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Interactive comment on "Pliocene diatom and sponge spicule oxygen isotope ratios from the Bering Sea: isotopic offsets and future directions" *by* A. M. Snelling et al.

Anonymous Referee #1

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This short paper presents a preliminary result of oxygen isotope analysis of biogenic opal from the Bering Sea. It indicates no isotope offset in different size fraction of diatom, and some similarity between δ18O for pure sponge spicules calculated by mass balance and a global stacked benthic δ18O-foram record. The oxygen isotope analysis of siliceous sponge has been rarely reported, and the previous studies suggested that sponge does not form its siliceous spicules in oxygen isotopic equilibrium with ambient water. Thus, the data showing the possibility of δ18O-sponge as paleoenvironmental proxy are very interesting and should be published after minor revision below.

1) The authors calculated the δ18O value for pure sponge spicule by mass balancing using the relative abundance of sponge spicules in the > 38μm fraction and δ18O-

diatom obtained from the corresponding diatom-rich 3-15 μm fraction. But, it should be better to use the volume ratio of silica between diatom frustules and sponge spicules for the accurate calculation of δ18O value for pure sponge. If authors used the area ratio between diatom frustules and sponge spicules in the microscopic field, the relative abundance of sponge would be underestimated compared to that based on volume ratio, and the calculated difference between δ18O-sponge and δ18O-diatom could be overestimated (also the calculated fluctuation of δ18O-sponge could be overestimated). This is because the sponge spicule generally seems to have more massive structure compared to that of diatom frustule, and the thickness of the sponge spicule also seems to be thicker than that of diatom frustule. Authors should concern and discuss the error of calculated δ18O-sponge caused by the difference between volume ratio and area ratio. Further more, if authors used the relative abundance of number of frustules and spicules in the > 38μm fraction, the value of the "relative abundance" is no longer quantitative for the calculation. Please explain what type of "relative abundance" was used in more detail.

2) As described in P2092, L3, a linear relationship between the magnitude of the isotope offset and the sponge spicule content would indicate that the offset is driven by the relative abundance of siliceaous sponge material. But, the strong correlation could be attributed to that the offset is usually constant in the value calculated by extrapolating sponge abundance to 100 %. And, the sponge abundance increased at glacial stage. The constant offset between δ18O-sponge and δ18O-diatom and increased sponge abundance at glacial stage also could result in the δ18O-sponge trend similar to that of the global stacked δ18O curve. Please consider this possibility.

3) The authors indicated that the similar trend between the δ18O-sponge and δ18O-diatom. On the other hand, the δ18O-diatom value increased from 2.713 Ma to 2.541 Ma. There appears to no correlation between the δ18O-diatom change and the global stacked benthic δ18O-foram record. Did authors have any idea for the trend of δ18O-diatom? Please discuss not only the trend of the δ18O-sponge but also δ18O-diatom.

Or show the graph of δ18O-diatom with age and mention the trend at least.

The followings are minor comments:

P2090, L9, The year, 2013, may not be needed for personal communication.

P2090, L20, Does the proportion mean number of frustules or area ratio?

P2090, L22, How much of weight of sample was analyzed for one analysis?

P2094, L 18, As noted above, the variation of δ18O-sponge could be over estimated because of the mass balance calculation using the relative area or specimens ratio of sponge spicules.

Table S1, The δ18O of sample (BS348–BS351) in the 3–15 μm fraction is not shown, but the δ18O of pure sponge is calculated. How were these values calculated?

Interactive comment on Clim. Past Discuss., 10, 2087, 2014.