

Multi-year climatology of fog and low cloud occurrence in the Atacama desert derived from satellite measurements

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Within the German Science Foundation funded Collaborative Research Center “Earth – Evolution at the dry limit” our overarching goal is to understand the moisture supply to the Atacama desert and its variability which is driven by synoptic and large scale patterns. Characterizing the moisture supply to the Atacama desert in the context of the recent climate is essential in order to establish thresholds for growth and development of the local biota and for surface alternations. Due to the scarcity of in-situ measurements especially over longer time periods, studies on a climatological scale are limited to satellite remote sensing and model data.

Here, we utilize the MODIS Cloud Mask (MOD35) from Terra and Aqua satellites along with other satellite products to determine the long term characteristics of the spatiotemporal variability of fog and low clouds. The MOD35 product utilizes spectral threshold tests which allow the distinction between low and high clouds. To validate this distinction, we utilize a newly installed network of 15 weather stations positioned across the coastal and continental Atacama. Next to temperature, pressure, wind and humidity measurements, the stations provide estimates of upward and downward radiation suitable to determine the presence of low clouds. Furthermore, leaf wetness sensors provide information whether fog was present or not at the stations. Moreover, we investigate the influence of synoptic and large scale features, such as cut-off lows, SST variations, and ENSO, on the spatial distribution of fog and low clouds. Understanding the relationship between these features and fog and low cloud occurrence will enable the estimation of fog and low cloud amounts in future and former climates.