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Interactive comment on "Water column biogeochemistry of oxygen minimum zones in the eastern tropical North Atlantic and eastern tropical South Pacific Oceans" *by* C. R. Löscher et al.

Anonymous Referee #1

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Löscher et al. provide an far ranging review on oxygen minimum zones with particular focus on the two contrasting systems, namely the Eastern Tropical North Atlantic and the Eastern Tropical South Pacific, where they have undertaken much research. The paper covers extensive ground including aspects of effects on microbial populations, nutrient regeneration and biological productivity, export and particle flux, diel vertical migration, nitrogen and sulfur cycling, climate relevant trace gas production. A major theme is on the potential expansion of these zones and the implications of this. In general, I found this very readable and informative. I did note some omissions of both older key papers and some recent work. There are some redundant passages whose removal might streamline the paper a bit.

Specific comments: p. 4497, line 6. “among” vs “between”?

p. 4498, lines 11-13. You switch between uM and umol L-1. Pick one.

p. 4499, lines 6-7. Something missing here. Reword. line 21. “among” vs “between”

p. 4501, line 29 “during daytime” or “at daybreak”?

p. 4502, line 5. “during daytime”

p. 4506, lines 2-6. Sounds overly dramatic. Temperature shifts will be gradual- not likely a step function which would induce massive lysogeny.

p. 4507, line 23. Delete “are” in this sentence.

p. 4509, line 8. How is BATS a "less intense OMZ area"?

p. 4512, line 14-15. Arabian Sea- what about Ward et al. 2009 who contend denitrification is dominant in the Arabian Sea? Nature 461, 78-81 doi:10.1038/nature08276

lines 15-18. Could be better worded- “. . . lost by denitrification or anammox or recycled by DNRA or nitrification”.

p. 4513, line 24-25. Previously you quote an upper boundary of 20 uM (p. 4501, lines 16-17). In the next paragraph on p. 4514 you use 25uM as the upper limit.

Lines 18-19. You said this on the last page (4512).

p. 4514, line 14-16. How can “ratios” be a source of a nutrient?

p. 4515, lines 2-3. Please note: Dekaezemacker, J., S. Bonnet, O. Grosso, T. Moutin, M. Bressac, and D. G. Capone (2013), Evidence of active dinitrogen fixation in surface waters of the eastern tropical South Pacific during El Niño and La Niña events and evaluation of its potential nutrient controls, Global Biogeochemical Cycles, 27, 1-12, DOI: 10.1002/gbc.20063, 22013. Bonnet, S., J. Dekaezemacker, T. Moutin, A. N. Knapp, R. Hamersley, O. Grosso, and D. G. Capone (2013), Aphotic N2 Fixation in the Eastern Tropical South Pacific Ocean, PLoS One, 8(12), e81265. Turk-Kubo, K. A., M.

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Karamchandani, R. Foster, D. G. Capone, and J. P. Zehr (2013), The paradox of marine heterotrophic nitrogen fixation: Abundances of heterotrophic diazotrophs do not account for nitrogen fixation rates in the Eastern Tropical South Pacific Environmental Microbiology, doi:10.1111/1462-2920.12346.

Line 3. Whose unpublished data?

Lines 15-21. Also should mention the recent kerfuffle regarding contaminated N2 stocks Dabundo, R., M. F. Lehmann, L. Treibergs, C. R. Tobias, M. A. Altabet, P. H. Moisander, and J. Granger (2014), The Contamination of Commercial 15N2 Gas Stocks with 15N–Labeled Nitrate and Ammonium and Consequences for Nitrogen Fixation Measurements, PloS one, 9(10), e110335.

p. 4516, lines 27-28. Not sure I fully get this. For both anammox and nitrification through regeneration of NH4+?

p. 4517, line 16. “Oxygenic” means O2 producing. Perhaps use “oxic” or “aerobic”?

lines 24-26 and then some on the next page. Seems a redundant passage to earlier discussions.

p. 4518, lines 7-10. Needs to be explained more fully.

Lines 18-20. Should clarify – from an “N” cycle perspective, or N:P ratios, N2 fixation should be a negative (stabilizing) feedback compensating for N losses as proposed by Deutsch et al. Indeed, the N2 fixation may be a positive feedback within the OMZ with respect to O2.

p. 4520, lines 6-9. See also Dekaezemacker et al. (above) for their 10oS transect to 100oW

Lines 16-19. Perhaps something else is constraining diazotrophic cyanobacteria here (e.g. Fe). See also Turk-Kebo et al. and Bonnet et al. (above)

p. 4521, lines 8-9. This point here is unclear to me. Clarify.

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p. 4522, lines 14-15. Perhaps cite the early Dugdale et al. 1977 observation here?

Line 23. “Diffusive” vs “diffuse”?

p. 4525,line 16. To “increase” rather than to “be increasing”?

line 18. Do you mean “>” rather than “<” here? How is this level of O2 “classical”? A reference might help.

Line 23. “. . . remains to be proven”. Is there a suggestion that anammox and/ or DNRA produces N2O? References. Or change to “assessed” or “demonstrated”.

p. 4526. This observation goes pretty far back- Firestone’s work in soil. Also see Cohen, Y. (1978), Consumption of dissolved nitrous oxide in an anoxic basis, Saanich Inlet, British Columbia., Nature, 272, 235-237

p. 4529. Line 17. “Classical” is an odd word to use with Anammox.

Interactive comment on Biogeosciences Discuss., 12, 4495, 2015.