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A new network of climate stations in the Atacama to fill the observational gap.

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The Atacama desert is one of the driest places on earth but climate data and climate models show large biases there with especially too high precipitation. Meteorological observations in the region are sparse and limited. Thus we built up a new network of 15 climate stations which is intended to work as a reference for climate models as well as ground truth for satellite missions. Goal of the network is also to understand how water is transported into the desert. Especially fog and dew play an important role as precipitation is with annual values around 0.1 mm/a extremely low.

The network is build up by three transects from the coast of the pacific up to the slope of the Andes. The transects cover typical land forms of the region: the gypsum desert, result of the extreme dryness of the region; a wide valley running from west to east through the coastal mountain range allowing inflow of moist air from the pacific into the desert, and a narrow valley showing a strong gradient of decreasing vegetation from the coast to inland. Instrumentation of the network includes not only standard parameters like temperature, wind and precipitation but also solar and terrestrial radiation, soil temperatures and soil moisture. A 'leaf wetness' sensor gives information about deposition of liquid water by dew or fog. All data is available under DOI 10.5880/CRC1211DB.1.

First results of the meteorological parameters show very regular patterns with some seasonal variation. Coastal stations show in general during daytime southerly winds, i.e. along the coast and easterly winds at night i.e. wind blowing from land to sea. This is a combination of the synoptic situation (high pressure system above the Pacific), a land/sea breeze system and a cold air drainage flow from the coastal cliff. All inland stations show a daily pattern different from this: starting at midday wind is coming from the west i.e. from the Pacific ocean whereas during night it is blowing from the east i.e. from the Andes. Wind speeds are during daytime usually higher than during night indicating a mountain wind system driven by solar heating.

At the stations in the coastal mountain range the west wind during daytime is usually moister than the east wind during night. This indicates that the daytime west wind originates in the oceanic boundary layer. At the most eastward stations at the foot of the Andes this day-night difference is not present. This means that over the day moisture is transported into the desert. A rough maximum estimate assuming that the advected moisture is deposited as dew in the central valley of the desert gives 0.5mm/day which would exceed the annual average rainfall of the region. Possible alternative pathways of the water vapor will be discussed.