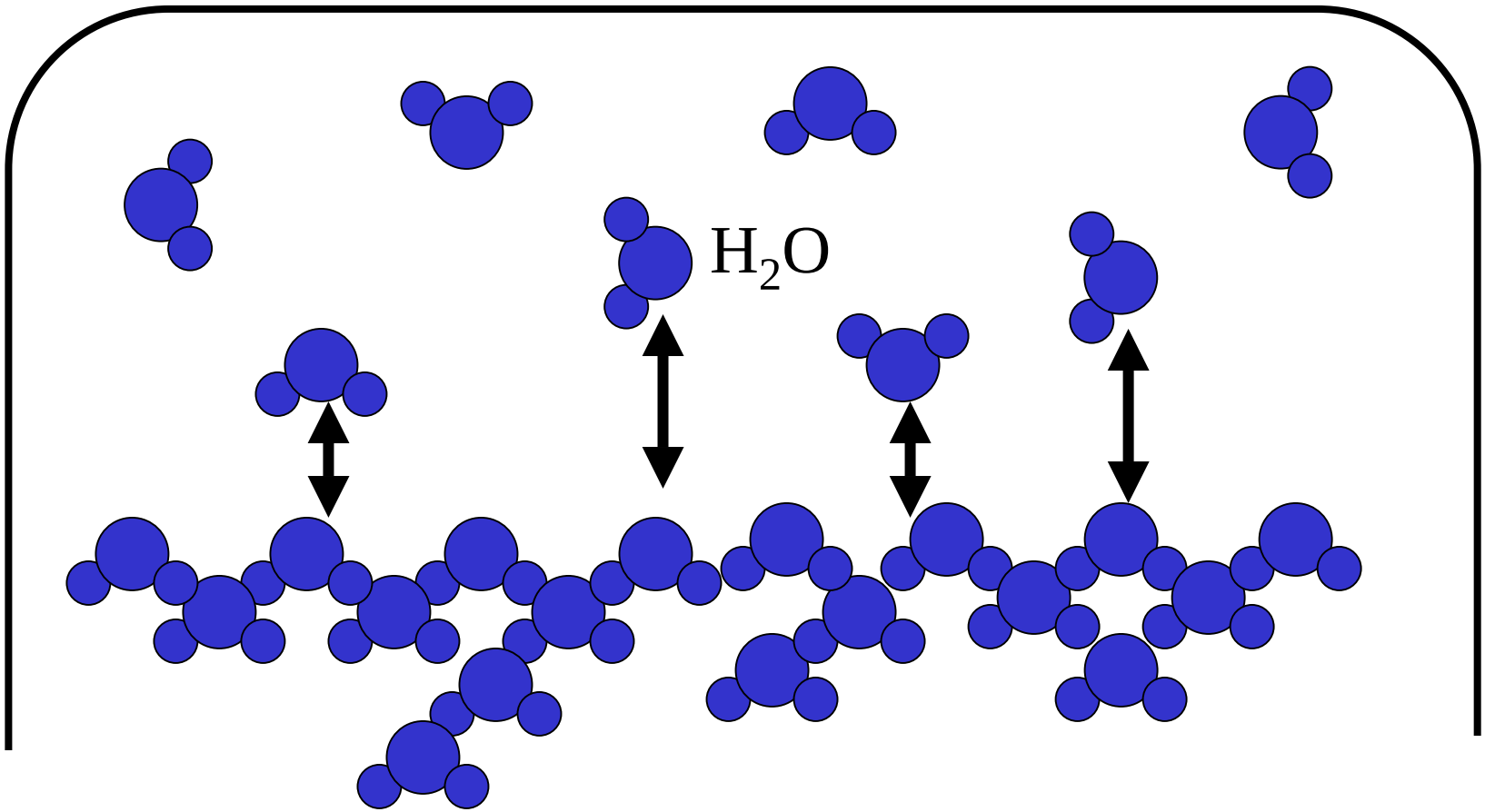
