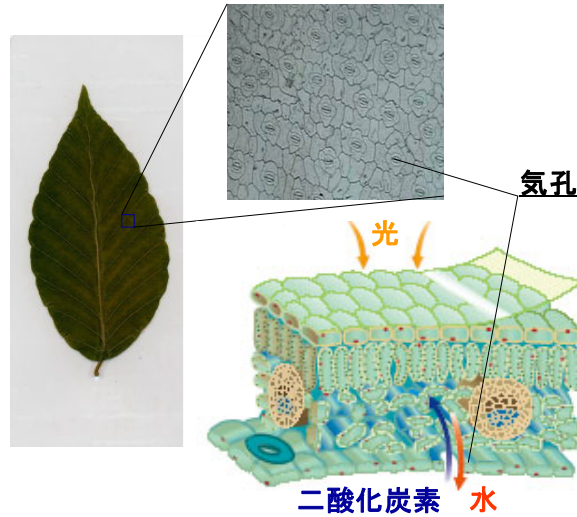


蒸散・気孔について

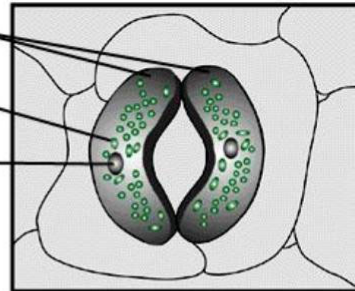
群落も個葉も基本は“気孔”



1

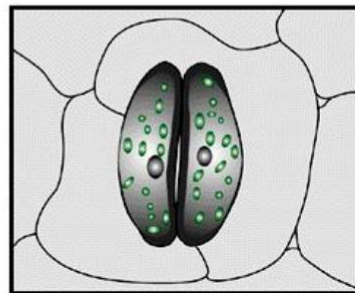
Estelle Levettin and Karen McMahon, Botany Visual Resource Library © 1998 The McGraw-Hill Companies, Inc. All rights reserved.

