

## ***Interactive comment on “Effects of cyanobacterial-driven pH increases on sediment nutrient fluxes and coupled nitrification-denitrification in a shallow fresh water estuary” by Y. Gao et al.***

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We appreciate these comments by the reviewer that are value to improve this paper. Here I provided the details of this experiment and gave point to point responses to each referee comment/ question.

Section 2.1 : Study sites and collection of cores: Please add the depth of the sites already here. How did you filter bottom water (pore size)? Also the depth of the “surface sediment” for nitrification (2 cm) could already be told here. Answer: we added

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information listed below to describe the study sites: a) water depth of both stations, b) pore size (0.8  $\mu\text{m}$ ) for bottom water filtration; c) the oxic layer depth (0-2 mm) where nitrification may occur.

Section 3.9 Effect of pH on potential nitrification; there probably are no data on pH on Archaea, are there? Answer: Bowers and Wiegel (2011) suggests only a very few extreme halophilic Archaea are able to grow optimally under alkaline conditions (pH  $\geq$  8.5). However, we are unaware how exactly high pH effects of Archaea in the freshwater estuaries.

Table 1: The chlorophyll unit must be  $\mu\text{g/l}$  –even in a middle of a cyano bloom the chlorophyll cannot be 78 mg/l Answer: we corrected the units of Chl a concentrations.

Table 4, Fig 3, Fig 4, Fig 6: Using just “control” and “pH1” and “pH2” is confusing. I understand you have used this notation because they vary between the experiments, but could you find a way of giving the actual values? For example two rows, one for Powerline site and one for Budds site? Or maybe in the figure legend? The original pH of the site is given in Table 1, but that is not the control pH, which complicates the matter. Answer: we agree with the reviewer on pH expression. In the final paper, pH values are elaborated in figure and description. The in situ pH (Table 1) were not exactly the same value in control group. Especially for the water taken from a bloom at Powerline site, photosynthetic carbon removal by cyanobacteria resulted in high pH (>9) in the water column. When we took samples, the water was filtered to remove cyanobacteria. Otherwise, their nutrient consumption may lead to underestimate nutrient release from sediments. However, pH values have slightly dropped by CO<sub>2</sub> penetration from air ever since. After the overnight bubbling (Section 2.1), the original value of pH's were reduced to neutral pH, which were used as the starting point in laboratory experiments. With persistent aeration, input of CO<sub>2</sub> balanced the carbonate equilibrium in air-water, leading to pH reduction to the similar levels .