

Peer Review

Review of: "Microbial Mediation in Gypsum Dissolution and Its Role in Evaporitic System Transformation in Northern Chilean Salt Flats"

Christine Heim¹

1. Universität Köln, Germany

Comments to the authors:

The manuscript entitled "Microbial Mediation in Gypsum Dissolution and Its Role in Evaporitic System Transformation in Northern Chilean Salt Flats" examines how microbial consortia influence gypsum dissolution and secondary mineral formation under laboratory-simulated polyextreme conditions using brines and microbial mats from Andean salt flats. Results show that microbial activity can either enhance or inhibit gypsum dissolution and promotes diverse secondary mineral precipitation via extracellular polymeric substances, unlike abiotic controls.

The manuscript is well-structured, the general content is informative, and may also be of interest to a broad readership for Qeios. I really appreciate the experimental setup trying to mimic the natural conditions as closely as possible. I do only have some concerns about some expressions and explanations in the text, and therefore I ask the authors to consider the following points:

1. Title: Why do you use "microbial mediation "in" gypsum dissolution" instead of mediation "of"? This expression is rather uncommon and has a slightly different meaning which seems unnecessary to me.
2. Page 1: ... implications in astrobiology: this sentence is often used but remains still very unspecific. If the authors assume that the combination of the different salt minerals may serve as a biosignature, mirroring the complex EPS-influenced nucleation process, then this should be clearly pointed out.

3. Page 4: The authors mention mineral assemblages which are not common to the broad readership. Therefore, please provide at least the formulas in brackets, so that the reader easily gets an idea about the different cations involved in the chloride and sulfate minerals and the respective water content.
4. Page 5: The 2nd sentence (For instance, it has been reported that...) is unclear.
5. Page 5: In endorheic basins, microorganisms ... (instead of Microorganisms)
6. Page 13: The figure captions below Figure 3 contain only information about figs a, b, c, but d, e, and f are missing.
7. Page 14: Please correct to: due to the growth (not grown) of acidophilic fungi..
8. Page 28: The authors mention the replacement by carbonates – which is correct – but why do you not refer to your dumbbell-shaped carbonates?
9. Page 28: Did you investigate the communities in the natural environment? Which organisms are dominating in the natural environment? Are these the same that you observe in the growth experiment – or if not, which community changes in abundance? (cyanobacteria vs. diatoms or other algae, etc.)
10. Page 29: Section 4.3: The nucleation processes are not clearly described but rather remain blurry, although this is a core section of this paper! Can the authors please be more specific? Especially if mineral phases are altered due to metabolic processes and/or interaction with EPS, it would be helpful to clearly describe in detail which of the Ca/Na minerals mentioned in the introduction are actively forming.

Declarations

Potential competing interests: No potential competing interests to declare.