

## **From salt to sky: Estimating evaporation at the Salar de Atacama, Northern Chile**

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**Abstract.** The Atacama Desert of northern Chile is one of the driest locations on the planet. A persistently dry climate has contributed to the formation of thick salt deposits in terminal basins (playa lakes). One of these playas, the Salar de Atacama, has accumulated more than 100 m of salt in some areas. This study compares modern evaporation estimates from eddy correlation techniques and remote sensing to long-term salt accumulation rates in the basin. Eddy correlation measurements were useful in distinguishing distinct evaporation zones for different salt and vegetation types and showed that most basin evaporation in the salar occurs from the margins, with rates ranging from 0.4-2.8 mm d<sup>-1</sup>. Measurements could resolve evaporation rates to within  $\pm 0.1$  mm d<sup>-1</sup>, but evaporation rates from thick halite salt crusts in the center of the basin were below the detection limit for the eddy correlation method. Remotely sensed data from the Advanced Spaceborne Thermal Emission and Reflection radiometer (ASTER) sensor were useful for distinguishing salt types and zones with different land surface energy flux characteristics; however, evaporation estimates derived from ASTER data were not accurate enough to enable estimates of total evaporative losses from the playa. Salt accumulation rates suggest that evaporative losses from the central halite crusts of the Salar de Atacama may be only about 2 mm yr<sup>-1</sup>, an evaporation rate significantly lower than any reported for playas elsewhere in the world. Results of the study show that salt crusts can become practically impermeable to evaporation, even with shallow water tables.