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Interactive comment on "Aphotic N_2 fixation along an oligotrophic to ultraoligotrophic transect in the Western Tropical South Pacific Ocean" *by* Mar Benavides et al.

Anonymous Referee #3

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The study by Benavides and coauthors report aphotic N2 fixation rates and identify diazotrophs present in the mesopelagic layer of the western tropical South Pacific. The paper is a significant contribution which increases the knowledge about aphotic nitrogen fixation in a region which is highly interesting in terms of N-input from N2 fixation. Rates of N2 fixation were low but detected across all depths and stations. Shifts in diazotroph assemblages seemed to be mostly associated with depth. A distinct 1G phylotype was identified to coincide with the oxygenated Sub-Antarctic Mode Water. The paper is very well written and the methods used are well described, solid and established.

In my opinion the presentation of data could be improved by clearer links to different water masses. In the title the oligotrophic to ultraoligotrophic transect is highlighted but the way that this translates into sampling stations and different water masses is not evident to the reader from the figures. Further the nifH data is presented largely based on depth rather than sampling location/water mass.

The DOM analysis is valid but considering the low abundances these diazotroph groups are likely present in compared to other members of the microbial community establishing connections may be difficult. From the results section is not evident if differences in DOM compounds were seen across the transect or different depths.

The (relatively) high N2 fixation rates at station 13 are curious and could be given some more attention in the discussion. From Fig 2. it appears like the diazotroph composition from station 13 differs largely between the depths and clusters away from the other samples. I find it very intriguing that this suggests that several different groups may be responsible for similar rates at the different depths. It is mentioned that high concentrations of chlorophyll were observed at this station. Did this coincide with high photic N2 fixation rates?

Other comments: The presentation of average N2 fixation rates and relation to % of photic N2 fixation is unclear and values in abstract and text appear to be different. (Abstract Lines 33-34 and Discussion Lines 20-23)

The Bray-Curtis distances in Figure 2 might be more meaningful if done on a level with higher resolution. Currently the variations in phylotypes is largely "hidden" in the 1G subcluster. A rarefaction to equal sampling depth would further improve this analysis.

In Figs. 2 and 3 data is presented as depth but in Fig. 1 as pressure [dbar]

Fig. 1 Please adjust the scale so that the circles are not cut for stations 1 and 15

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