Dead Sea evaporation by eddy covariance measurements versus aerodynamic, energy budget, Priestley-Tylor and Penman estimates.

By Metzger et al.

The paper shows, for the first time, results of direct annual evaporation (E) measurements from the Dead Sea (DS) based on eddy covariance (EC) technic Understanding the annual and the short-term dynamic of the lake evaporation rate is important scientifically in many aspects, for the regional managers and for the future fate of the whole region.

The paper is a clearly written, covering both measurements aspects and evaporation modeling aspects over free water body in exceptional conditions, and one can assume that the measurements were carried under very harsh conditions. Last, there are not many E measurements over water bodies that are based on eddy covariance technique and are comparing measurements results versus different evaporation rate models as the Authors presented here.

Having said that, there are a few significant points the Authors need to address before any publications:

1. Comparing annual evaporation results with previous estimation.
   Comparing to previous works need caution which the Authors have to mention and discuss, including; A. The change in the water level likely changed as well the DS surface area between the different estimation years (e.g., in the case of Stanhill 1994 the lake level was probably 30 m higher and surface area much larger). B. Changes of the climatic conditions due to large-scale changes as well as due to the lake shrinkage. The Authors already mentioned the rapid changes in the reginal Persian trough frequency. C. Likely salinity changes over the years and possibly also the amounts of water removal to the mineral production pools in those years? And D. This work is based on a single measurement year that the Authors mentioned as a relatively wet one.
2. H and L_v calculations (section 3.1) were needed for the energy budget models (as in Tab1). And I assume, though not clearly presented, that ET was derived directly from EC evapotranspiration calculation, not from L_v ?
   However, figure A1 is important in showing that compared with pure water, saline water L_v is lower for temperature higher than ~22C , which likely means that for most times of the year L_v of Dead Sea water is lower than that of a pure water. In this respect, the sentence in L27, page P5 is confusing and future warming and increase water salinity will possibly increase E?
3. Gap filling model for E values when wind direction is coming from the land enhances considerably the total evaporation, especially during the afternoons. However, this model uses VPD (and wind speed) derived from humidity values of air coming from the lake. While the humidity of the land air is probably lower compared to wind coming from the lake. But, it is likely that RH of this dry air increases as it is blowing over the lake for some distance., Thus VPD and E should decrease. Shouldn't such effects be estimated, considering its large effect on E? Do the Authors have any information on the RH difference between the two sides of the lake (e.g., west vs. east) for wind blowing to either directions?

4. Combining or incorporating variables with previous works that have been carried out over the DS in the past to check estimations and assumptions. For example, I found published works on DS surface temperature (*T*om) measurements, and others on the lake heat storage on different time scales. I am wondering why the Authors did not refer to this data? Δe is highly dependent on *T*om and close to the shore *T*om is warmer than in the open sea, thus it would be valuable if the authors could compare their estimations with independent measurements and its effects on E estimation.
5. This leads to the last main point: The basis for the uncertainty around E (± 82.2 mm) is unclear. For ecosystems over land, it is generally assume to be ~10%; is it about the same here or? However, although the uncertainty value is about 8% of E it is likely still a substantial large number for water management of the region. Can Authors suggest ways to reduce this in future activities?

A few detailed comments:

1. L. 9 p. 3. I would look for additional citation(s) for the EC approach reliability to measure E over water bodies.
2. Is the IRGASON a close or open path IRGA?
   And generally, did the researcher had any problems with the presumable high rusty environment down there, with salt particles etc.?
3. Heat storage in section 4; can the Authors add 'zero' line in Figure 2, ΔQ value. The impression from inspecting that figure is that the annual value deviate considerably from zero? Is it due to negative heat transfer (e.g., by rain)?
4. Please add the units for MD and std in Table 6.