Guard cells
Chloroplast
Nucleus



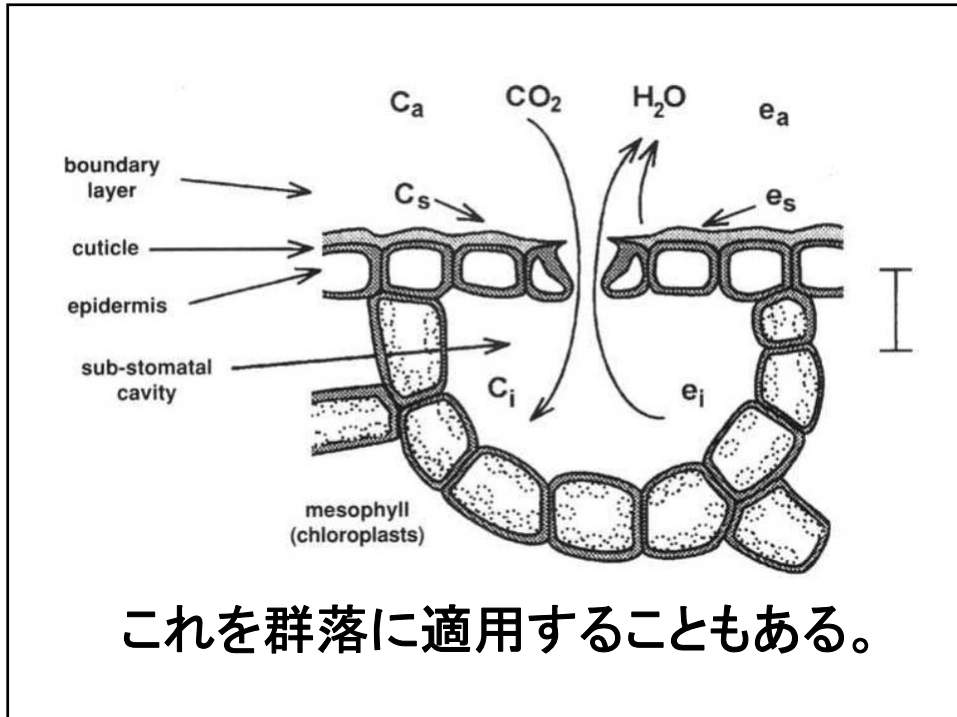
Open Stoma

蒸散とは—
気孔の開閉だ

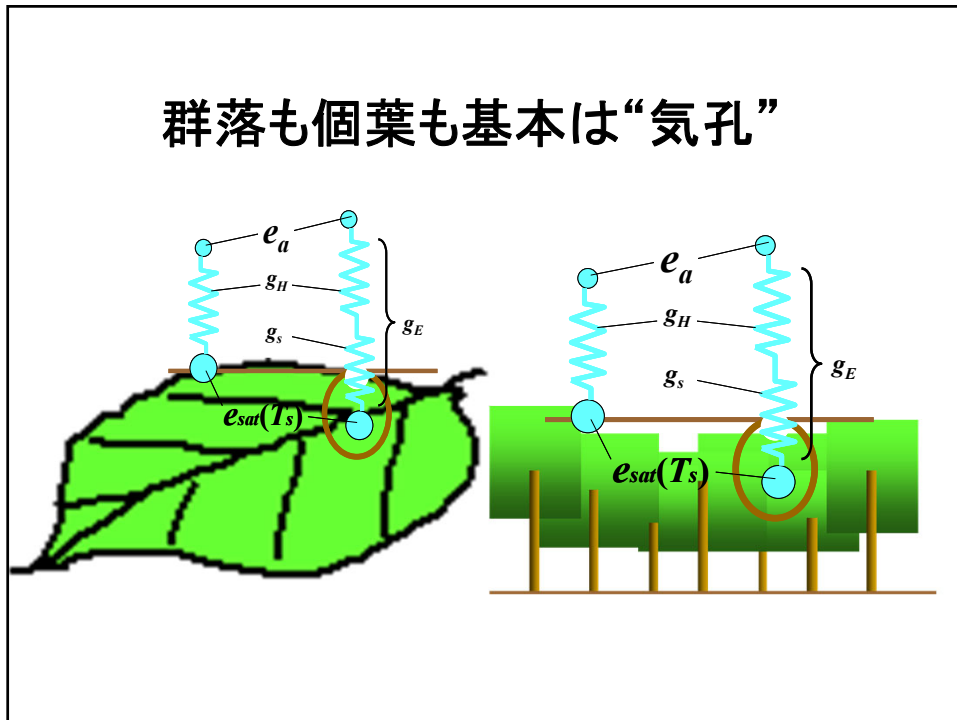


Closed Stoma

2



3



4

個葉

$$\frac{g_{sw}g_{aw}}{g_{sw} + g_{aw}} \approx g_{sw} \leftarrow g_{aw} = m\sqrt{\frac{u}{d}}$$

