

# ***Interactive comment on “Intact polar lipids of Thaumarchaeota and anammox bacteria as indicators of N-cycling in the Eastern Tropical North Pacific oxygen deficient zone” by M. Sollai et al.***

## **Anonymous Referee #2**

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The paper by Sollai et al. reports on the distribution of archaeal and bacterial denitrifying organisms in oxygen deficient zones (ODZ) of the Eastern Tropical North Pacific (ENTP). These groups of organisms are of relevance as they account for most of the nitrogen loss in ODZs worldwide. The authors have tracked the occurrence of the aerobic ammonium oxidizing archaea and anaerobic ammonium oxidizing bacteria in the water column by using two diagnostic biomarkers. Their main observations are that these two groups overlap in offshore regions, while there is a clear zonation separating them in coastal waters. They consequently suggest that this distribution represents

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a potential for either competition or cooperation of these two microbial groups at the open ocean sites. Understanding the distribution and functioning of these two microbial groups is of great relevance for understanding the marine nitrogen cycle. While this study gives insights on their distribution patterns, the authors have invested little effort into further investigating the interactions of these two groups with each other. One could envision for instance  $^{15}\text{N}$ -labeling studies to track the cycling of for instance nitrite, a potentially important intermediate between aerobic and anaerobic oxidation of ammonium. This study therefore only provides little in-depth insights into the processes related to nitrogen cycling in ODZs and only adds minimally to the advancement of the field. However, I see no technical problems with the paper and therefore only have minor request for revisions to the paper. Some citations were incorrect that need to be corrected before publication.

1) Page 3, lines 24-27: It is true that Karner et al., 2001 observed that Archaea (particularly Crenarchaea) account for 20% of picoplankton and ca. 40% of the estimated total number of cells in the ocean, however, these cells are not very likely to be ammonia oxidizing archaea (AOA), since these archaeal cells were found predominantly between 200 to 5000m water depth and AOA thrive in the upper water column, between 100 to 100m water depth (e.g., Lam et al., 2007, Pitcher et al., 2011). The statement as the authors have written is consequently misleading and needs to be corrected.

2) Page 6, line 1: The authors are citing a number of studies in the context that HPH-crenarchaeol and not MH and DH-cren is a more suitable tracer to track living biomass. However, many of the cited papers do not provide support for this statement. To my knowledge there exists no study that systematically investigated the relative liabilities of glycosidic over phosphate-based head groups. Instead, what the authors could say is that HPH crenarchaeol has proven to be an adequate tracer for ammonium oxidizing Thaumarchaeota in past studies (e.g., Pitcher et al., 2011), while other IPL-GDGTs could have other archaeal sources in the water column (add the other citations, the authors could also consider adding Lincoln et al., 2012 PNAS) or represent fossil

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contributions (e.g. Xie et al., 2011).

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**BGD**

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