



## **Aerosol-Cloud Interaction at the Land Site of VOCALS-REx**

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Aerosol-Cloud-Ocean interactions in the South-East Pacific represent one of the best natural laboratories to study aerosol-cloud-climate processes thanks to stable large scale atmospheric and oceanic circulation and large anthropogenic sources associated mainly with copper industry. This article discuss the microphysical and optical characteristics of aerosols in the marine boundary layer (MBL) and the free troposphere (FT) related to the coastal MBL dynamics, stratocumulus cloud formation and dissipation in an environment influenced by air pollution sources in the FT and MBL. The analysis is based on observations from the Land Sites of VOCALS-REx at Paposo (25 S, 70 W, 700 masl) on the Pacific ocean coast, about 150 km south of Antofagasta in Chile and from free tropospheric site at ESO Paranal Observatory located inland at 2435 masl some 40 km NE from Paposo site. Combination of the in situ measurements from both, free troposphere and MBL together with lidar observations provides comprehensive insight into MBL-free troposphere interactions. The aerosol properties in FT are to a large degree controlled by sulfate-dominated aerosol from copper industry in northern Chile. The free tropospheric aerosol close to the coast has very stable accumulation mode dominated size distribution with mode diameter  $\sim 0.1 \mu\text{m}$ , but the aerosol number density for particles  $> 0.01 \mu\text{m}$  as well as for particles  $> 0.26 \mu\text{m}$  show large variability between 300 and 1600  $\text{cm}^{-3}$  and 5 and 50  $\text{cm}^{-3}$ , respectively. The large variability can be attributed to changing influence from individual emission sources due to changing intensity of the coastal jet flow and diurnal ventilation of the shallow boundary layer in hilly region of the Atacama Desert mountain plateau. Polluted aerosols from FT are transported to the MBL along the Andes western slope through katabatic flows and downward mixed into the MBL most intensively in a narrow band along the coast.