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Interactive comment on "Mechanism of O and C isotope fractionation in magnesian calcite skeletons of *Octocorallia* corals and an implication on their calcification response to ocean acidification" *by* T. Yoshimura et al.

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We sincerely appreciate the comment which helped us to improve this manuscript. Please find our responses to the general and specific comments below.

Abstract: ... contribution of isotopically heavy DIC from seawater THROUGH the skeleton and pericellular channels... (probably the authors mean TO the skeleton through the channels) -> We corrected the text.

Bottom of page 397: ... has a significantly low delta-11B, corresponding to a theoretical

pH of ca. 0.3 ... !?!?!? -> According to the boron isotope study by McCulloch et al. (2012), the aragonitic coral species have relatively high δ11B compositions ranging from 23.2 to 28.7‰ and pH value of the internal calcifying fluid is elevated by 0.6–0.8 units (ΔpH) relative to ambient seawater. In contrast, the calcitic cold-water coral Corallium sp. has the much lower value of an increase in pH (ΔpH = $\sim$0.3) relative to ambient sea at the site of calcification. We corrected the text.

Page 398: everything is mixed up: octocorals, scleratinian corals and foraminifera, for which the biomineralization mechanisms are entirely different. -> The isotope ratios of the calcitic corals in this study correlated positively with B/Ca ratios, which is supposed to be an indicator of internal pH. This result differs from that of foraminifera. Although there are strict organism-specific biological controls on the precipitation of biominerals, biogenic CaCO3 is not only controlled by biological factors but is also under strong physicochemical control. Because the mechanism of O and C isotope fractionation in calcitic coral skeleton is still not well explored, it would make sense to compare with the result of other calcitic organism (foraminifera) and aragonitic corals.

P391 Line 25: This is not an appropriate reference for the solubility of carbonates in seawater. -> Sorry for that the journal information of this reference is mistaken. I corrected the reference list.

P392 Line 17-24: Are these bulk samples? If so then I am not sure there is much value in this particular study. We have no idea as to the state of preservation, degree of contamination, diagenesis, bioerosion, actual mineralogy, size of the samples used, sample preparation, and so one. Not sure if any of this information was previously reported but it should be presented here. The large variations could a consequence of some of these factors. -> We used bulk samples of precious coral skeletons. Soft tissue and organic matter on the skeletal surface was first removed. Then, the specimens were cleaned in an ultrasonic bath. All specimen has no signs of bioerosion. The coral branch samples were cut with a diamond saw, and we made bulk sample of a branch for each coral specimen. Amount of powdered samples were several grams. The

Mg/Ca ratios of the deep-sea corals ranged from 73.75 to 137.40 mmol/mol showed a clear positive correlation with water temperature, which is consistent with published data for deep-sea corals (Yoshimura et al., 2011), and showed no signs of contaminations, such as Fe and Mn. As reviewer #2 pointed out, the different part of coral branch probably have different δ13C and δ18O ratios. Previous studies have already reported large intra-skeleton variations in O and C isotope values. What we reported in this study is significant positive correlations of B/Ca with Δ13C and Δ18O, suggesting the mechanisms of O and C isotope disequilibrium is related to pH of the coral calcifying fluid. This relationship is observed in 11 samples of Octocorallia deep-sea corals collected from a large range of depths, therefore it is more primary controlling factor than intra-individual δ18O and δ13C heterogeneity.

P393 Line 16: Which isotope are we talking about here? I assume it is oxygen but this was not defined. In this section which is the results section you are discussing the data. This should be moved into the discussion under a separate heading. -> We corrected the text (oxygen isotope), and changed these sections to "Results and Discussion".

P395 Line 11: This is not an appropriate reference for this statement. Use the original reference. Keith and Weber (1965) or Weber and Woodhead (1970) -> We changed the references as suggested.

P395 Line 21: This is a circular argument pH controls CO32- and CO32- controls pH. Suggest you remove this and this (down to line 4 on page 8) is known and nothing new. -> We removed the sentences as suggested.

P396 Line 6-7: The relationship between C and O isotopes in aragonite corals is only strongly linear in non-symbiotic corals. Once again this was known and published before the work of McConnaughey and Adkins. -> We added references. Please see the revised version.

P396 Line 17: Once again incorrect reference. -> We added early papers. This reference also deals with carbon isotope fractionation of biogenic carbonates.

P400 Line 25: Incorrect reference -> This reference deals with this topic.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/12/C1028/2015/bgd-12-C1028-2015-supplement.pdf

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Interactive comment on Biogeosciences Discuss., 12, 389, 2015.