Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-189-RC2, 2019

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Successional patterns of (trace) metals and microorganisms in the Rainbow hydrothermal vent plume at the Mid-Atlantic Ridge" *by* Sabine Haalboom et al.

Anonymous Referee #2

Received and published: 30 July 2019

Haalboom and collaborators conducted a multidisciplinary (geochemical/microbiological) study at the Rainbow vent site. They collected samples from different sites around Rainbow, at downstream stations, distal downstream stations, and upstream stations, and included different depths (above the plume, inside the plume and below the plume), as well as near-bottom water and sediment. The geochemical characteristics in the particulate phase were studied. The study was focused on trace metals and Rare Earth Elements. In parallel, they studied microbial communities and their variations in the different biotopes. These results are potentially very interesting and could provide new information for the knowledge and understanding of hydrothermal sites and their geochemical and microbiological characteristics.

Printer-friendly version

Discussion paper

However, the link between the different geochemical parameters is not sufficiently detailed. What does the combination of Rare Earth Elements and trace metals really bring to the story? Similarly, the link between geochemical parameters and microbial communities is not sufficiently exploited. For example, one of the major results that should have been discussed is Figure S4, which shows the correlations between environmental variables and classes of microorganism. It is only indicated that there is "a complex array of community drivers within the plume". Moreover, the authors claim that their study represents a T0 before mining activities, but I am not convinced by the analogy between the 2 types of plumes. Indeed, if the geochemical characteristics could be similar, the temperature, density, and microbial communities will be totally different.

Specific comments:

Title: I am not convinced that the results show the successional patterns of trace metals and microorganisms and I would recommend to remove the word "Successional".

Sampling (p 6): The sampling strategy seems confusing to me. Why several stations were sampled at the same location? What is the difference between these stations? The differences observed for the same parameter among the stations are not discussed. SPM, trace metals, and the microbial community are not systematically sampled at the same location. For example, stations 37, 38, and 39 were only sampled for trace metals. Is there any explanation why the different depths of each station were not systematically sampled for all parameters? It is indicated that intermittent water samples were taken for nutrients, but no information is reported on Table 1. For suspended particulate organic matter, I assume the authors refer to C/N on Table 1. No information is given for the analyses of nutrients and POC/PON. I understand that coring sites were constrained by the coring substrate, but why was not CTD deployed at each coring site?

SPM analyses (p 7): I would have liked to see the values of blank filters and the as-

Printer-friendly version

Discussion paper

sociated uncertainties as well as the average percentage they represent. Please write what SEM and EDS mean.

Chemical analysis (p 6): This section is missing some important information and is much less detailed that the following one. Were the filters acid-cleaned before use? What are the values for the filter blanks? Were procedural blanks performed? Which certified reference material was used to asses the accuracy of the analyses?

Statistics (p 9): For the biodiversity index, the authors should be consistent along the ms. With the name of the index (Shannon-Wiener vs. Shannon).

Water column characteristics (p 10): Using the T-S diagram, the authors identified 3 water masses. However, the hydrography of the area is certainly more complex than that, as shown in the article by Jenkins et al (2015, http://dx.doi.org/10.1016/j.dsr2.2014.11.018), even if this later study was located further south.

Enrichment of trace metals compared to the ambient seawater (p 11). In addition to the enrichment factors, I would have liked to see vertical profiles of the absolute values of trace metals and the range of variations. How was the "clear water" defined?

Geochemical gradients (p 12): Fe was found to be linearly correlated to the turbidity with a R^2 higher than 93%. What was the p value? In the text, it is written that the chalcophile elements Co, Cu, and Zn are shown on Fig. 6A, but only Cu is shown. Same for V and P for Fig. 6B and REEs for Fig. 6C, where only V and Y are shown. Similarly, in the text, Mn, Al, Ni, In, Pb, Ti, and U are referred to Fig. 6D while Sn is shown on this figure. Line 301: the authors state that Zn/Fe ratio is elevated at stations 37, 39, and 44. This is also the case at station 40, and is not discussed in the text. Line 302: on Fig. 6B, the relation between V and Fe indeed looks linear, but the axes are drawn with a logarithmic scale, which means that the relationship is not linear but polynomial. The V:Fe ration is not more or less constant and display values from 0.005 to $\sim$ 0.012 (please change also on line 462). It is the same for the REEs.

Microbial assemblages (p 13): Line 316: please replace “above plume” by “no plume” Line 317: please replace “which clustered distinctly from each other and from plume and below-plume communities” by “which clustered distinctly from each other and from plume, below-plume, and above-plume communities” Line 318: please replace “sediment and near-bottom water samples have communities that are very dissimilar from the overlying water column samples” and “sediment, near-bottom water, and no-plume samples have communities that are very dissimilar from the overlying water column samples”

Univariate biodiversity (p 13): Data used for Fig. 10 and Fig. 11 is slightly confusing. In Fig. 10, the value for diversity index in the plume is about 3.5 with SE lower than 0.5. In fig. 11, the values for samples in each plume vary from less than 2.5 to higher than 4.5. So I am wondering if the value in Fig. 10 corresponds to the average value of the data in Fig. 11 or not.

Plume influence on the water column chemical and microbial make-up (p 16-17): A table with the range of variation of the literature values would be useful. Line 408: please specify here what you mean with oceanic water masses. Line 411: please specify what you mean with SUP05 Line 442-443: the authors infer the dependence of sediment dwelling Epsilonproteobacteria on nearby plume precipitates, such as Cu, Zn and Cd, but why only these 3 elements? This should be justified.

Geochemical gradients within the hydrothermal plume (p 19): The high Ca:Fe ratio at station 40 is explained by the non-influence of hydrothermal plume. Please add a reference for this statement.

Microbial gradients within the hydrothermal plume (p 20): The authors state that the dominance of Epsilonproteobacteria is likely driven by the strong chemical enrichment of the plume but when looking at Fig. S4, Epsilonproteobacteria is not within the group that is the most strongly positively correlated with trace metals. As I wrote above, this point would be very interesting to discuss as well as the other correlations. Lines

Printer-friendly version

Discussion paper

511-513: this statement is too speculative.

Figures and Tables: Fig. 1: Station 30 is indicated twice. Fig. 2: The X axis represents the distance from Rainbow. On Fig. 1, it looks like station 44 is located closer to Rainbow than station 26. Table 1: Could you indicate long-lat for each station?

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-189, 2019.

Printer-friendly version

Discussion paper