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Modelling sub-daily evaporation from a small reservoir.

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Accurate quantification of evaporation from small water storages is essential for water management and is also required as input in some regional hydrological and meteorological models. Global estimates of the number of small storages or lakes (< 0.1 kilometers) are estimated to be in the order of 300 million (Downing et al., 2006). However, direct evaporation measurements at small reservoirs using the eddy covariance or scintillometry techniques have been limited due to their expensive and complex nature. To correctly represent the effect that small water bodies have on the regional hydrometeorology, reliable estimates of sub-daily evaporation are necessary. However, evaporation modelling studies at small reservoirs have so far been limited to quantifying daily estimates. In order to ascertain suitable methods for accurately modelling hourly evaporation from a small reservoir, this study compares evaporation results measured by the eddy covariance method at a small reservoir in southeast Queensland, Australia, to results from several modelling approaches using both over-water and land-based meteorological measurements.

Accurate predictions of hourly evaporation were obtained by a simple theoretical mass transfer model requiring only over-water measurements of wind speed, humidity and water surface temperature. An evaporation model that was recently developed for use in small reservoir environments by Granger and Hedstrom (2011), appeared to overestimate the impact stability had on evaporation. While evaporation predictions made by the 1-dimensional hydrodynamics model, DYRESM (Dynamic Reservoir Simulation Model) (Imberger and Patterson, 1981), showed reasonable agreement with measured values. DYRESM did not show any substantial improvement in evaporation prediction when inflows and out flows were included and only a slighter better correlation was shown when over-water meteorological measurements were used in place of land-based measurements.

Downing, J. A., Y. T. Prairie, J. J. Cole, C. M. Duarte, L. J. Tranvik, R. G. Striegl, W. H. McDowell, P. Kortelainen, N. F. Caraco, J. M. Melack and J. J. Middelburg (2006), The global abundance and size distribution of lakes, ponds, and impoundments, Limnology and Oceanography, 51, 2388-2397.

Granger, R.J. and N. Hedstrom (2011), Modelling hourly rates of evaporation from small lakes, Hydrological and Earth System Sciences, 15, doi:10.5194/hess-15-267-2011.

Imberger, J. and J.C. Patterson (1981), Dynamic Reservoir Simulation Model - DYRESM: 5, In: Transport Models for Inland and Coastal Waters. H.B. Fischer (Ed.). Academic Press, New York, 310-361.