

Interactive comment on “Redox sensitive elements in foraminifera from the Peruvian oxygen minimum zone” by N. Glock et al.

Anonymous Referee #2

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The manuscript by Glock et al. reports elemental/Ca ratios in shallow infaunal benthic foraminiferal species, *Bolivina spissa* and *Uvigerina peregrina*, from Peruvian OMZ. The authors focus on redox sensitive metals/Ca ratios, including Mn/Ca and Fe/Ca, and compare them with ratios measured in pore water. In addition, a comparison is made with bottom water oxygen content. The element/Ca ratios were measured using various techniques (solution ICP-MS, SIMS and electron microprobe). The measurements were carried out in cleaned and non-cleaned specimens.

The manuscript contains interesting data, however, the current form is not well organised and the focus of the paper is not clear. Question is: Is there enough field data to conclude whether Mn/Ca and/or Fe/Ca ratios can be used in paleoreconstructions or should the main focus of the study concentrate on the comparison of different measur-

C2922

ing and cleaning techniques? I suggest the authors should re-examine and re-evaluate the scope of the study and formulate the title/introduction/discussion accordingly. Also, one topic should be discussed only once to avoid unnecessary repetition.

The authors should also re-examine all their tables and figures. Are all the tables really necessary (e.g. tables 2-5), what can be deleted and what can be put into the appendix? Figures should be above all readable, and also neat and informative. At the moment I find figures 1-8 not very attractive and the scales are not legible in figures 2 and 3. To give more space for the scales, the secondary electron images could be made smaller and the elemental maps larger? Also, authors should carefully consider if all figures are really necessary (e.g. Figure 9). Finally, tables and figures should be referred to in a chronological order (not the case now).

I also have a problem with the trend lines and accompanied R² values, which are reported in Figure 10. The R²-values and the trend-lines are based on averages, thus excluding the scatter (error-bars) in the real data. If all data would be used instead of the averages the trends would not be visible at all. So the R² is misleading. I also find it very tedious, if not impossible, to figure out how many measurements were really carried out in this study? And how many measurements the error bars in figures 10 and 12 represent. What is the n-number?

Figures 11 and 13 seem out of scope of this study. The foraminifera were collected from top 1 cm of sediment, so it is not necessary to discuss/present the Fe-pore water profiles down to 20 cm depth in sediment. In stead, the real miss-match between the Fe/Ca in foram vs. pore water Fe/Ca may be more appropriate to plot.

Some other smaller comments:

Diagenesis discussion (sections 4.1 and 4.2.)

All discussion regarding uncleaned vs. cleaner specimens (regardless of foram species) should be done in one section to avoid unnecessary repetition.

C2923

p. 7968 line 7. On average, how large proportion of the foraminiferal test is covered in pores? 1-3% or more? If measuring (trace) metal in foraminiferal calcite with LA-ICP-MS, I doubt that the pores make such a big difference, or the "pore error" would be smaller than inter-specimens variability from the same site.

The discussion regarding the miss-match of Fe/Ca ratios in forams and pore water data (Section 4.3.)

How stable is the Peruvian OMZ through time/seasons? In the Arabian sea OMZ the lower boundary is relatively stable through time and only the upper part shows seasonal fluctuates (Cowie and Levin, 2009). Thus, how plausible is it that such anoxic intrusion occurred prior to sampling?

Were any of the analysed foraminifera identified as living (e.g. Rose Bengal stained)? If not, the specimens measured here could be relatively old. Is the sediment bioturbated? What are the sedimentation rates like?

page 7971 line 8. What do the authors mean with a long phase of oxygenation? How long is long? Bolivinids are known to be very opportunistic (e.g. Hess et al. 2005, Langezaal et al. 2006) and can reproduce offspring quickly. The life span of foraminiferal species is estimated to vary from a month to few years (Murray 1991), during which a foraminifer can produce hundreds of offspring. Thus species with shorter longevity and large offspring, like Bolivinids, can become overrepresented in the dead assemblage. This part of the discussion should be omitted. It is too speculative.

p. 7970 line 25. I do not agree that you can conclude from your data whether *B. spissa* needs trace amounts of oxygen to live or not. *B. spissa* is known to accumulate nitrate (Glud et al. 2009), and is a potential denitrifier.

Few textual suggestions/typos are given in the supplement pdf.

Please also note the supplement to this comment:

C2924

<http://www.biogeosciences-discuss.net/8/C2922/2011/bgd-8-C2922-2011-supplement.pdf>

Interactive comment on Biogeosciences Discuss., 8, 7953, 2011.

C2925