Biogeosciences Discuss., 9, C1662–C1666, 2012
www.biogeosciences-discuss.net/9/C1662/2012/

Biogeosciences Discussions

Interactive comment on "A reappraisal of the vital effect in benthic foraminifera on Mg/Ca ratios: species specific uncertainty relationships" *by* J. C. Wit et al.

Anonymous Referee #1

Received and published: 5 June 2012

Dear Editor and Authors,

This paper focuses on inter-individual variability and temperature sensitivity of Mg incorporation in calcite shells of the benthic foraminifer Bulimina marginata. The manuscript is well-written; in particular, the Discussion section is well-thought-through. The topics attract many readers interested in biocalcification and paleo-temperature reconstructions. However, I consider this paper needs moderate revision before being published in Biogeosciences for the following reasons.

As the authors concluded, the species used in this paper was not suitable for a temperature proxy because of its infaunal habit, a weak correlation to temperature and

high inter-individual variability. Rather than discussing the application of the Mg/Ca-temperature calibration using this species, the authors should propose criteria to either accept or reject Mg/Ca-temperature calibrations.

Much of the Discussion has been devoted for sections 4.3 and 5. Most of these sections, however, describe either speculations or hypotheses upon many assumptions without any quantitatively supported data. These sections also seem to be a review paper on the sensitivity of Mg/Ca-temperature calibrations, and are only slightly relevant with the former part of the paper describing the authors' original results. I recommend the authors to prepare another review paper to propose their hypotheses together with many supporting data.

In spite of long and thoughtful Discussion, Methods and Results sections are too short and brief to understand in detail. This makes me wonder if presenting the original results is not the main part of this paper.

This paper does not answer clearly why inter-individual variability has occurred even if the authors could successfully remove any analytical errors and environmental offsets. Is inter-individual variability after removing the above factors attributed to the vital effect, which differs within individuals of the same species?

Specific comments

Title: The title does not reflect the main points in this paper. What means "species specific uncertainty relationship"? Some keywords should be included, such as inter-individual variability and low temperature sensitivity.

Abstract

P4948

L7: I do not think Mg/Ca values correlate "well" with temperature because of R2=0.28.

L18-21: The sentences give a vague impression. Better to rewrite more specifically.

1. Introduction

P4949

L24: The term “sub-oxic” needs definition/explanation.

L26 to P4950 L3: I wonder bottom water temperature can be reconstructed using infaunal species. Rethink the significance using this species.

2. Methods

P4950

L7: Why did you set this temperature range?

L9: Were specimens cultured in Calcein-seawater or in seawater after staining in Calcein-seawater?

L12: Explain how to control water temperature. This is important information for your experiments.

L16: Alkalinity means Total Alkalinity? Why pH and DIC are connected with slash (/)? pH and DIC are different parameters.

L26: Explain which part of a chamber you measured. Information on the depth and width of measurements are necessary as well. I prefer these are shown in SEM photographs. Assess the influence of lamellar structure (primary and secondary calcite) and organic linings/membranes on measurement data.

P4951

L2: I prefer to describe it even if a previous paper described it in detail.

L10: Elemental ratios with respect to Ca means (24Mg+26Mg)/(42Ca+43Ca+44Ca)?

L12: For ontogenetic analysis, the number of chambers is more suitable than test size diameter.

3. Results: Explain each result and graph in more detail.

4. Discussion

Section 4.2: How about comparing Mg/Ca values with growth rates of each individual during culture periods?

P4952 L20: “T” should be written in full.

Section 4.3

P4951

L12: According to Table 3, the standard deviation is 2.5%.

L16-19: Average Mg/Casw values and standard deviations are assumed based on other experiments measured. Does this not affect your conclusion?

L26: Which is salinity Eq. (1) ?

P4955

The second paragraph (L4-): This analysis is successful assuming that all calibrations work in the same direction. If this assumption is correct, remaining inter-individual variability shows vital effects, which differ by individuals?

L21-24: I have no idea if this assumption is reasonable or not.

P4956

Eq 4: Hard to understand how to derive this equation.

L14: No Table 5. Mention whether this number of measurements is realistic to analyze by LA-ICP-MS.

Section 5: Does this section not included in the Discussion?

Based on a general biological knowledge of foraminifers, three groups with different

sensitivities may be related to microhabitats and higher taxonomic groups. Infaunal species belong to a low sensitivity group, epifaunal and planktonic species belong to an intermediate sensitivity group, and porcelaneous species belong to a high sensitivity group. Off course these relationships do not imply any causality at all. However, infaunal species may become evolved to be poorly sensitive to temperature irrelative to phylogeny because of a relatively small variability of temperature within sediments compared to that at sediment surfaces. Alternatively, comparisons of growth rates among these groups may give some clues. Anyway, more supported and quantitative data are necessary to insist your speculations.

L4957 L12-13: This sentence is grammatically incorrect.

Fig. 1: How do you think peaks at the start and end? Are these included in the average value?

Fig. 2: Are average values of 9 and 11 degree C lower than others due to either the small number of data or other reasons?

Fig. 3: Put a/b for each graph.

Fig. 4: Difficult to understand this graph and relevant paragraph. Explain in more detail. Show references for the original data in the caption.

Fig. 6: Abbreviation “Nr” should be written in full.

Interactive comment on Biogeosciences Discuss., 9, 4947, 2012.