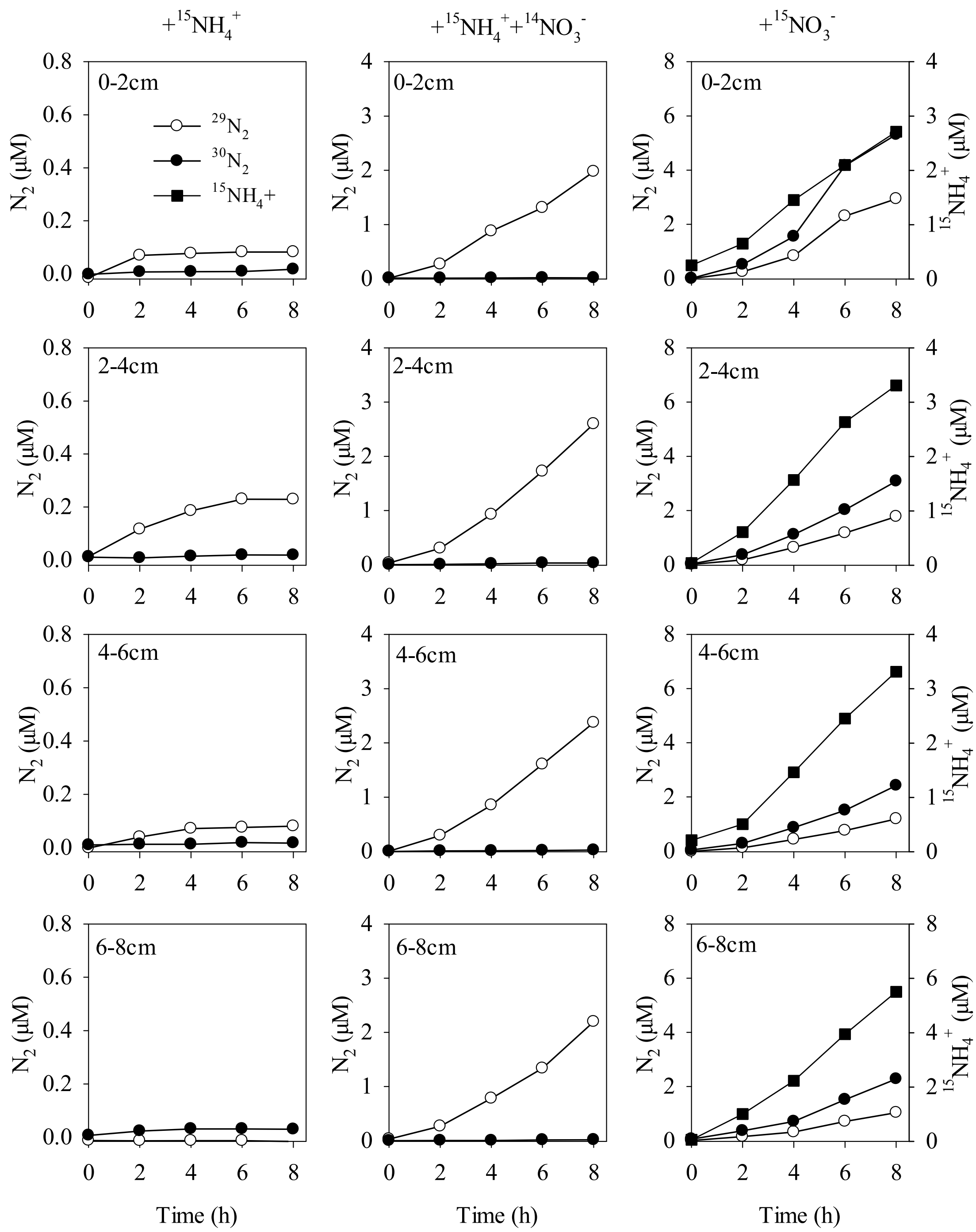

Fig. S3 Similar to Fig. S1 but at DH53.

