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Biogeosciences Discussions

Interactive comment on "Miniaturized biosignature analysis reveals implications for the formation of cold seep carbonates at Hydrate Ridge (off Oregon, USA)" *by* T. Leefmann et al.

T. Leefmann et al.

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The authors appreciate the constructive comment of the referee. Below we will answer the questions raised and specific comments.

"However, you might provide more details on the way you obtain your sample material as it appears to be crucial for this paper. Concomitantly, you might add a paragraph on the advantages and disadvantages of the presented micro sampling technique."
Considered. A more detailed description is given in the revised manuscript.

"Results - The results are clearly outlined and well structured. Nevertheless, it might be helpful for the readers, if the biomarkers in table 1 are assorted concerning their potential sources (archaeal-, SRB) and allochthonous biomarkers)."

Considered. Table 1 has been modified in the way outlined by the referee.

"It is not clear in which figure you show that "Ca was somewhat more abundant in the lucent aragonite than in the whitish aragonite and grey micrite" (page 4449 line 12)."
Considered. The abundance of Ca in the lucent aragonite is shown in Fig. 3e). The figure caption has been complemented accordingly.

"How do you think the lucent carbonates are formed if you state that microbes are not involved? Where is the bicarbonate for the formation coming from? Were these void spaces, later filled by carbonate precipitation possibly caused by AOM-bicarbonate diffusing in? Or are there differences in the carbon isotopic composition of the lucent aragonite compared to the other phases indicating a different source for the lucent aragonites?"
Considered. Stable isotope data are now included in the revised manuscript. The analyzed stable carbon isotope signature of the lucent aragonite samples with δ^{13}C values as low as -46.98 $\%_0$ PDB is characteristic for methane-derived carbon and thus AOM-derived bicarbonate. As nearly no biomarkers were found within the lucent aragonite samples, we assume that the bicarbonate was not produced in situ, but was diffusing in to the site of precipitation.

"Where is the bicarbonate for the precipitation of carbonates coming from in the lucent aragonite phases in the chemoherms (page 4450 line 25)! Can a microbial role totally be excluded? What about diffusion of bicarbonate from AOM layers? What do you think, how the lucent aragonites have formed during these "intermittent periods of low fluid supply" as outlined in the conclusions (page 4452 line 3). Be more detailed. Carbon isotopes might be helpful to check about the origin of the carbonates! Thus, your statement "that there is no direct involvement" might possibly not be correct down to the word. You should check this and maybe adopt this statement a bit if necessary."
Considered. The authors admit that statement concerning the "direct involvement of microorganisms" might be somewhat misleading. By the term "direct involvement" we tried to express that the precipitation of the lucent aragonite may have lacked the im-

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mediate proximity of microorganisms and thus did not incorporate microbial biomass. However, as the referee pointed out, a microbial bicarbonate source can not be excluded by the biomarker data.

Interactive comment on Biogeosciences Discuss., 4, 4443, 2007.