↓

$$E = g_{sw} (C_{ws} - C_{wa})$$

既知

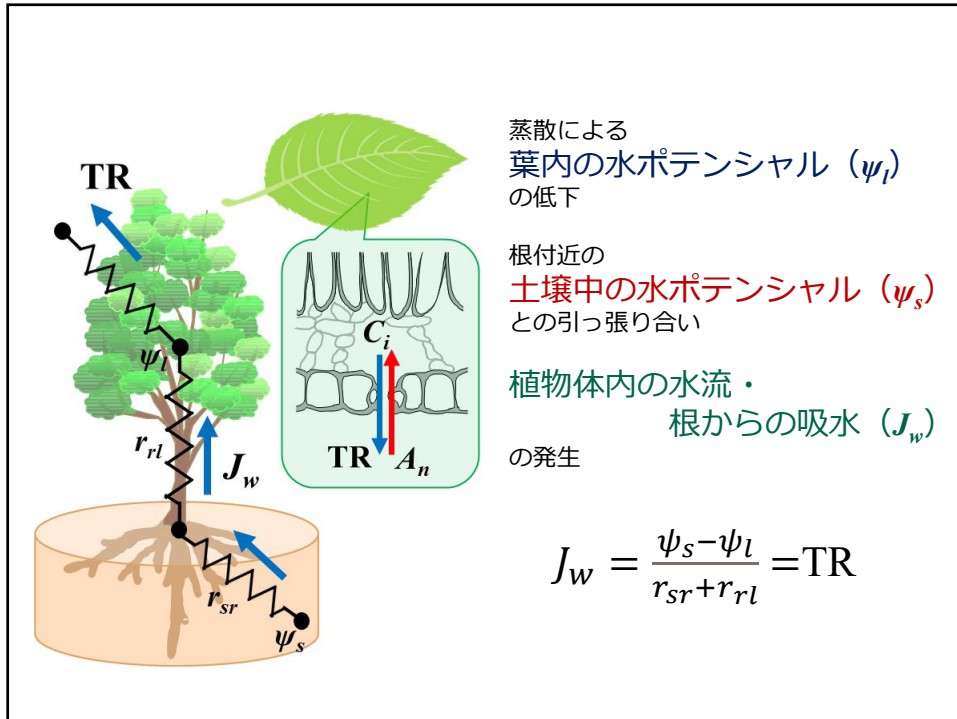
5

群落

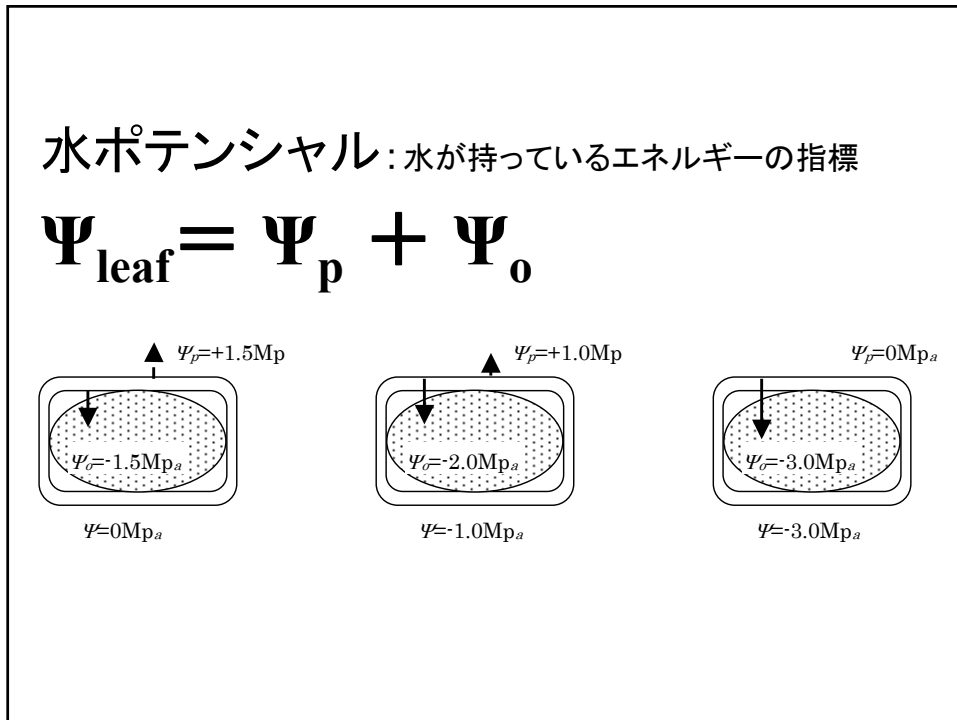
$$\lambda E = \frac{\Delta(R_n - G) + \rho c_p g_H (e_{sat}(T_a) - e_a)}{\Delta + (1 + g_H/g_s)\gamma}$$

