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Discussions

Interactive comment on "Evaporation in a Mediterranean environment by energy budget and Penman methods, Lake Baratz, Sardinia, Italy" *by* F. Giadrossich et al.

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This paper describes an interesting experimental study of the evaporation from Lake Baratz which is of potential practical importance and which is well conceived and designed and professionally implemented. However, there are some significant shortcomings in the analysis of the data obtained, notably in the comparison between the measured evaporation and the estimate of evaporation given by the Penman Equation. This is discussed below and recommendations made for reanalysis of this aspect of the study.

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It is important to recognize that the Penman Equation is merely a specific implementation of the Penman-Monteith Equation with the surface resistance at the evaporating surface set to zero and the an empirically based form used for the aerodynamic resistance, see, for example, pages 339-341 of Shuttleworth (2012). Consequently the calculation of a Penman estimate should be made not using measured net radiation as assumed in Equation (12) of this paper, rather using the best available measurement-based estimate of A, the energy available for evaporation instead, i.e. A = (Rnet + Anet –[Delta]S) in this study - see, for example, Equation (4.4.10) of Shuttleworth (1993) and Equation (23.9) of Shuttleworth (2012). If the authors recalculate the Penman estimates for the lake using the energy available for evaporation rather than using net radiation this should result in a major improvement in their comparison between the BREB measurements and Penman Equation.

However, some discrepancy between the BREB measurements and the Penman Equation may still persist when this recalculation has been made because of the empiricism in the expression (implicitly) assumed by Penman for aerodynamic resistance, which was indexed to be relevant to a small evaporating area in southern England (and likely biased towards summertime conditions). It is likely that the effective surface roughness of the extensive evaporating surface of Lake Baratz and the different surface energy partition (and hence effective average sensible heat and thus effective stability of the near-surface atmosphere). In principle these remnant discrepancies might perhaps be used to calibrate a (likely seasonally dependent) version of the so-called “wind factor” in the Penman Equation to derive a Lake Baratz specific form of the Penman Equation. It is possible using this revised lake-specific form of the Penman Equation may improve comparisons with BREB measurements of lake evaporation elsewhere.

Note that Blanken et al (2000) and Finch and Gash (2002) are interesting references that relate well to this paper. Given the rich water and energy storage data available in this experimental study, in a follow up study the authors might consider adopting the idea of building a model of energy storage (c.f. Finch and Gash) and inflow/outflow

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based on weather variables. Such a model when coupled with a lake-specific version of the Penman Equation may provide a basis for predicting changes in lake water storage in response to changing climate conditions.

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