Energy budget for open lake evaporation

The energy transferred from the water by the energy for evaporation $Q_ {ve}$ equals:

$Q_{ve}= Q_e*c* \frac {\left (T_s-T_b\right)} {L}$

where c is the specific heat capacity of water (cal/gm/°C) and T_b is an arbitrarily chosen base temperature, in general 0 degrees Celsius, while L is the latent heat of vaporization (590 cal/gm).

Re-combining the first two equations, we obtain:

$Q_{e}=\frac {Q_s-Q_{rs}-Q_{lw}+Q_v-Q_{\theta} } {1+R+c*(T_s-T_b)/L }$

with Q_s incoming solar radiation and Q_{rs} reflected solar radiation and Q_{lw} net long wave radiation from the water body to the atmosphere, Q_v net energy advected into the lake by flows of water, Q_{θ} change of energy storage in the lake. R is the Bowen Ratio.

As the total amount of energy used for evaporation is:

$E_o = \frac {Q_e} {L*\rho}$

where ρ is the density g/cm^3, evaporation from an open water surface can be expressed in terms of the energy balance components and conditions at the lake surface:

$E_{o} = \frac {Q_s-Q_{rs}-Q_{lw}+Q_v-Q_{\theta} } { \rho * \left [L*(1+R)+c*(T_s-T_b) \right] }$

References Dunne, T. & Leopold, L. B. (1978). Water in Environmental Planning. New York: Freeman and Company.