

## ***Interactive comment on “Arctic Gypsum Endoliths: a biogeochemical characterization of a viable and active microbial community” by L. A. Ziolkowski et al.***

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This is an interesting paper mostly devoted on microbiological issues. As far as the physical environment, its description and discussion, this paper seems to me significantly less interesting. Although the authors have carefully collected data on the ecology of the environment (appropriate job and well done), there is not a satisfactory work on the physical substrate on which these microbial communities settled. There is not a real study on the microfacies (for examples through optical microscopy) and this is clearly evidenced by the poor physical documentation of the microbial communities and their EPS products.

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\*\*\*\*The purpose of this study was to bring together three branches of science in order to present the first data on an Arctic gypsum endolithic community. Each of these branches of science have their own sample requirements for examining the endolithic community. A detailed study of the microfacies would describe the microbial community on a different scale than the lipid analyses. Therefore, we chose more of an overview of the system rather than an in depth study of the microfacies.

I have edited the last paragraph of the introduction to state that the purpose of this study was to provide an “overview of this polar microbial community” in order to clarify that this study is did not include an in depth analysis of the microfacies.\*\*\*\*

Below a few details: Introduction - Lines 55-58: I hardly think that microbes organize endolithic communities pressed by lack of solar radiation. Most probably it is the opposite.

\*\*\*In non-polar regions, it is very likely that these communities receive abundance amounts of solar radiation throughout the year, however this community is at 80oN where there is not sunlight for months of the year. The context in which we talk about the limited solar radiation here is when discussing polar endolithic communities. \*\*\*

Line 82-86: Are these statements related to what? There is no reference, nor geographic indication.

\*\*\*To ground these statements, in the revised version of the paper we have added references after this sentence.\*\*\*

Methods - Line 126-134: which type of material was sampled? I can only presume it was gypsum. Neither figure nor, even less, the description in text, provide any detail on the type of rock sampled. Figure 3 seems to suggest it was a granular rock (wethered?) with possibly some dust. . .Is the sampled material a superfacial crust?

\*\*\*The evaporitic diapir at the site is composed mostly of gypsum, hence the name Gypsum Hill. To date most of the work done at the site has been on the sulfur rich

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perennial springs (e.g. Pollard et al. 2008). The material collected was both the superficial crust and the underlying gypsum. Sample was taken to a depth of 10cm.

To add more clarity to the description of the study site, the revised text has been edited to include more detail about what rock material Gypsum Hill is composed of and to what depth the samples were taken.\*\*\*

Biogenic and physical weathering - Line 357: "endolithic habitats covered by bacteria and associated extracellular polymeric substances (EPS)". I can hardly envisage any resemblance with filamentous bacteria or (even worse) EPS. Since morphology does not provide any real help, it would be necessary to have some other line of evidence.

Perhaps some optical microscopy would have substantially improved this poor section of physical description of the microenvironment.

\*\*\*As illustrated in Figure 6, we used electron microscopy to characterize the endolithic habitat. It is very possible that optical microscopy could have improved the characterization of this microenvironment, but an in depth study of the microenvironment was beyond the scope of the paper. \*\*\*

Discussion - Line 376-377 ". . .with little evidence of microbe mineral interaction." Since these interactions can be both physical and chemical, it seems to me that the paper does not provide any convincing evidence of at least physical interactions that may occur in a number of ways. Therefore, this statement should really be discussed.

\*\*\*This particular sentence was an overall summary previewing the "Discussion" section. Section 4.2 "Nutrient cycling and microbe-mineral interactions" discusses the lack of evidence of microbe mineral interaction in more depth.

To alert the reader to the fact that we discuss the statement at the beginning of the "Discussion" section in more detail I have added the sentence "Below we discuss these results in further detail".\*\*\*

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