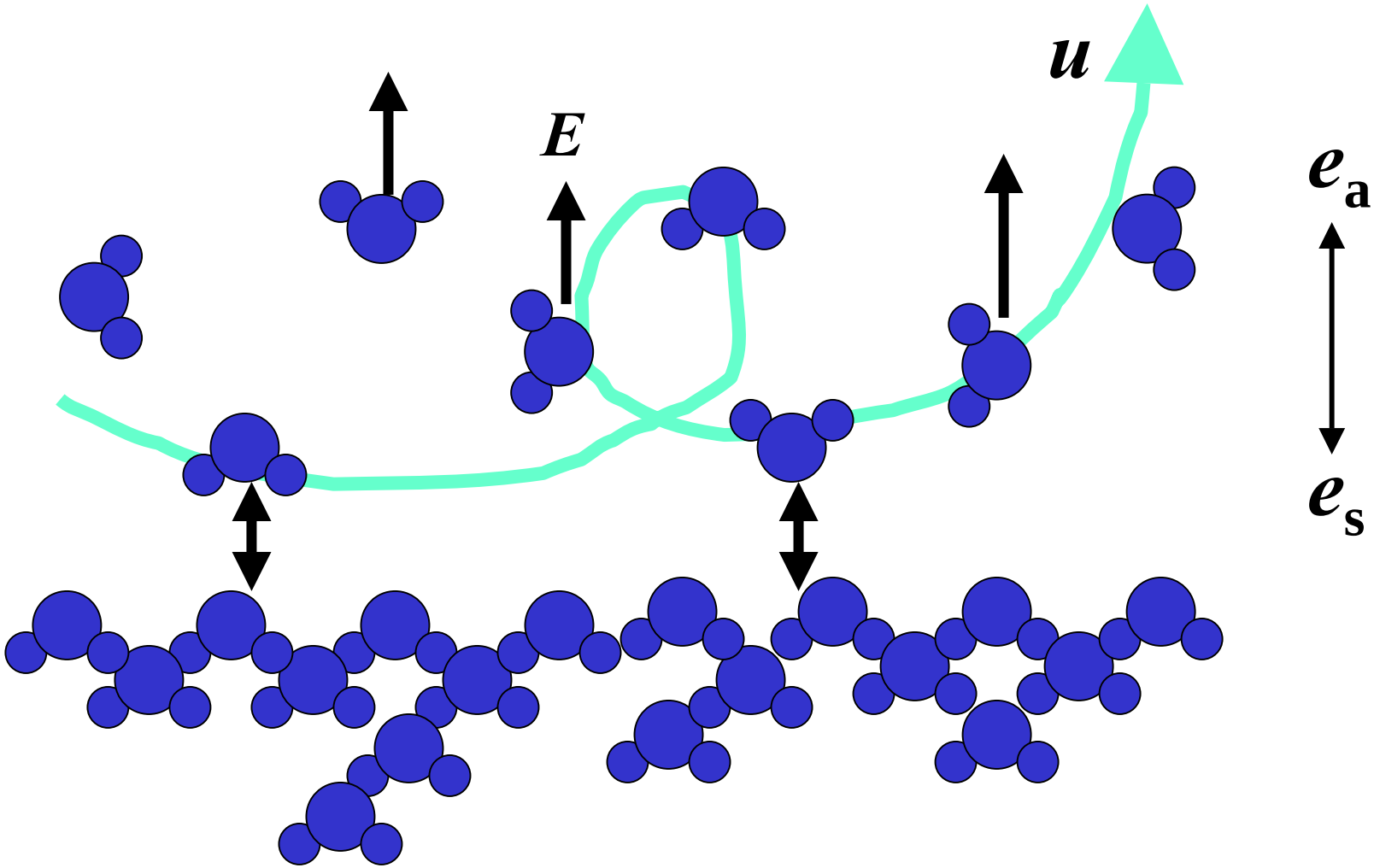
蒸発とは





