Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2018-328-RC3, 2018

Interactive comment on "Silicon isotopes of deep-sea sponges: new insights into biomineralisation and skeletal structure" *by* Lucie Cassarino et al.

Anonymous Referee #3

Received and published: 30 August 2018

Review of the manuscript "SILICON ISOTOPES OF DEEP-SEA SPONGES: NEW INSIGHTS INTO BIOMINERALISATION AND SKELETAL STRUCTURE " by Lucie Cassarino, Christopher D. Coath, Joana R. Xavier, and Katharine R. Hendry This manuscript present new silicon isotopic data of marine sponges and ambient seawater to evaluate the apparent Si isotopic between both Si reservoirs. The wide range of the apparent Si isotopic of Atlantic sponges grown in relatively low and homogeneous Si concentrations is contrary to previous publications which show that the apparent Si isotopic composition of marine sponges is dependent on ambient dissolved Si concertation of seawater. Based on skeletal morphology, the authors found evidence that sponges which experienced different degree secondary silicification, exhibit extremely

light 30Si signatures. The conclusion is that only certain types of spicules can be used for paleo reconstruction of dissolved silicon in seawater. With this new data this manuscript addresses a relevant scientific question how marine sponges can be used to reconstruct the Si availability in the oceans. I agree with reviewer 1 that a better quantification of the levels of spicule fusion would be desirable. Also an identification of the level of fusion within the table A1 in the appendix would be nice with a possible database of the SEM images for each sample. This enables the reader to get an idea of changing spicule morphology and how it is related to the apparent Si isotopic fractionation. This is one important aspect since from the residual plot in Figure 5d it can be seen that compared to the Demospongiae, Hexactinellida exhibit not only the lightest, but the heaviest D30Si residuals (also seen in Figure 4, although mean and median of all sponges in this group are lighter). Here sponges (Hexactinellida and Demospongiae) from the location GRM 17.4306 53.1831 at 1869m show heavy values. What do spicule morphologies of these samples look like how is their degree of fusion? Sadly I was not able to find the sample with the second highest D30Si (figure 5c at >30uM Si(OH)4. From figure 5d it seems to be a Hexactinellida. Saying this, there is a mismatch between figure 5c and Figure 6 although both figures present all published data and all JC094 data. Also please also compare if all data presented in Figure 5c are also displayed in the residual plot 5d. Some question regarding the dissolved Si concentrations: why are the dissolved Si concentrations for e.g. samples of the GRM location always 15.96 uM although they have a distance of more than 250 km and a depth difference of 400m? Can these sites, close to the mid Atlantic ridge, are affected by dissolved Si supplied by hydrothermal vents? How such a supply, although temporally, might influence the morphology of the spicules? Hydrothermal waters enriched in silica seems to promote the development of sponge growth with have thicker spicules compared to sponges that live in Si poor waters? After excluding such external, environmental parameters section 4.2 and 4.3 discuss the effect of organosilicon complexes on Si isotopic fractionation. Within section 4.2 conclude that the absent "difference in the fractionation between Hexactinellida and Demospongiae classes despite the difference in their spicule composition, suggesting that the large fractionation in sponges that display a dictyonal framework is not solely a result of the organic composition of the spicules but could be controlled by the enzymes that mediate silica deposition." However only Hexactinellida show a higher degree of fusion (figure 1). So why can the development of a silicon matrix or fusion of Si, possibly with the help of organosilicon complexes, can not be a additional Si deposition method for Hexactinellida? I think that the model calculation in 4.3 is valid since differences in Si uptake parameters are between sponges are obvious and will have influence on the apparent Si isotopic fractionation. But expect one very light data at $\sim$125 uM Si(OH)4 (Hendry & Robinson, 2012) Hexactinellida and Demospongiae from compiled previous publications from different oceans do show a relative small range in residual D30Si. I admire that this manuscript double the amount of available sponge Si isotope data, but if uptake parameters between sponges such a large effect on apparent Si isotope fractionation, why it has not been discovered it in the compiled previous datasets? Does this give indication that environmental parameters at some sample location presented here are different compared to previous publications?

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2018-328, 2018.