g_s 以外、気象観測により全て既知

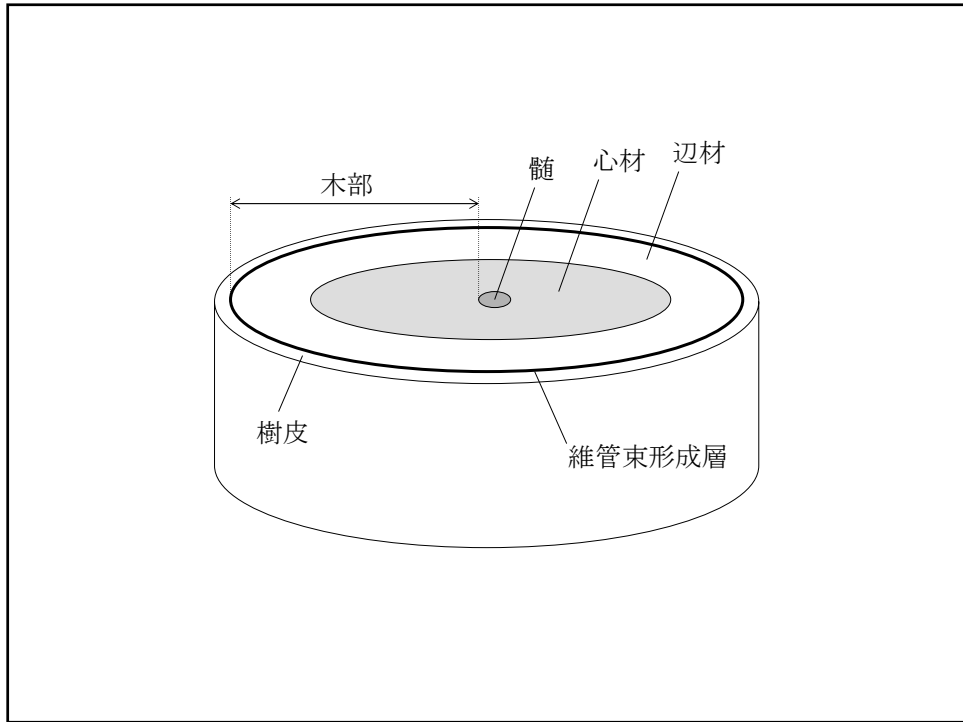
6



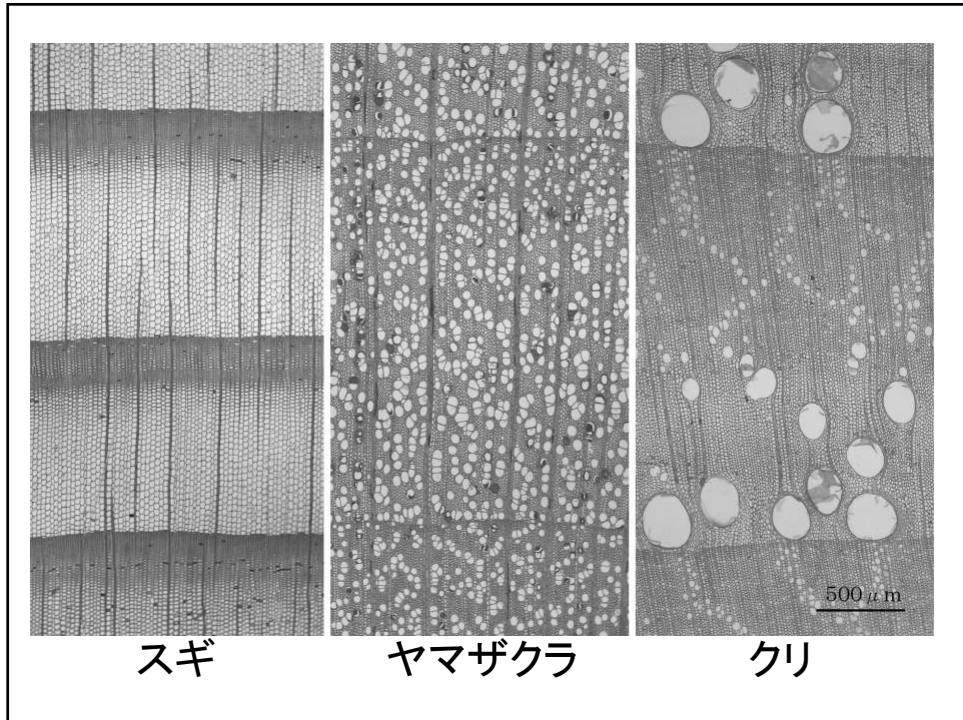
