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Stratocumulus Clouds at the West Coast of South America: Observations of Diurnal and Seasonal Cycle

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Marine stratocumulus clouds of the eastern Pacific play an essential role in the Earth's energy and radiation budget. Parts of these clouds off the west coast of South America form the major source of water to the hyper-arid area at the northern coast of Chile. Within the DFG collaborative research center 'Earth evolution at the dry limit', for the first time, a long-term study of the vertical structure of clouds and their environment governing the moisture supply to the coastal part of the Atacama is available.

Three state of the art ground based remote sensing instruments were installed for one year at the airport of Iquique/Chile (20.5°S, 70.2°W, 56m a.s.l.) in close cooperation with Centro del Desierto de Atacama (Pontificia Universidad Católica de Chile). The instruments provide vertical profiles of wind, turbulence and temperature, as well as integrated values of water vapor and liquid water. Instrument synergy provides vertical cloud structure information.

We observe a land-sea circulation with a super-imposed southerly wind component. Highest wind speeds can be found during the afternoon. Clouds show a distinct seasonal pattern with a maximum of cloud occurrence during winter (JJA) and a minimum during summer (DJF). Clouds are higher and vertically less extended in winter than in summer. Liquid water path shows a diurnal cycle with highest values during night and morning hours and lowest values during noon. Furthermore, the clouds contain much more liquid water in summer. The turbulent structure of the boundary layer, together with the temperature profile, can be used to characterize the mechanism driving the cloud life cycle.