

Inhabited subsurface wet smectites in the hyperarid core of the Atacama Desert as an analog for the search for life on Mars

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Abstract

The modern Martian surface is unlikely to be habitable due to its extreme aridity among other environmental factors. This is the reason why the hyperarid core of the Atacama Desert has been studied as an analog for the habitability of Mars for more than 50 years. Here we report a layer enriched in smectites located just 30 cm below the surface of the hyperarid core of the Atacama. We discovered the clay-rich layer to be wet (a phenomenon never observed before in this region), keeping a high and constant relative humidity of 78% (a_w 0.780), and completely isolated from the changing and extremely dry subaerial conditions characteristic of the Atacama. The smectite-rich layer is inhabited by at least 30 halophilic species of metabolically active bacteria and archaea, unveiling a previously unreported habitat for microbial life under the surface of the driest place on Earth. The discovery of a diverse microbial community in smectite-rich subsurface layers in the hyperarid core of the Atacama, and the collection of biosignatures we have identified within the clays, suggest that similar shallow clay deposits on Mars may contain biosignatures easily reachable by current rovers and landers.