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Interactive comment on "Bottom-water deoxygenation at the Peruvian Margin during the last deglaciation recorded by benthic foraminifera" *by* Zeynep Erdem et al.

Anonymous Referee #1

Received and published: 10 June 2019

The text is well written, being relatively easy to read and understand, though there are some minor errors. One technical problem with the MS is the figures, where there appear some mistakes (error bars, lack of scale bars, outlined below). Scientifically the approach of the authors is straight-forward, applying a transfer function of foraminiferal census counts to determine the bottom water oxygen concentration or an indication thereof. The robustness of the transfer function could/should be test via bootstrapping or a similar analysis (this would help to determine what is the 'counting error', as in how much a few percent change in the abundance would change the transfer functions resultant oxygen value). Moreover, the fitted/predicted oxygen values give negative values, below 0 (figure 5 to 7), I am unsure whether this is possible with concentration

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values?

The authors have considered sources of error, one such source of error is the preservation potential of certain forms. For clarity though, it might be prudent of the authors to state how the agglutinated were removed from the data (pg. 5 Line 29-30), i.e., is there potential for error through a closed sum effect? If the assemblage is counted to a certain number, or split to gain a certain number of grains, by removing data (which has to be done) does this introduce some bias (when considering low abundant species – removing 3 specimens in a count of 300 means a loss of 1%, the 100% would be then based on 297, it also shifts the percentages for the remaining species which is more problematic for rare species than for dominant species)? In a similar vein how reliant is the transfer function on small changes for rare species – and have the authors considered a transformation of the abundance data to reduce the impact of dominance and rarity (e.g. Log the data)?

Have the authors considered more environmental variables (e.g. temperature, salinity, etc), whilst the approach here is to reconstruct bottom water oxygen concentrations the question is, is this the dominant control on the assemblage composition? This is especially important given how regional the dataset is especially when comparing different time periods. How similar or dissimilar are the various assemblages for each time period? And how similar or dissimilar are they between? It is not that I doubt that oxygen is a dominant variable, instead knowing whether there is some variation in the assemblage due to another variable might help to put the results into better context.

The discussion of the data is lengthy - what I miss is a statistical comparison between d15N, TOC and the O2 prediction of the authors – as in, figure 7 is under used. Here the authors could compare their proxy against the previous proxy values statistically (e.g., simple scatter or regression analysis) rather than descriptively (section 4.3).

Finally, I agree with the other reviewer that the age models should be outlined in this paper somewhere (e.g., diamond symbols with the depth in cm in the figures?), given

Pg. 8 Line 18 (: ‘Erosion, reworking and high energetic bottom conditions’).

Text comments:

Pg. 6 Line 4 -7: agglutinated forms have a lower preservation potential, could this affect the splitting? Removing species from abundance counts does impact the closed sum; Pg. 6 Line 19: Mean values – would it not be better to consider the mean with std dev. to construct the equation? Pg. 6 Line 20: “from a synoptic compilation” what do the authors mean by synoptic (= general, vs. synoptic data)? Pg. 6 Line 25-29: How different are the ‘different primary productivity values’ used for the RRPOC? What would the values be if the same equation were used? This can be tested by applying each set of values used. Pg. 10 Line 25 – 29: Have you considered placing the various species into comparable niche occupations? The table is a good reference guide for readers, but it would be interesting whether the different species regionally/globally occupy different niches or similar ones. Pg. 12 Line 14-16: “Moreover, we are confident in the [O2]BW differences in each time interval considered, even though the absolute estimates for each sample might be biased because of the dominance of the low-oxygen samples in the reference dataset.” – maybe elaborate why you have confidence despite the absolute estimates being biased? And how does the absolute estimates being biased fit with research question 2 and 3?

Section 2.2.2: what is the sensitivity of the CTD and equipment used for oxygen, is there not some lower limit (5 umol/kg) below which the data is not accurately measured? Or at least the reliability is not the best.

Section header 1.1 Benthic foraminifera as oxygen proxy -> ‘as an oxygen proxy’ or reword as ‘as a proxy for oxygen’?

Figure comments:

Figure 1a: scale bar missing – if the authors (as implied by the caption) are trying to demonstrate the low oxygen values how about a single contour around the purple?

Figure 1 Caption: should it read as two units? “<0.5 ml/l to <20 μmol/kg” the ‘to’ implies a ‘sliding scale’

Figure 2b: perhaps color the symbols to show the different rain rates?

Figure 3: (capitalise R in relative abundance). (Bottom panel) The last datapoint (sample M77/2-776) is forcing the plot’s yaxis to be skewed toward higher fisher alpha values so that the values of the other samples are condensed. Consider, perhaps using a log-scale for the yaxis of the Fisher Alpha panel, alternatively the authors could exclude from this plot sample M77/2-776 and with a big red arrow just tell the reader the values of this ‘outlier’. (Bottom and Middle panel) I assume the bars are ‘errorbars’ – some seem to be not symmetrical around the datapoint (possible depending on the statistic used) but more importantly Site 830, 1004P1 the error bars are below the datapoint.

Figure 5 to 7: Is it possible to have a negative value for oxygen concentration?

Figure 5: give a 1:1 line.

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