Review:

"Western Indian Ocean bottom water temperature calibration – are benthic foraminifera Mg/Ca ratios a reliable palaeothermometry proxy?"

Larsson & Jung, 2024

The manuscript provides a new dataset of various element/Ca ratios, focussing on Mg/Ca ratios, for three benthic foraminifera species. The data originate from the western Indian Ocean and were checked by the authors for their applicability as a paleothermometer proxy for bottom water temperatures. Although the number of samples seems too small to establish a valid new calibration, the manuscript contributes to an improved understanding of benthic foraminifera and their usability as palaeoproxy in this area.

Furthermore, the authors compare their data set with two others from the region and evaluate the quality and relevance of their data as a palaeoproxy in the discussion chapter, under consideration of significant literature. As I myself am not particularly familiar with benthic foraminifera, I cannot make a qualitative statement about the methodology which is used here.

The authors have presented their results in a sufficient number of graphics, although some of them still need a bit of reworking. Furthermore, the language is a little clumsy in some places, but as I am not a native speaker myself, I have only made minor comments here.

Overall, I rate the manuscript as good and recommend publication, although there are still a few points that need to be improved.

Be more consistent throughout the manuscript e.g.:

1) Line 172 “(Table A1 in Appendix A)” vs. Line 201 “(Appendix A Table A1)”

2) Abbreviation of the foraminifera. Sometimes you wrote *Cibicidoides mundulus* vs *C. mundulus*. You can write the entire name throughout the manuscript, but I recommend to write the full genus and species name when you first mention it and then continue throughout the manuscript with the abbreviation.

3) Same for figure vs. fig. vs Figure (and table, Table, tab.), choose one and stay consistent.

Figures and Tables

Figure 2 would benefit from gridding the potential temperature.

Figure 4: Use either two different symbols or two different colors (best is both), it is hard to distinguish between both.

Figure 6: Same like Figure 4. I find it hard to distinguish between the both triangles, since the dark blue and black do not show a strong contrast, but also the other blue symbols could benefit from a different color. Also, the graphic labelling is confusing here. I would write “Mg/Ca ratio against (a) Fe/Ca ratios, (b) Al/Ca ratio and (c) Mn/Ca ratio in *Cibicidoides spp.* …”

Figure 9: Again. Maybe use a circle for *C. spp*. ?

Table 1: “*Wuellerstrofi*” is written in capital letters, change it.

Table A2: Numbers e.g. at 2a, 2g and 3a seem to be smaller.

Table A2: Why is the species at samples from 3g to 3i *G. ruber*? I thought it is *Uvigerina spp.* and *Cibicidoides spp.*

Minor revisions:

Line 74: One space too many after “i.e.”

Line 92: strange bracket after “(Stripe et al., 2021)” and one space too many

Line 107-109: You say “three” water masses but listed just “two” of them

Line 136: two dots at the end of the sentence

Line 138: One space too many after “(Table 1)”

Line 143: first mention of *G. ruber* -> write the entire name

Line 153: write „In experiment 1” to keep it consistent. Furthermore, mention that you used 6 sets with a varying amount of *G. ruber* somewhere.

Line 162-164: 5.81 ppm and 9.53 ppm, where does these numbers come from? In Table A2 I see three tests with *G. ruber* for the crushing experiment between two glass slides (Ca 0.55, 7.5 and 3.75 ppm = **3.93**) and three tests with *G. ruber* for the crushing experiment using a metal pin (1.68, 5.1, 5.66 = **4.15**). Same for Mg/Ca, can’t find the 3.43 and 3.53 mmol mol-1 in A2, especially since sample 1a has incredibly high values of 35.23 mmol mol-1.

Line 170: maybe add “(0.55 to 7.50 ppm in both crushing between two glass slides and when using a metal pin, Table 1A and A2 in Appendix A)” to make sure that the general results, regardless of the method used, are really low.

