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***In situ* metabolism in halite endolithic microbial communities of the hyperarid Atacama Desert**

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Abstract:

The Atacama Desert of northern Chile is one of the driest regions on Earth, with areas that exclude plants and where soils have extremely low microbial biomass. However, in the driest parts of the desert there are microorganisms that colonize the interior of halite nodules in fossil continental evaporates, where they are sustained by condensation of atmospheric water triggered by the salt substrate. Using a combination of *in situ* observations of variable chlorophyll fluorescence and controlled laboratory experiments, we show that this endolithic community is capable of carbon fixation both through oxygenic photosynthesis and potentially ammonia oxidation. We also present evidence that photosynthetic activity is finely tuned to moisture availability and solar insolation and can be sustained for days, and perhaps longer, after a wetting event. This is the first demonstration of *in situ* active metabolism in the hyperarid core of the Atacama Desert, and it provides the basis for proposing a self-contained, endolithic community that relies exclusively on non-rainfall sources of water. Our results contribute to an increasing body of evidence that even in hyperarid environments active metabolism, adaptation, and growth can occur in highly specialized microhabitats.

Key-words: Atacama, halite, deliquescence, metabolism, endoliths