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# *Interactive comment on* "Dynamics of $N_2$ fixation and fate of diazotroph-derived nitrogen in a low nutrient low chlorophyll ecosystem: results from the VAHINE mesocosm experiment (New Caledonia)" *by* S. Bonnet et al.

**Anonymous Referee #3**

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Review of the manuscript Biogeosciences Discuss., 12, 19579–19626, 2015

Dynamics of N2 fixation and fate of diazotroph-derived nitrogen in a low nutrient low chlorophyll ecosystem: results from the VAHINE mesocosm experiment (New Caledonia)

Authors: S. Bonnet, H. Berthelot, K. Turk-Kubo, S. Fawcett, E. Rahav, S. l'Helguen, and I. Berman-Frank

The manuscript entitled "Dynamics of N2 fixation and fate of diazotroph-derived nitro-

gen in a low nutrient low chlorophyll ecosystem: results from the VAHINE mesocosm experiment" by Bonnet et al. describes N2 fixation rates over a 23 day period, identifies the transfer of recently fixed nitrogen to the microbial community and the vertical export of diazotrophic carbon. The topic is of interest for microbial ecologists and might even provide values for integration into large scale models.

This manuscript is in general very well prepared and written. Moreover, experimental procedure and concept are thoroughly planned. Nevertheless, some re-ordering of the Method and Result section might help to increase fluency and some minor questions have emerged which need clarification.

Below are some more specific suggestions:

Abstract and Introduction

As I understood, the scope of the manuscript and experiment is to provide a time series and temporal variability in N2 fixation rates. This should be mentioned already in the abstract.

What does the abbreviation VAHINE stand for? Please add!

1) Page 19584, line 7: Short term fate of to me <24 hours. How do you distinguish between direct 15N2 fixation and recycling and re-uptake of 15N derived from of N2 fixation?

2) Please add a list of accompanied manuscripts which deal with the VAHNE mesocosm experiment and their individual scope (I understand that there were a couple more).

Material and Methods

3) Please structure analytical methods and experimental procedures together.

4) Did you clean the walls of the mesocosm - cell wall growth can be a major difficulty and introduce errors in the overall element budget.



BGD

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5) A schematic overview concerning samples taken and sub experiments done would ne useful maybe put Fig. 1 in supplements and add it here.

6) How did you calculate DIP turnover?

7) Page 19581, line 10: The authors state, that their values are in the upper range of rates reported for the global ocean- that is not surprising as they added DIP to fuel production.

8) What was the batch number of 15N2 gas used?

9) Page 19587, line 16:- Please give details on how you testes for contamination.

10) 15N enrichment in bottle done for the bubble method- why did you not analyze the 15N enrichment using MIMS like you did for the Mohr method and use measured value in the calculation instead of the theoretical one?

11) How did you identify organisms in the NanoSIMS picture- by additional microscopic identification and marking with laser?

Results and Discussion

12) Please add a table with abundances measured.

13) Figure 3- What sustained C-fixation in A1 below 200 m and was there any light available at that depth?

14) Page 19605, line 9. Please explain the calculation of e ratio in methods.

15) Fig. 1. SSHA is not an acronym for Aviso sea level anomaly- please correct!

16) Fig. 3: Please enlarge numbers and legends- it s hard to read.

17) Fig. 6. Please delete repetition of “N2 fixation and O2 and N2 fixation and O2”

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Interactive comment on Biogeosciences Discuss., 12, 19579, 2015.