



Exploring Polygonal Patterned Grounds in the Hyper-arid Atacama Desert: Insights into Formation Mechanisms and Implications for Martian Analogues

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Understanding the formation mechanisms of polygonal patterned grounds in hyper-arid environments like the Atacama Desert is crucial for unraveling their significance as an analogue for extraterrestrial landscapes, notably Mars. Unlike their extensively studied periglacial counterparts, the genesis of hyper-arid polygons requires more detailed exploration, since multiple processes, such as, desiccation [1] (including gypsum dehydration), thermal contraction [2], and haloturbation [3] are currently under debate. Therefore, we excavated a trench in polygonated ground in the Yungay area of the Atacama Desert and systematically collected over 80 soil samples covering an entire polygon, its adjacent sand wedges, and underlying sediments (190 x 190 cm). Sedimentological and geochemical analyses indicate a continuous interplay of atmospheric salt deposition, dissolution, precipitation, and inducing clast heave and shattering, under extreme dry conditions. Our findings emphasize that polygons in the Atacama Desert provide a promising analogue to Martian saline polygons, emphasizing the relevance of terrestrial studies for advancing our understanding of extraterrestrial landscapes.

References:

¹ Ewing 2006

² Sager 2021

³ Zineabelidin 2024 (preprint)