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Present and past distribution of fog-dependent Tillandsia vegetation in the hyperarid Atacama Desert

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The Atacama Desert in northern Chile is believed to be the driest place on Earth, where the availability of water plays a crucial role in determining the presence of plants. Rainfall is basically non-existent but fog is frequently occurring year-round along the coastal mountain range fueling a distinct "lomas" vegetation (Pinto et al., 2006). Here, isolated patches of mainly *Tillandsia landbeckii* plants typically grow in the fog zone at an elevation between 800 and 1300 m. The formation of *Tillandsia* is largely controlled by the availability of fog moisture and the spatial distribution has been related to major fog corridors reaching up to 50 km inland (Cereceda et al., 2002). However, little is known about the controls on fog intensities and frequencies over longer timescales due to the general lack of suitable climate archives.

In this study, we use stable nitrogen and hydrogen isotopes, lipid biomarkers and remote sensing to track present and past variations in available fog moisture. We collected individuals from different *Tillandsia* populations (active and dead specimen) along the coastal transect between Arica and the Rio Loa Canyon (ca. 18.5-21.5˚S). In addition, we excavated a series of fossil dunes that revealed multiple relict but well preserved *Tillandsia* layers. We ^{14}C-dated a total of 27 buried *Tillandsia* layers to develop a chronology of past growth events, and link changes in foliar δ^{15}N and compound-specific n-alkane δD values to moisture availability (Latorre et al., 2011; Sachse et al., 2012). Our first results indicate that *Tillandsia* growth occurred in continuous intervals over the past 2500 yrs in the North while it ceased at ca. 1000 cal. yrs BP in the South, in agreement with persistent dry conditions during the Medieval Climate Anomaly (Rein et al., 2004). This is also indicated by a shift towards more enriched foliar δ^{15}N values and n-alkane δD values during the same time interval. Our findings indicate the potential of fossil *Tillandsia* dunes as a valuable paleoclimate archive for past fog events during the late Holocene that may be largely controlled by ENSO-related climate anomalies.

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