

Interactive comment on “Novel water source for endolithic life in the hyperarid core of the Atacama Desert” by J. Wierzchos et al.

Anonymous Referee #2

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This manuscript extends and refines previous observations of water condensation within halite pinnacles in a hyperarid desert, by monitoring in situ and during a year various physico-chemical parameters with the aid of probes located at the surface and the interior of the pinnacles. Unexpectedly, Wierzchos and colleagues not only observed that water condenses within the halite when the outside conditions are of extreme dryness but, once condensed, water remains liquid for variable but often long periods. Based on cryomicroscopy and environmental scanning electron microscopy observations of halite endoliths under different relative humidity conditions, the authors suggest that water condenses in nanoporous phases within the halite. This would make liquid water available to endolithic and extremely halophilic microorganisms (cyanobacteria and a variety of heterotrophic bacteria and/or archaea), which are adapted to live in such brines.

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I cannot pronounce myself about the possibility that the nanoporous phases observed in LT-SEM and ESEM are (or not) the consequence of experimental artifacts. Irrespective of that concern, the fact is that records of water condensation along one year have been measured, implying that some mechanism allows for water to condense. Whether these are nanoporous structures or not remains to be validated. In fact, setting the probes within the halite pinnacles requires drilling them and, even if the probes are tightly adapted to the holes drilled, they may not be recording exactly the same values as would occur in nano- or micro-porous halite areas. However, if liquid water is measured in drill holes, it could be assumed that it is also present in the surrounding halite environment (though perhaps water evaporates earlier in the holes where the probes are inserted).

I find the observations that water condense and remains liquid forming brines for long periods very interesting. However, one can only regret the absence of replicate measurements in a second nearby halite pinnacle as control. The conclusions would have been much stronger. Indeed, if these observations are confirmed in a more statistical way, they would imply that these endolithic microorganisms are wonderfully adapted to recurrent drying up and rehydration, and to develop their metabolism whenever water is available (and at very low water activity due to the high salt concentration).

Another question that remains open is what happens below the colonization zone. Is water condensing there as well? If so, why do not heterotrophic microorganisms colonize that region as well? Is it only because they associate tightly to the photosynthetic cyanobacteria? How does organic matter distribute within the pinnacles? If the zone below the colonized area does not induce water condensation, why is it so?

Minor comments:

- Page 3073, lines 8-9. "Soils here are the most abiotic on Earth". Abiotic means without life, so soils here as everywhere else are either biotic or abiotic, but they cannot be little or very abiotic. - Page 3073, line 28: Halothece genus (not genera). - Page

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3076, line 18: imaging instead of imagining

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