もう一つ：

なぜガスは濃→薄へ移動するのか？

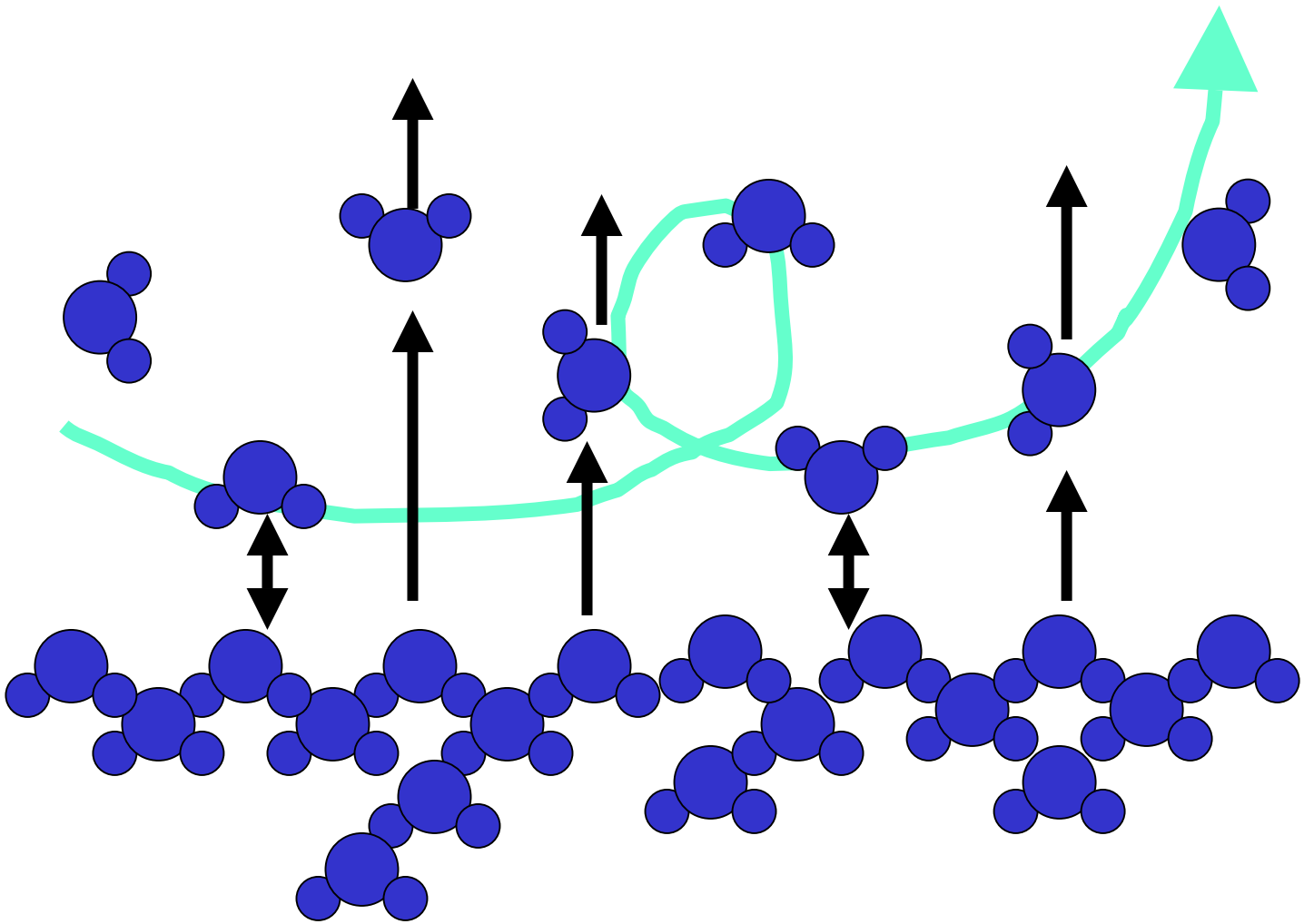
基本

$$E = g\left(e_{\mathrm{s}} - e_{\mathrm{a}}\right)$$

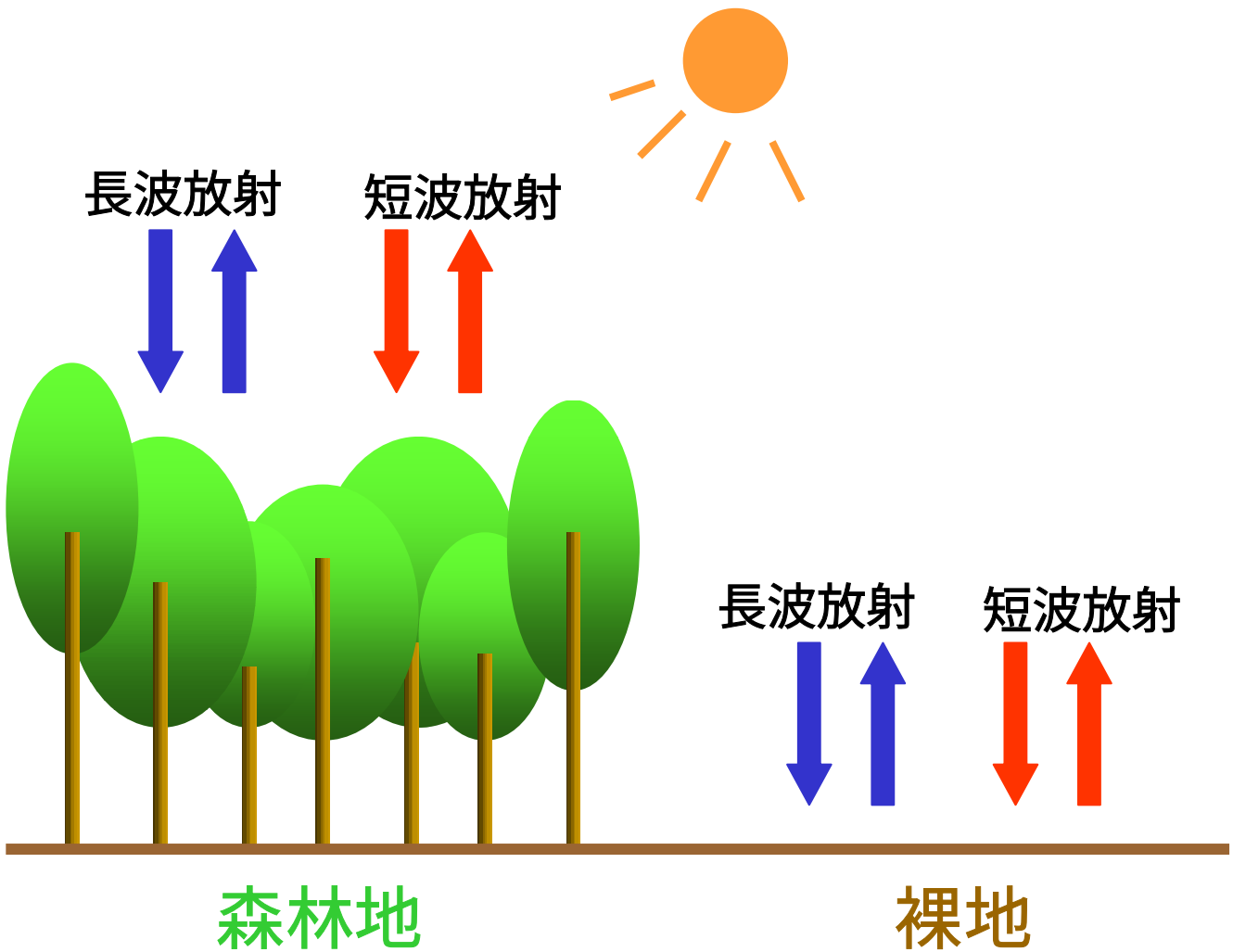