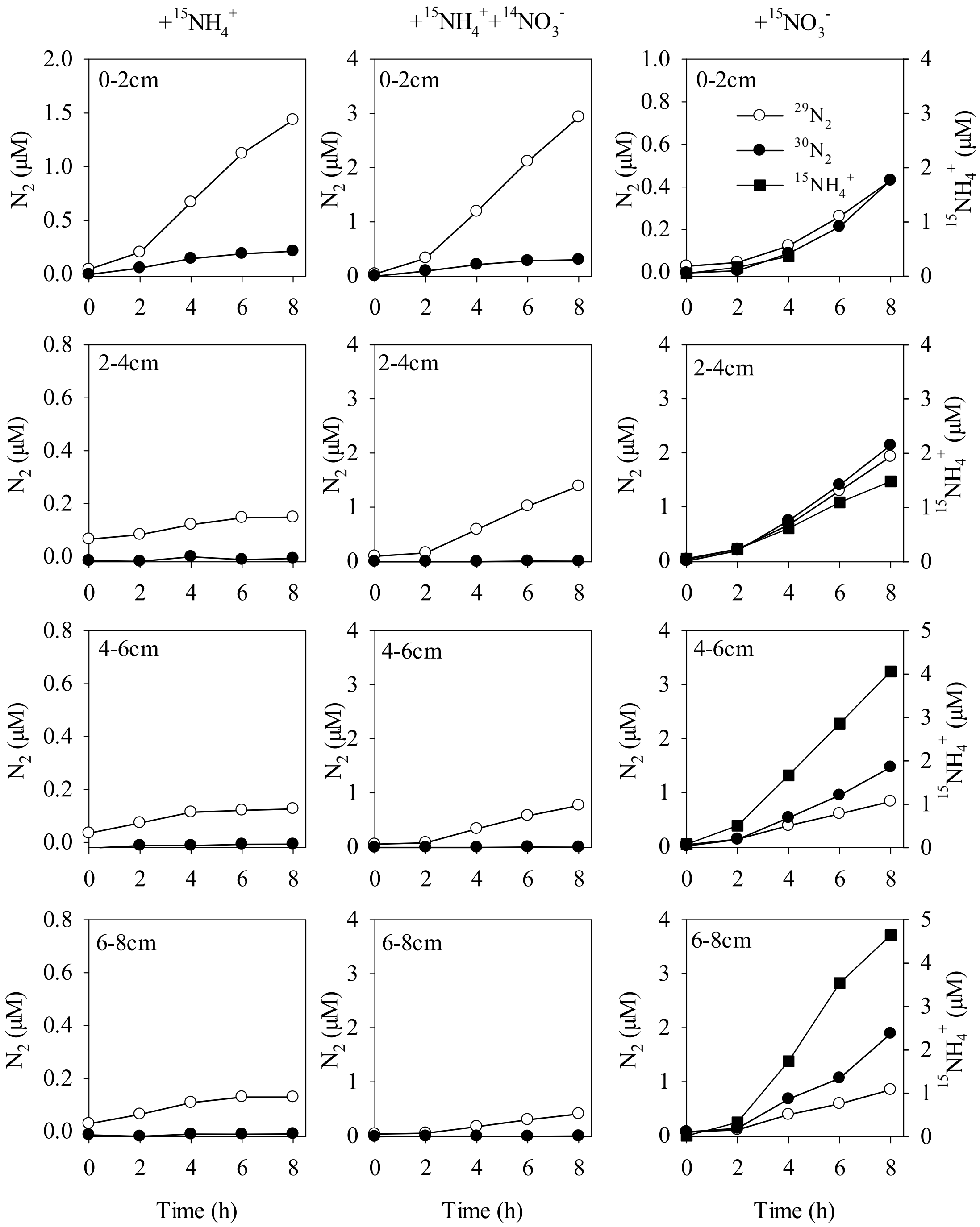

Fig. S4 Similar to Fig. S1 but at DH55.

