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Biogeosciences Discussions

Interactive comment on "Nitrogen budgets following a Lagrangian strategy in the Western Tropical South Pacific Ocean: the prominent role of N_2 fixation (OUTPACE cruise)" *by* Mathieu Caffin et al.

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The manuscript by Caffin et al. describes budgets of nitrogen at three stations in the oligotrophic western tropical South Pacific using a Lagrangian strategy thus being able to track the same water mass over time. The study reports exceptionally high N2 fixation rates and a corresponding high contribution of N2 fixation impacted material to export production. The study is very interesting to me particularly because of an approach that is more innovative than what is classically used when it comes to N budgets and N2 fixation. Overall, the paper doesn't need much changes to get into

shape for publication, the study is clear and well presented. I personally think the title is not the best choice, it could make a statement on what the prominent role of N2 fixation is.

In order to make the study entirely convincing I have some main aspects, which should be and easily could be clarified:

1. The good old topic on using the bubble method: It is not convincing to just measure the dissolved fraction and not give any ranges. There are concerns with that method, everyone knows that, if you claim it is ok to use it you should have done a comparative measurement at least for some of your samples using both methods. In this context, I either need to see the data on the dissolved vs. particulate phase, or the rates have to be presented as potential rates.

2. In the same context, I don't know the gas quality of the company you bought from, but I assume you checked for purity as recommended in the Dabundo paper. Otherwise the high rates may as well come from an ammonia incorporation or similar. Please present your quality check, here.

3. In addition, ammonia background measurements, fluxes and inputs are not mentioned- this would add enormous value to the stud, so please present if available. As you are making a suggestion on zooplankton moderated export, ammonia is a good part of this, too.

4. No sequencing was performed and no single cell rates were determined- how can you interpret on the key N2 fixers if you just look at 6 clusters via qPCR? What makes you conclude that Trichodesmium or UCYN clusters are important if you don't assess which diazotrophs are there?

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