$$g = g\left(u, \cdots\right)$$

$$e_{\mathrm{s}} = e_{\mathrm{sat}}\left(T_{\mathrm{s}}\right)$$

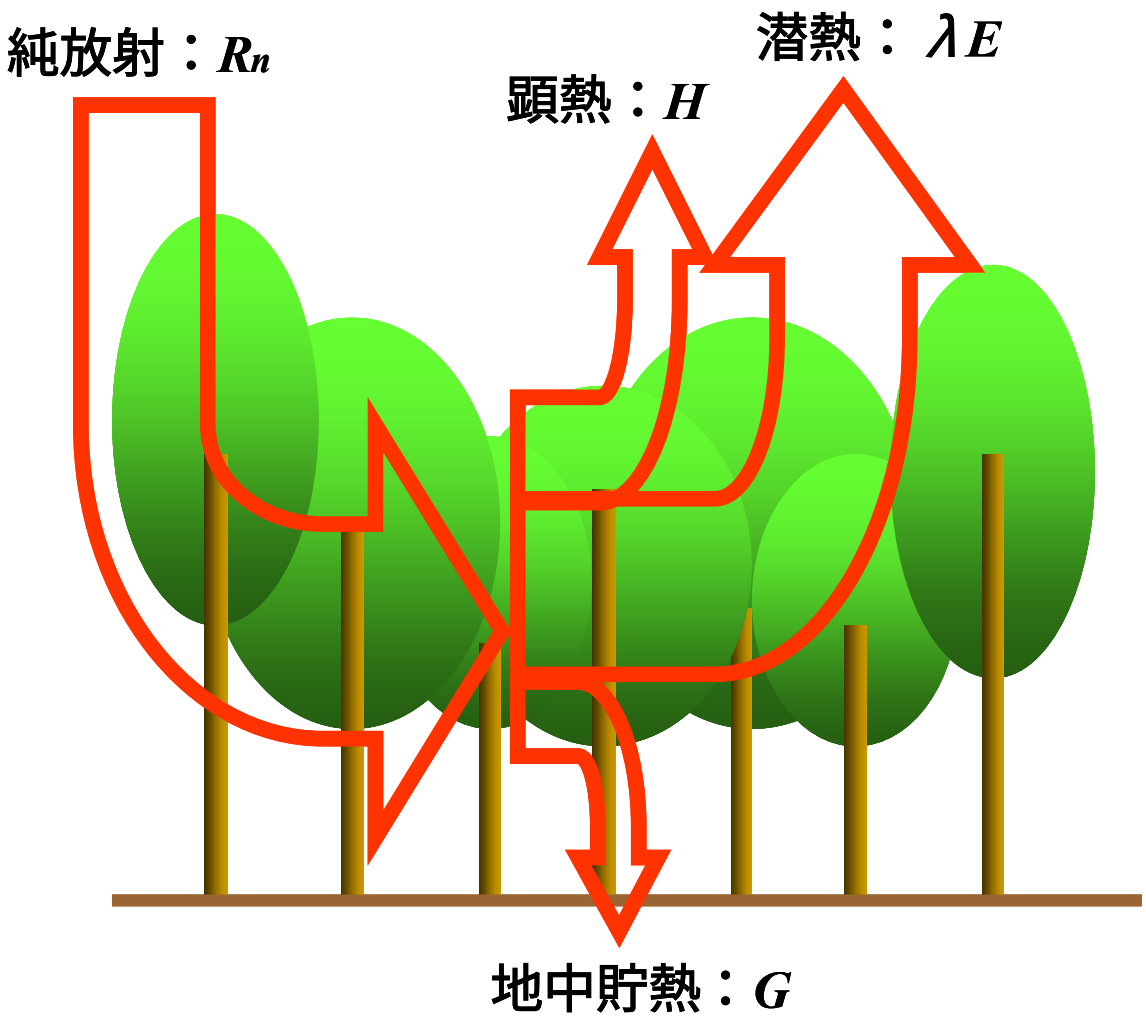
潜熱：なぜ蒸発すると温度が下がるのか？



