

EGU2020-6064

<https://doi.org/10.5194/egusphere-egu2020-6064>

EGU General Assembly 2020

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Evaporation measurements with an Optical-Microwave Scintillometer system over a Saline lake in the Atacama Desert

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Evaporation is the main water outflow and a key component of the water and surface energy balance in the endorheic basins of the Atacama Desert. This is very localized to confined environments such as saline lakes, wetlands and crop fields. In these environments, the understanding of evaporation is challenging due to the interaction between the large-scale forcing and local scale turbulence over heterogeneous surfaces. Here, the advection of momentum, heat or moisture plays an important role in the enhancement of evaporation. To understand the evaporation dynamics over such environments, we performed a comprehensive 10-days experiment: the E-DATA (**E**vaporation caused by **D**ry **A**ir **T**ransport over the **A**tacama **D**esert), localized under extreme conditions in the Salar del Huasco saline lake (22,3°S - 68,8°W - 3790 m a.s.l.), Chile. The measurement strategy was based on spatially distributed high-resolution surface and airborne observations in combination with WRF (Weather Research Forecasting) modeling. The main findings of the experiment show that evaporation is mainly controlled by the lack of turbulence in the morning and by regional-scale forcing in the afternoon, which leads to a sudden increase in mechanical turbulence, therefore in the evaporation flux.

This work compares two in-situ independent measurements of surface heat fluxes over the saline lake, by using an Eddy Covariance (EC) system and an Optical-Microwave Scintillometer (OMS). Our results show in general a good agreement between EC and OMS measurements of latent (L_vE) and sensible (H) heat fluxes over the water surface (R^2 : 0,90-0,96). During the morning, slight differences are observed between the EC and OMS measurements. However, differences up to 200 W m⁻² are observed in the afternoon for L_vE and up to 20 Wm⁻² for H. The first analysis shows that these differences given during the afternoon are likely attributed to Monin-Obukhov stability (MOST) functions, which need to be developed yet for open water surfaces. Moreover, differences in the footprint of both measurement systems together with dramatic wind changes between the morning and afternoon may play a role. Finally, inaccurate bandpass filtering of the raw scintillometer signal may be a factor in the differences between EC and OMS, where we are currently working to refine our results. Our findings highlight the advantages and disadvantages of

each measurement method over an open water body and provide a discussion about its performance.