

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2022-20

Stephanie Kampf (Referee)

Referee comment on "Multi-scale temporal analysis of evaporation on a saline lake in the Atacama Desert" by Felipe Lobos-Roco et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-20-RC2>, 2022

This manuscript is an interesting multi-scale, multi-method evaluation of evaporation and water balance at the Salar del Huasco in Chile. The paper contributes insight into climate drivers of evaporation variability and illustrates how dominant controls on evaporation vary with time scale. The manuscript is well-written, with methods carefully documented.

My suggestion of major revisions is due to concerns about influences on evaporation that appear to be neglected:

1) Salinity reduces evaporation rates, and as far as I can tell this effect is not included in the site-adapted Penman equation. See Mor et al. 2018 WRR

2) Although open water evaporation rates are likely highest, water can also evaporate from areas with salt crusts (see Kampf et al. 2005 JOH, though probably some more recent references are also available). Because the salt crust areas may be large relative to the open water, they likely do have a substantial effect on the basin water balance. An interesting study on salt crust changes over time in Bowen et al. 2017, Geomorphology.

Please incorporate these effects into the analysis, or explain why they can be neglected.

Other minor suggestions:

line 214: "Evaporation estimates are obtained from the downscaled ERA5 and precipitation" - presumably precipitation data are not used to calculate evaporation. Should this state "precipitation-adjusted evaporation estimates"?

line 215: how is the lake depth determined?

lines 257-258: "we observe that and coefficients". Should the "and" be deleted here, or is another word missing?

Table 2, 1st row: "addapted"

Table 2, what is "m" column?

Figure 5: Time series are great to see, but I would suggest (1) plotting as lines rather than columns for easier viewing, and (2) paring this with a scatterplot of met station vs ERA5, so the reader can more easily evaluate the performance comparison. Consider also adding precipitation to the time series to visualize how these changes in evaporation correspond with year-to-year and seasonal variability in precipitation. This time series information about precipitation would be a helpful addition to the combined year precipitation data in Fig 6.

Figure 9: Similarly, I am curious what these patterns look like as a time series rather than aggregated to monthly means and ranges. The complete time series (or an example series of years) would illustrate how much the lake area changes from year to year & how those area changes relate to precipitation and evaporation.

Lake water balance, paragraph starting line 369: I am not entirely following the water balance calculations and results. Could you show the water balance graphically?

Figure 9: b and c are plotting mean monthly values? Related to the comment above about showing full time series - this monthly aggregation illustrates the average role of evaporation in determining lake surface area, but it misses the interannual variability and how precipitation influences area. If the lake surface area lags behind the precipitation because of the slower moving groundwater, then comparing one month's area to the same month's precipitation will not necessarily be helpful. You could try correlations between precipitation and area using the full time series, but instead of comparing same months, lag the lake area month until you find the lag time at which precipitation and lake area are best correlated.

A3: energy balance non-closure coefficient - from Figure A-3, it looks like this is the slope (m) in each scatter relationship? Please connect "m" from the figure to the energy balance non-closure coefficient variable.

Ice coefficient: on what basis did you choose the number of hours below freezing for ice coefficient values? Did you consider salinity effects on freezing?