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# *Interactive comment on* "Geophysical and geochemical controls on the megafaunal community of a high Arctic cold seep" *by* Arunima Sen et al.

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Relating the geochemistry to the species distribution of the macrofauna at seeps is always very difficult. Concentrations of possible energy sources, both in the surface layers, and within the sediment depth to which most macrofauna occur, can change by an order of magnitude or more over a distance of 10-50 cm from the seep outlet. In this study the positions of the cores with respect to the camera tracks are not that well constrained.

Core 920 is shown here as NE of GHP5 while in Hong et al. (2017) it is shown as SE of GHP5. My earlier comment regarding false dissolved methane readings by adding



equal volumes of 1 M sodium hydroxide to samples for the analysis of free methane was influenced by my own early studies in which samples were not analysed at sea and had a longer storage time in contact with NaOH. I accept that a short exposure may not bias the results to the extent I believed, although it would be good to have results from an untreated pore water sample for comparison. Indeed Ertefai et al. also used 1 M NaOH treatment before measuring free methane and then continued the treatment for a longer period to measure adsorbed methane. Timing is everything!

There is at least one paper on free methane concentrations in sediments off Spitzbergen, that did not use sodium hydroxide pre-treatment for dissolved methane measurements, and should be cited Kneis et al. (2004). These authors analysed 26 sediment samples between 15 and 30 cm depth and found a thermogenic methane signature, d13C of -50.8 (mean) in the adsorbed methane but a d13C of -65.2 (mean) in the free methane. The free methane concentrations, 0.5 – 5.5 micromol/litre were lower than measurements from a similar sediment depths in the pingo areas, 6-330 micromol/litre (Serov et al. 2017). It was suggested, Kneis et al. (2004), that the adsorbed methane was not available to the microbes and that the free methane was probably a mixture from both thermogenic and biogenic sources. However, the methane isotope data reported from the pingo area (Serov et al. 2017) was taken from a greater sediment depth so that a direct comparison of the sources of the free methane cannot be made.

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