

## ***Interactive comment on* “Distribution of chlorine and fluorine in benthic foraminifera” by Anne Roepert et al.**

### **Anonymous Referee #2**

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Roepert et al present NanoSIMS results looking at the distribution of chlorine and fluorine in cultured benthic foraminifera; two rotaliid species where calcite test walls are constructed via calcification around a primary organic sheet (hyaline calcification), and two miliolid species where test walls are constructed from calcite needles within an organic matrix.

The preliminary results show that the calcification pathway of benthic foraminifera determines the incorporation and distribution of Cl, F, P and other elements in their calcite shells.

The paper is interesting and well written and a good fit to Biogeosciences. One thing that is missing from the text relates to what kind of proxy the authors think the various halogen elements versus calcium ratios would represent?

I have a couple of minor comments that can easily be addressed with minor revisions:

- The study takes advantage of benthic foraminifera cultured for different purposes, under different conditions (Figure 4). Were all the samples cultured in the same artificial/natural seawater, and were halogen concentrations monitored? Several of the environmental parameters were calculated from other relationship (salinity-alkalinity) rather than measured. How constant would these parameters have been during the culture experiments? It would be good to see a discussion of error estimates relating to the parameters the halogen/Ca are being compared with. Furthermore, a brief discussion about halogen/Ca errors/variability also seems appropriate.

- All results are grouped together in Figure 3 and 4. Why would you expect a similar relationship between halogen/Ca and environmental parameters in hyaline and miliolid species?

- Correlations. Tone down discussion concerning correlations as only very few specimens were used of the same species etc in abstract and results section.

- Spatial distribution of halogen/Ca (Figure 1). For the hyaline species higher values are found in the primary organic sheet for all three halogens. Have the authors taken into consideration that Ca in the primary organic sheet will be much lower than in the calcite? Halogen/Ca ratios are hence higher, but it doesn't mean that halogens are actually higher in concentration than they are in the calcite. Do the anion counts show elevated concentrations in these bands?

Other comments:

Abstract: The discussion of the results is vague. What is meant by 'Cl and F were highly heterogeneous and correlated within the shell walls' (line 7, 8), and 'In these species Cl and P were correlated' (line 10)? was the correlation positive or negative, and how significant? Lines 14, 15 'We further propose that in the miliolid species Cl may be incorporated as a solid solution of chlorapatite or associated with organic molecules in

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the calcite'. It is unclear what is meant with solid solution? Do you mean chloroapatite that has dissolved? Perhaps not use the word organic lining as a pseudonym for primary organic sheet, as foraminifera sometimes have an organic lining on the inside of the test.

4.1 How could you check if fluorite or fluorapatite are the incorporation mechanism for fluorine in calcite? Has there been a discussion about this with regards to aragonite which is also higher in F?

Figure 5 What is new here compared with previous work? Needs appropriate referencing.

Figure A1 SEM images are mirrored. Please change back!

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2019-424>, 2019.

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