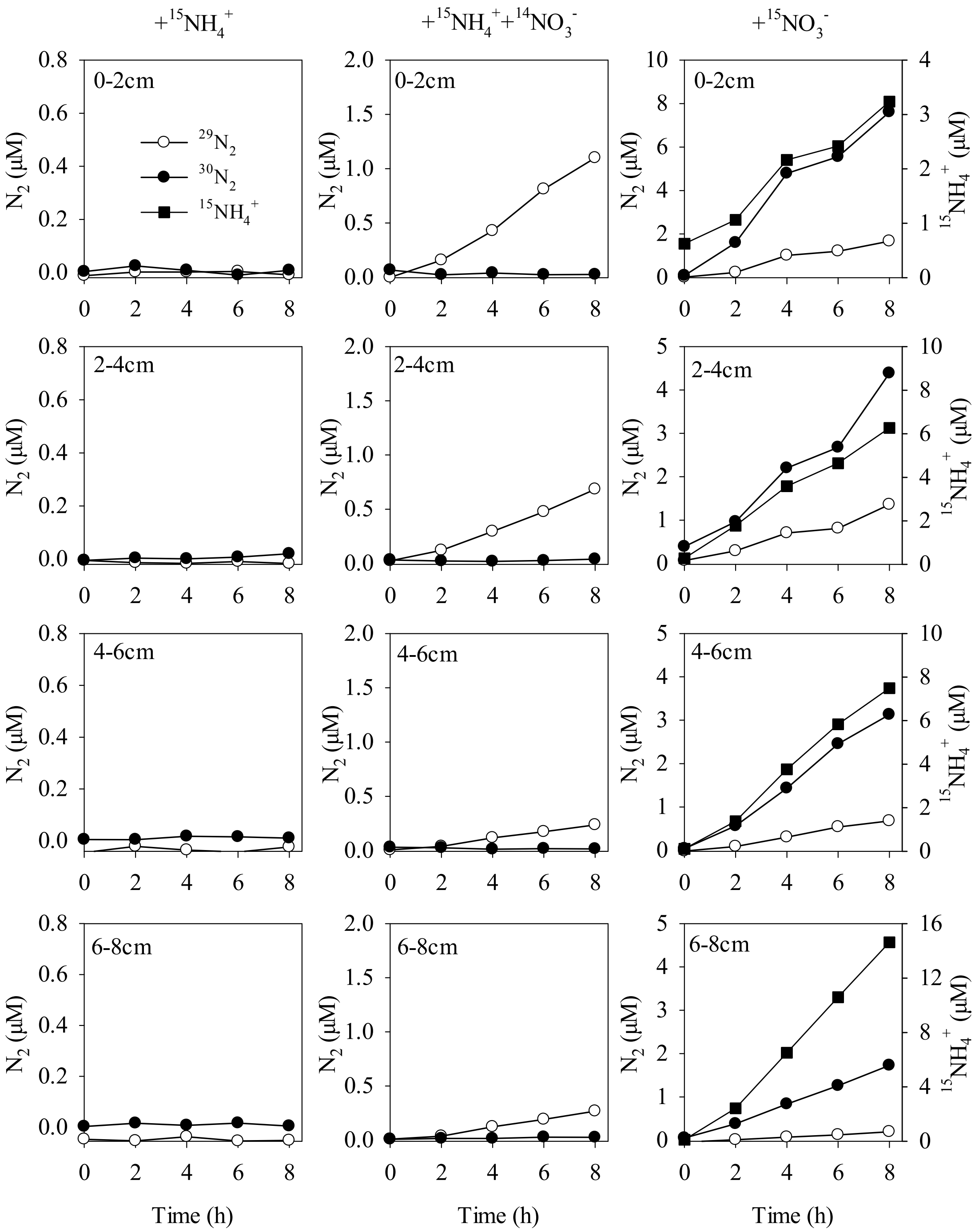

Fig. S5 Similar to Fig. S1 but at DH15.

Supplementary Material 2 for Paper

Anammox, denitrification and dissimilatory nitrate reduction to ammonium in the East China Sea sediment

G. D. Song[1], S. M. Liu[1], H. Marchant[2], M. M. M. Kuypers[2], G. Lavik[2]

[1]{Key Laboratory of Marine Chemistry Theory and Technology, Ministry of Education, College of Chemistry and Chemical Engineering, Ocean University of China, 238 Songling Road, 266100 Qingdao, China}

[2]{Department of Biogeochemistry, Max Planck Institute for Marine Microbiology, Celsiusstrasse 1 D-28359 Bremen, Germany}

Correspondence to: S. M. Liu (sumeiliu@ouc.edu.cn)

Supplementary discussion about the influence of nitrate release on anammox rate calculation.

The potential rates of anammox could be calculated from the production of $^{29}N_2$ and $^{30}N_2$ and the labeling $^{15}NO_3^-$ fraction (F_N) in the slurry incubation with the calculation procedure of Thamdrup and Dalsgaard (2002) as was shown in equation (2) in the text. If nitrate release occurred, then we could use equation (4) to calculate the derived $^{15}NO_3^-$ fraction (F_N^*).

$$A_{(E\_Denit)} = [P_{29} - 2\times(1/F_N - 1)\times P_{30}]/F_N \qquad (2)$$

$$F_N^* = \frac{(P_{29} + 2\times P_{30}) - \sqrt{(P_{29} + 2\times P_{30})^2 - 8\times \mathrm{A}_{(\mathrm{E\_Amox})}\times P_{30}}}{2\times \mathrm{A}_{(\mathrm{E\_Amox})}} \qquad (4)$$

Where, $A_{(E\_Denit)}$ denoted the potential rate anammox in E_Denit. P_{29} and P_{30} were the production rate of $^{29}N_2$ and $^{30}N_2$ in E_Denit, which could be obtained by the linear regression of the N_2 isotope concentration against time.

This first order derivative of equation (2) could be written as,

$$\frac{dA_{(E\_Denit)}}{dF_N} = \frac{4\times P_{30} - (P_{29} + 2P_{30})\times F_N}{F_N^3} = \frac{4-(r29+2)\times F_N}{F_N^3/P_{30}}$$

Where, $r29=P_{29}/P_{30}$. Because $0<F_N<1$, if $0 < F_N < 4/(r29+2)$, $\frac{dA_{(E\_Denit)}}{dF_N}$ would be a positive value and equation (2) would be an increasing function with F_N. In our study, all the measured r29<2, thus 4/(r29+2)>1, therefore when $0<F_N<1$, the anammox rate in E_Denit would also decrease with the decreasing of F_N. Thus, anammox rate would be overestimated if nitrate release was not considered according to equation (2). If nitrate release was very significant and led to the mismatch of potential anammox rate in E_Amox and E_Denit, then $(P_{29} + 2\times P_{30})^2 - 8\times \mathrm{A}_{(\mathrm{E\_Amox})}\times P_{30}$ could probably be less than 0, meaning that equation (4) could not be solved successfully. Maybe this was the case for 4 samples in our study; in these cases we recommended the anammox rates from E_Amox as the actual rates, as here nitrate release would have no effect. Besides, in another 4 samples, calculated F_N^* was higher than F_N, even more than 100%, these maybe caused by the sediment heterogeneity. In these cases, we used the original F_N to calculate A_{E_Denit}. However, excluding the four samples that we could not calculate F_N^*, all other anammox rates from the two experiments were consistent (Fig. 8a in the text).