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Fog deposition to the Atacama desert

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In the Atacama Desert, one of the driest places on earth, fog deposition plays an important role for the water balance and for the survival of vulnerable ecosystems. The eddy covariance method, previously applied for the quantification of fog deposition to forests in various parts of the world, was used for the first time to measure deposition of fog water to a desert. We estimated the amount of water available for the ecosystem by deposition and determined the relevant processes driving fog deposition. This is especially important for the species *Tillandsia landbecki* living in coastal Atacama at the limit of plant existence with fog and dew being the only sources of liquid water.

Between 31 July and 19 August, 2008, measurements were realized in a 31 ha large *Tillandsia* carpet at Cerro Guanaco, located 15 km south of Iquique, northern Chile. Several data quality assurance procedures were applied. For the values in compliance with the applied criteria, the mean total deposition per hour was determined (0.04 L per m^2) for foggy periods. This number was applied to estimate the amount of water deposited during the measuring period, during the entire month of August 2008, and throughout a whole year. For August 2008, a frequency of fog of 16 %, as established during the measuring period, was assumed. The frequency for a whole year was estimated from the differences of the collected amount of water obtained with standard fog collectors installed at Cerro Guanaco in an earlier study.

Calculations resulted in an amount of 2.5 L per m^2 of deposited fog water for the measuring period. During the entire August, 4.4 L per m^2 have likely been available, and for a whole year, a total of 25 L per m^2 was estimated to have reached the surface. Inaccuracies could have been caused by the low amount of data applied, and by a possible underestimation of the deposition due to additional formation of radiation fog during the fog events.

Three days were used for further analysis because of long, uninterrupted fog periods. On each of these days, turbulent upward fluxes occurred periodically. This leads to the assumption that there could have been a source of fog water near the surface. During the respective time periods, warm air was transported downward. The cold desert ground could have diminished the temperature of air layers at ground level, and therewith could have caused additional condensation. If there had been a source of droplets between the measuring height (5 m above ground) and the surface, deposition could have occurred while the instruments were measuring upward transport of fog droplets.

Westbeld, A., Klemm, O., Griessbaum, F., Sträter, E., Larrain, H., Osses, P. & Cereceda, P. (2009) Fog deposition to a Tillandsia carpet in the Atacama Desert. Annales Geophysicae 27, 3571-3576.