Hamon Potential Evapotranspiration

$$PET = k * 0.165 * 216.7 * N * \left(\frac{e_s}{T + 273.3}\right)$$

where,

PET	potential evapotranspiration [mm day^{-1}]
k	proportionality coefficient = 1[1] [unitless]
N	daytime length [x/12 hours]
e_s	saturation vapor pressure [mb]
T	average monthly temperature [°C]

e_s - saturation vapor pressure

$$e_s = 6.108e^{\left(\frac{17.27T}{T+237.3}\right)}$$

Source: Lu et al. (2005)

script: calcPEThamon.r

Primary Sources

Allen et al. (1998). Crop evapotranspiration -- guidelines for computing crop water requirements. FAO Irrigation and Drainage Paper 56. United Nations, Rome.

Lu et al. (2005). A comparison of six potential evaportranspiration methods for regional use in the southeastern United States. Journal of the American Water Resources Association, 41, 621-633.

[1] Lu et al. (2005) uses a k value of 1.2 for the southeastern United States.

N - daylight hours in units of 12 hours

$$N = \left(\frac{24}{\pi}\right) * \omega$$

where,

ω is the sunset hour angle [radians]

w - sunset hour angle

$\omega = cos^{-1}[-tan(\delta)\, tan(\varphi)]$

where,

φ is latitude [radians]

δ is the declination [radians]

δ - declination

$d = 1 + 0.033cos\left(\frac{2\pi}{365}J\right)$

where,

J is the Julian Day of the year.

NB: when the sun does not rise ω is set equal to 0, when the sun does not set ω is set equal to π. This is accomplished by taking only the real portion of the result of the equation calculating ω.

In order to calculate N at a monthly time step, we calculate average daily radiation for each day within the month and then average across the month.

Source: Allen et al. (1998)

script: calcN.r