$$R_n = (1-a)R_S + R_L - \varepsilon\sigma T_s^{\ 4}$$



$$R_n = H + \lambda E + G$$



ところで

$J/m^2s = W/m^2$

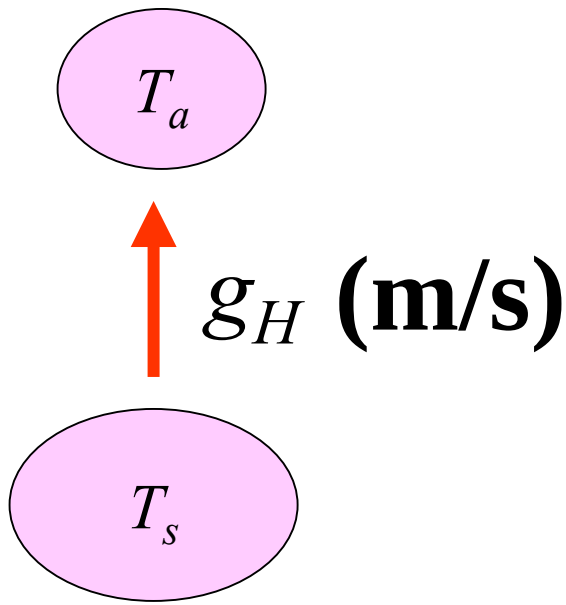
<u>フラックス</u>

*H*とは　(W/m^2)

