

# ***Interactive comment on “Carbonate “clumped” isotope signatures in aragonitic scleractinian and calcitic gorgonian deep-sea corals” by J. Kimball et al.***

**J. Kimball et al.**

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In this contribution, the authors present traditional O and clumped isotope data from carbonates precipitated by deep-sea corals over a range of temperatures. The authors compare their temperature-dependent  $\Delta_{47}$  data to existing biogenic and abiotic temperature calibrations. Differences between scleractinian and gorgonian corals are pointed out and discussed, as are similarities and differences among the observed temperature dependences in deep-sea corals and those in existing temperature calibrations. Overall, in this paper the authors present the data clearly, and although no far-reaching insight is obtained regarding calcification mechanisms in corals, the tem-

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perature dependence of carbonate clumped isotope compositions, or the validity of the various temperature calibration curves existing in the literature, the new data from corals are exhaustively compared with the existing calibrations, including a consideration of the effect of the acid digestion fractionation used. A nice contribution of the current paper is the schematic diagram showing expected trajectories for the various processes that can cause a deviation from equilibrium O and clumped isotope composition (Figure 10). As I am no expert on models of coral precipitation, I cannot speak to the accuracy of this aspect of the paper. In terms of the analytical details, the presentation and interpretation of the data, this paper requires only minor modifications prior to publication. Once revised and published, this paper will be a valuable source of isotopic data on disequilibrium isotopic compositions in corals, which may one day inform models of coral mineralization, as well as the validity of the various clumped temperature calibrations.

Minor comments:

Reviewer comment: 1. There are many references that appear in the text but not in the bibliography and vice versa.

Author response: This has been corrected.

Reviewer comment: 2. 19122 line 25: 'mortor' should be mortar.

Author response: Corrected

Reviewer comment: 3. 19123 line 24: 'John' should be Johns.

Author response: Corrected

Reviewer comment: 4. 19126 lines6-8: Why does it matter that this coral was only partly alive ("Mostly dead is partly alive!" - Miracle Max)? When measured in the geologic record, corals are quite dead, yet we are happy to use their isotopic composition to inform problems of interest. I'm not sure I see a reason for excluding this data point (because this is a calibration)

**BGD**

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Author response: We agree that the wording of this is imprecise so have revised it. This coral was not alive. Our aim is to focus on data for live-collected specimens to compare with in situ temperature measurements to eliminate any uncertainty in growth temperatures or post-formation dissolution when considering proxy systematics. For proxy validation, or for reconstruction purposes, using this specimen would be reasonable. The text has been revised to indicate this.

Reviewer comment: 5. 19127 sentence ending in line 6 is grammatically incorrect.

Author response: Corrected, now reads:

“In a plot of  $\Delta 47$  vs.  $106/T_2$ , the linear regression through data derived from 9 gorgonian deep-sea corals analyzed in this study gives a significantly shallower slope (slope:  $0.018 \pm 0.012$ , intercept:  $0.511 \pm 0.157$ ,  $R^2 = .23$ ) and  $\Delta 47$  offset of ca.  $0.04$ – $0.07\%$  in the temperature range of  $3.2$ – $11.2^\circ\text{C}$  compared to scleractinian corals as well as compared to the Ghosh et al. (2006) calibration.”

Reviewer comment: 6. 19130 line 1: 'used' should be uses.

Author response: Corrected

Reviewer comment: 7. 19130 line 7: 'predications' should be predictions.

Corrected

Reviewer comment: 8. 19131 line 5: The uninitiated do not know what an 'autoline' is. How about 'auto-mated sample extraction line'?

Author response: Clarified as suggested

Reviewer comment: 9. 19135 line 20: 'effects' should be affects.

Author response: Done

10. Data figures 7, 8, 9 are much less well prepared and presented than figures 3-6, in terms of marker sizes, font readability, legend location and readability, etc.

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We have modified figures 7-9 to address this comment.

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Interactive comment on Biogeosciences Discuss., 12, 19115, 2015.

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