



The hyperarid core of the Atacama Desert

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The Atacama Desert is one of the driest regions on Earth, characterized by long-term hyperarid climate. However, there are regional gradients from hyperarid to arid conditions. Today, the hyperarid core, the area receiving less than $2 \text{ mm} \cdot \text{a}^{-1}$ precipitation, is situated between 19 and 22°S. In the past, regional climate changes caused local pluvial phases in the hyperarid Atacama and possibly shifted aridity gradients.

We investigated the distribution of gypsum, nitrate and further water-soluble mineral phases along W-E transects in the northern, central, and southern part of the Atacama Desert to identify correlations with the degree of aridity. The main mineral composition was determined by XRD analyses. Thermogravimetric analyses were used to quantify the gypsum content. Furthermore, samples were leached and leachates were analysed by ICP-OES and MTPR to identify water-soluble mineral phases.

Water-soluble minerals are washed out during precipitation events. Thus, the presence of water-soluble minerals could be an indication for hyperaridity. Their concentrations are highest in the northern transect and very low in the southern area implying a higher degree of aridity in the northern part of the Atacama Desert.

Gypsum contents show clear differences between surface and subsurface samples. Along the northern transect surface samples have continuously moderate gypsum contents. In the subsurface, gypsum is only present near the coast. In contrast, in the southern area high amounts of gypsum are common in surface as well as subsurface samples. These results confirm that water availability is lower in the northern part of the Atacama Desert, where only surface layers are hydrated, probably by sporadic fog events. In the southern area rare precipitation events provide enough water to hydrate deeper soil layers.