$$H = \rho c_p g_H \left(T_s - T_a \right)$$

$$\rho c_p$$

kg/m^3×J/kgK

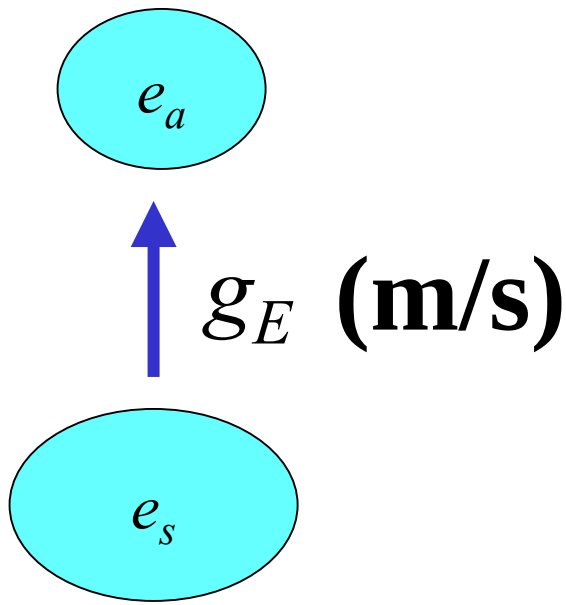


λEとは　(W/m^2)

