Supplemental Material for

ET Cool Home: Innovative Educational Activities on Evapotranspiration and Urban Heat

Unit Conversions and Dimensional Analysis for ET Calculations

Due to challenges sometimes faced by students in performing unit conversions when calculating ET, especially those with less developed quantitative skills, we have provided this guide for the calculations used in the sample data collection and calculations spreadsheet (Supplemental Materials). Each equation for calculating ET, referenced by equation number in the main manuscript, is provided below, along with all unit conversion values needed for final calculations. Note that all data are recorded in units of grams (mass), Kelvin (temperature), square centimeters (area), and minutes (time). All conversion factors and constants use units as described below or provided in Table 1 of the main manuscript. Initial equations enclose all units within square brackets.

Mass Balance

Evapotranspiration Rate (Eq. 4)

$$ET_{WB} = \frac{M_i[g] - M_f[g]}{\rho_w \left[\frac{g}{cm^3}\right] * \Delta t\ [minutes] * A[cm^2]}$$

$$= \frac{g}{\frac{g}{cm^3} * minutes * \ cm^2} \times \left(10\ \frac{mm}{cm} * 1440 \frac{minutes}{day}\right)$$

$$= \frac{mm}{day}$$

Energy Balance

Latent Heat Flux (Eq. 8)

$$LE = SW_{in}\left[\frac{W}{m^2}\right] * (1 - \alpha[-]) - H_s\left[\frac{W}{m^2}\right]$$

$$= \frac{W}{m^2} - \frac{W}{m^2}$$

$$= \frac{W}{m^2}$$

Sensible Heat Flux (Eq. 9)

$$H_s = \rho_{air}\left[\frac{g}{m^3}\right] * C_{\rho air}\left[\frac{J}{kg * K}\right] * \frac{T_s[K] - T_a[K]}{r_a\ \left[\frac{s}{m}\right]}$$

$$= \frac{g * J * K}{m^2 * kg * K * s} \times \frac{1\frac{W\ s}{J}}{10^3\frac{g}{kg}}$$

$$= \frac{W}{m^2}$$

Evapotranspiration Rate (Eq. 5)

$$ET_{EB} = \frac{LE\ \left[\frac{W}{m^2}\right]}{l_v\left[\frac{J}{kg}\right] * \rho_{H_2O}\left[\frac{g}{cm^3}\right]}$$

$$= \frac{\frac{W}{m^2}}{\frac{J}{kg} * \left[\frac{g}{cm^3}\right]} \times \frac{10^3\frac{g}{kg} * 86400\frac{s}{day} * 10^3\frac{mm^3}{cm^3}}{1\frac{W\ s}{J} * 10^6\frac{mm^2}{m^2}}$$

$$= \frac{mm}{day}$$