Line 180-184: For your average values 0.38, 2.91 and 3.01 mmol mol-1, I have 0.37, 2.90 and 3.02 respectively. I suppose this is because you used a higher number of decimals in your original calculation. I am mention this in case you want to change it, but I think this is fine. For your mean Fe/Ca ratio of 0.61 mmol mol-1, I have 0.57 mmol mol-1 instead. Please check this again and correct it.

Line 199: (6x25): change sentence: “In the procedure, specimens of *Globigerinoides ruber* (6 sets with a varying amount of 10 - 50 individuals; Table A1, Appendix) picked from …”

Line 200: remove point after “*Uvigerina…”*

Line 201: (Table A1 in Appendix A) -> see Line 172

Line 214: Make it two sentences: "… proposed by Hasenfratz et al. (2017). This suggest that Mn-oxide…"

Line 228 230: change to (Figure B1 in Appendix B)

Line 262: One space too many

Line 280: Table A3?

Line 299-300: I see **four** samples in water depth deeper than 2500 m and **five** samples in water depth <1500 m. Furthermore, instead of "Below 2500 m" maybe write "In water depth >2500 m …"

Line 303: *Cibicidoides* in italics

Line 308 – 310: rephrase sentence: „The Mg/Ca ratios of *Cibicidoides spp.*, although higher in their Fe/Ca ratios than >0.1 mmol mol-1, were also included, since they show no correlation between Mg/Ca ratios and Fe/Ca ratios."

Line 310: One space too many between "Table" and "2". Also, write "Figure 6" in capital letters to stay consistent.

Line 312: *C. mundulus* and *C. wuellerstorfi*, stay consistent.

Line 313: "Figure 9". Also, remove point after "*Cibicidoides*". Richtig: *Cibicidoides spp.*

Line 318: "Figure 9"

Line 314 & 320: BWT

Line 321: Sentence in parentheses not in italics

Line 322: "Figure 9"

Line 331: *Cibicidoides spp.*

Line 337: *Cibicidoides spp.*; Also, one space too many between "Table 2" and "When"

Line 353: One space too many between "Table 2" and "It"

Line 356: compared to what? Samples from *Cibicidoides spp.*?

Line 359: One space too many between "ratio" and "The"

Line 366: "Figure 10"

Line 369: "Figure 10"

Line 398: “Figure 11”

Line 400: space

Line 401: “SW Indian Ocean”

Line 426: Bracket after Figure 6 missing

Line 427: Bracket in the wrong place

Line 430 - 432: rephrase sentence e.g.: “Although the leaning procedure by Barker et al. (2003) has been widely used (e.g., …) the removal of Mn-Mg coatings is still inefficient (Hasenfratz et al., …).”

Line 439 – 441: rephrase sentence e.g.: “The high Fe/Ca ratios as well as the high Al/Ca ratios in most samples of all species used here (Table 2) indicate inefficient removal of silicate contaminants, suggesting that the number of rinse/ultrasonication repetitions of the Barker et al. (2003) procedure is inadequate.”

Line 449: what is with the value of 0.15 mmol mol-1 in Table 2 for the lowest range of *Uvigerina peregrina*?

Line 450: add “(… 0.35 mmol mol-1; Table 2)”

Line 451: rephrase term: compared to Fe/Ca rations in *Cibicidoides wuellerstorfi* below 0.04 mmol mol-1.

Line 455/457: Do you mean Table A3?

Line 457: add “(0.13 and 0.31 mmol mol-1)” behind *Cibicidoides spp.* -> There is also a dot missing after “*spp*”

Line 465: write: “… core depth, water depth, and morphology”

Line 474-476: Don’t understand this sentence. What is a nearby region here?

Line 477: I think there is a comma missing between contamination and Fe/Ca …?

Line 478: Bracket closed after “Figure 8”

Line 479: Bracket closed after “Figure 7”

Line 498: Missing commas before and after “respectively”, as well as before “but”

Line 507: one space too many between “i.e.” and “*Cib*”