$$\lambda E = \frac{\rho c_p}{\gamma} g_E \left(e_s - e_a \right)$$

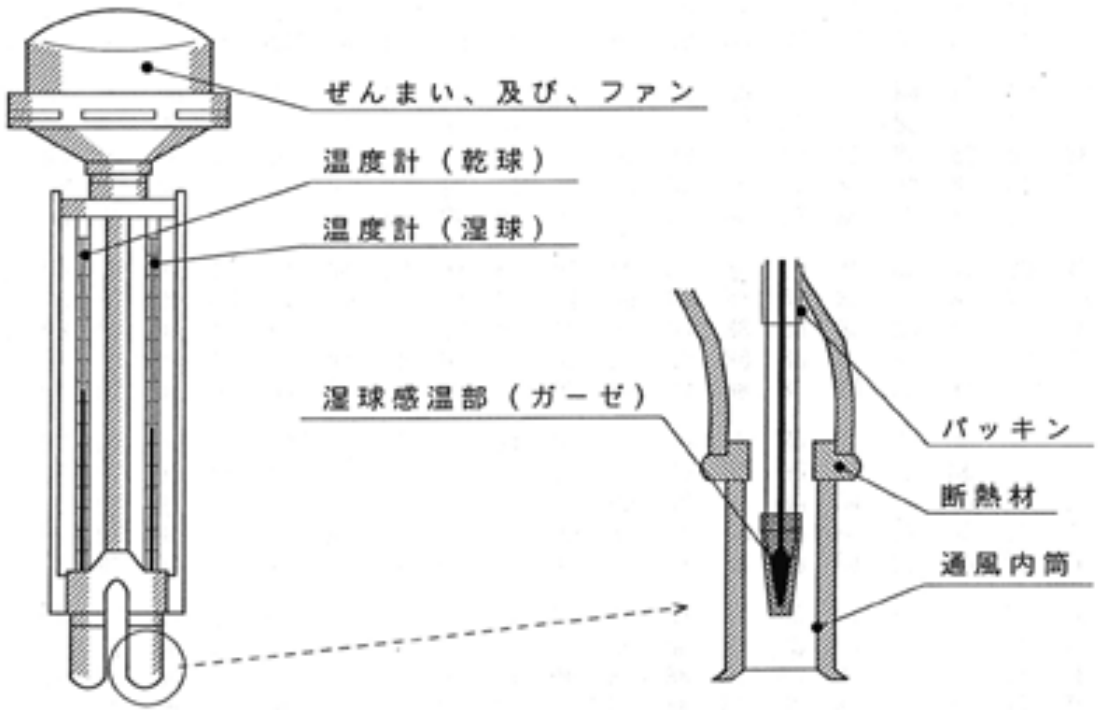
$\rho c_p / \gamma$

J/m^{3}K／Pa/K



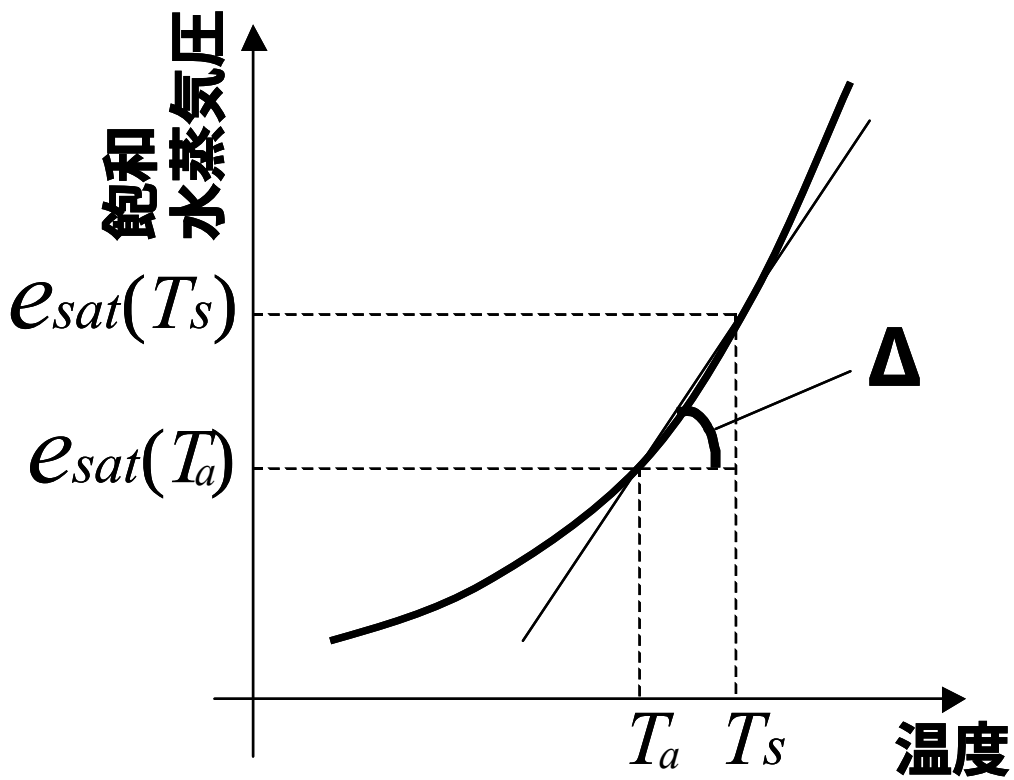
乾湿計定数について

$$e_{sat}(T_w) - e_a = \frac{Pc_p}{\lambda\varepsilon}(T_a - T_w)$$



Penman-Monteith式 の導出

$$e_{sat}(T_s) = \Delta\left(T_s - T_a\right) + e_{sat}(T_a)$$

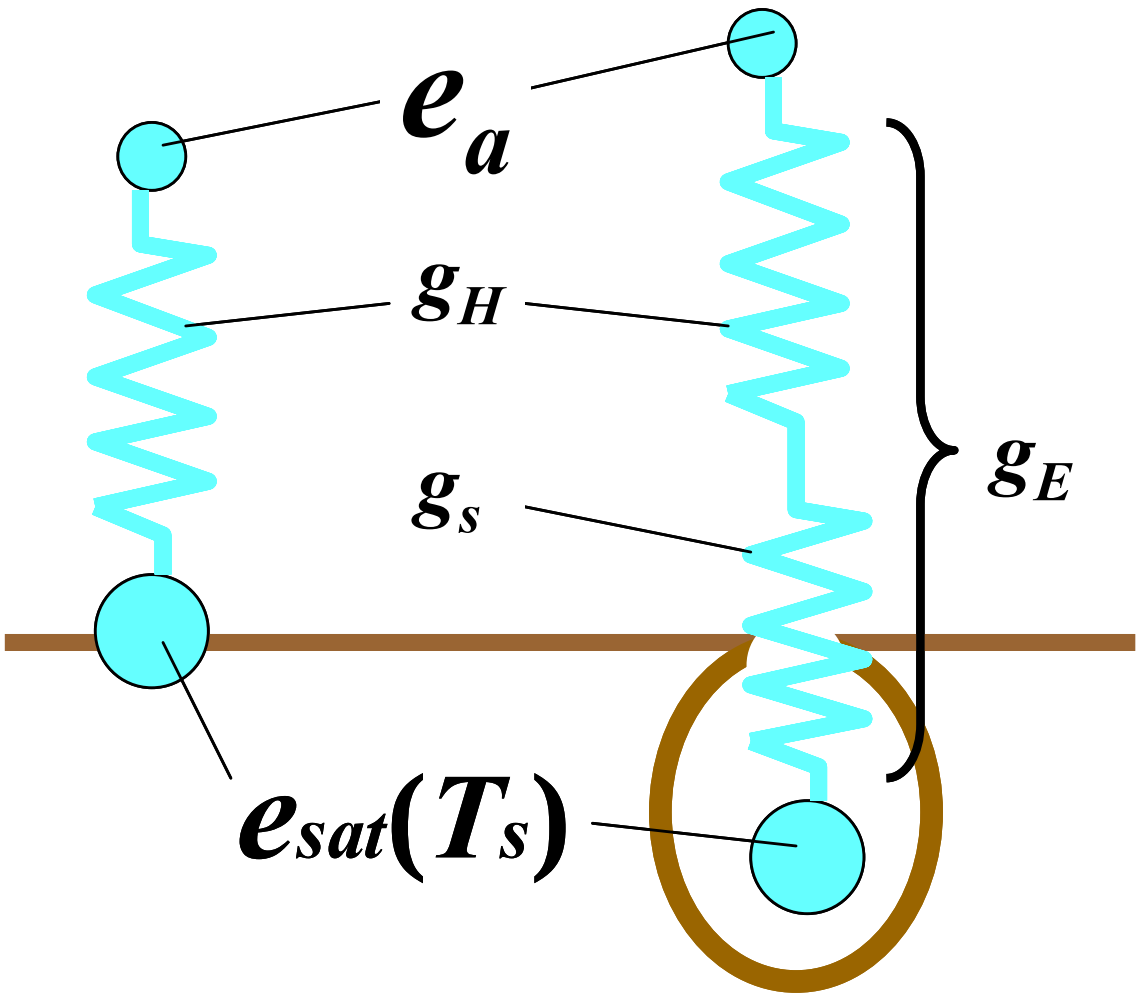


$$e_{sat}(T_s) = \Delta\left(T_s - T_a\right) + e_{sat}(T_a)$$

$$H = \rho c_p g_H \left(T_s - T_a\right)$$

$$R_n = H + \lambda E + G$$

からT_sを追い出す。
そして、λEでまとめる。


e_a
g_H
g_s
g_E
$e_{sat}(T_s)$

$$\lambda E = \frac{\Delta\left(R_n - G\right) + \rho c_p g_H \left(e_{sat}(T_a) - e_a\right)}{\Delta + \left(1 + g_H / g_s\right)\gamma}$$

Penman-Monteith式 で遊ぼう

- $g_s \rightarrow \infty$ ： 完全湿面
- $g_H \rightarrow \infty$ ： g_sだけが制限

$$\lambda E_{imp} = \frac{\rho c_p g_s}{\gamma}\left(e_{sat}(T_a) - e_a\right)$$

葉が小さい・樹冠の凸凹が大きい

- $g_H \rightarrow 0$ ： 風が無い

$$\lambda E_{eq} = \frac{\Delta\left(R_n - G\right)}{\Delta + \gamma}$$

湿面が無限に続く・乾燥空気が入ってこない

$$\lambda E = (1-\Omega)\lambda E_{imp} + \Omega \lambda E_{eq}$$

$$\Omega = \frac{\Delta/\gamma + 1}{\Delta/\gamma + 1 + g_H/g_s}$$

g_s と g_H どちらが支配的か？

⇩

物理的か生物的か？