

***Interactive comment on* “Reviews and syntheses: Processes and functional genes involved in nitrogen cycling in marine environments” by Ramiro Ramos and Silvia Pajares**

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The manuscript summarizes the very relevant topic of marine N cycling, addressing all major N cycling processes. Due to the existence of excellent reviews in this field (e.g. Voss et al 2013, Zehr and Kudela 2011, Lam and Kuypers 2011, Devol 2015), composing a review paper on this topic is a challenging task. In its current state, the manuscript does not represent a substantial contribution to the N cycle community. However, the authors mention a number of important aspects which could be elaborated further in order to focus more on new findings and ideas rather than repeating aspects that have already been reviewed. These aspects could potentially include (among others): more

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emphasis on anthropogenic effects on the N cycle (and potentially connections with C cycle), budgets of N loss processes and factors favoring N-loss (e.g. denitrification vs. DNRA) and the production and consumption of climate-relevant gases such as N₂O.

While the abstract provides a complete and concise summary of the topic, the overall representation of different aspects of the N cycle is not well-structured. Each N process is divided into sub-sections on factors affecting a specific process and on the distribution of organisms carrying out this process in the environment. However, as factors such as temperature, salinity, depth and oxygen concentrations define different environments, these two sections are highly repetitive and can be shortened and structured in a more concise way. In addition, some N process sections introduce other N processes (e.g. ANRA in the DNRA section). This issue could be overcome by a more detailed general introduction, which is at the moment rather short. A broader division into oxic vs anoxic, or nitrogen fixation/assimilation vs N loss processes could also help to guide the reader better through the different processes. In addition, some aspects on nitrifying microorganisms are not well represented in the manuscript. AOA are the dominant ammonia oxidizers in most parts of the global ocean, which does not become clear in the manuscript. Also, some statements regarding nitrifiers are too general e.g. it is not entirely clear why nitrifiers are mostly absent in surface waters and there are more potential explanations than UV light (specifically in the case of AOA). The whole process of nitrite oxidation is only mentioned in two sentences and the diversity and distribution of nitrite oxidizers is missing. While the recently discovered 'comammox' is a very interesting process and of great importance for the N cycle community, thus far there is no evidence of the existence of this process in the marine environment. Hence, a whole section on comammox in a review paper on marine N cycling is not necessary.

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