7



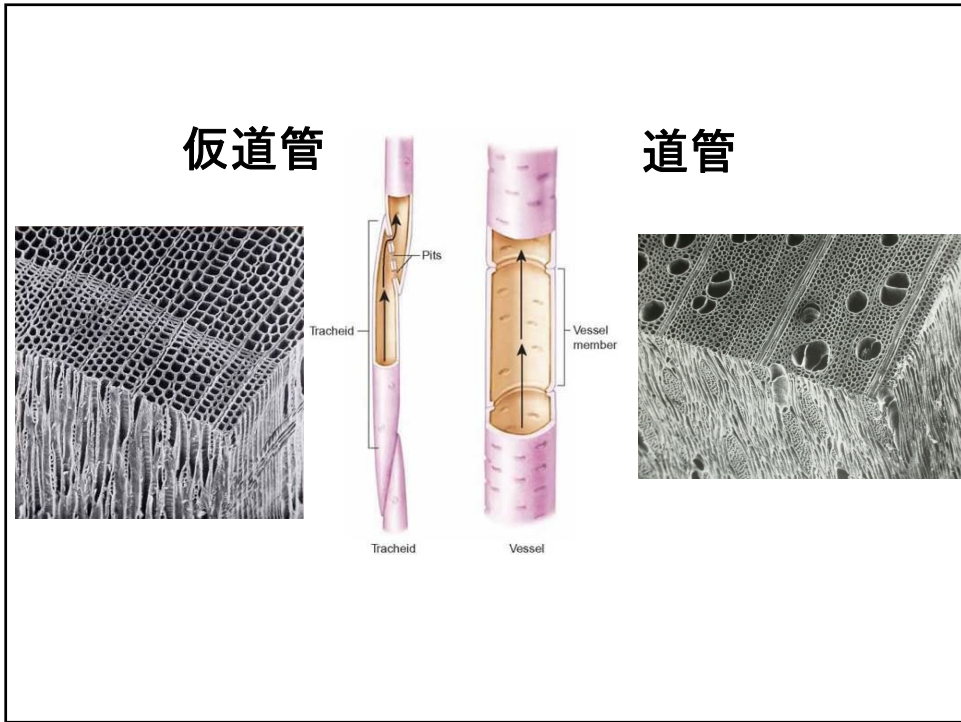
8



9



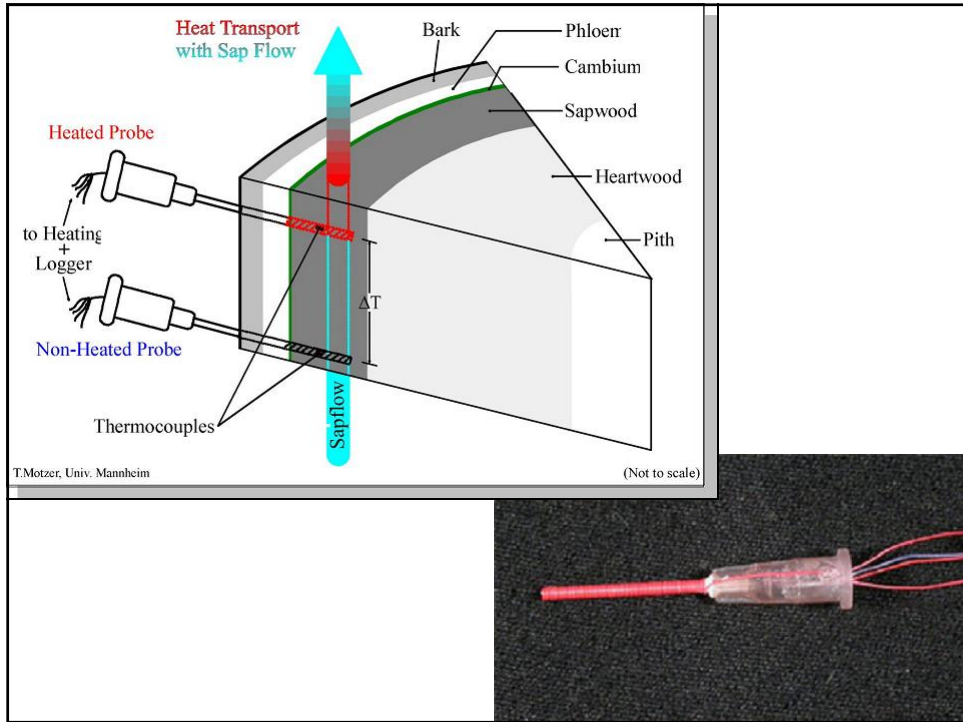
10



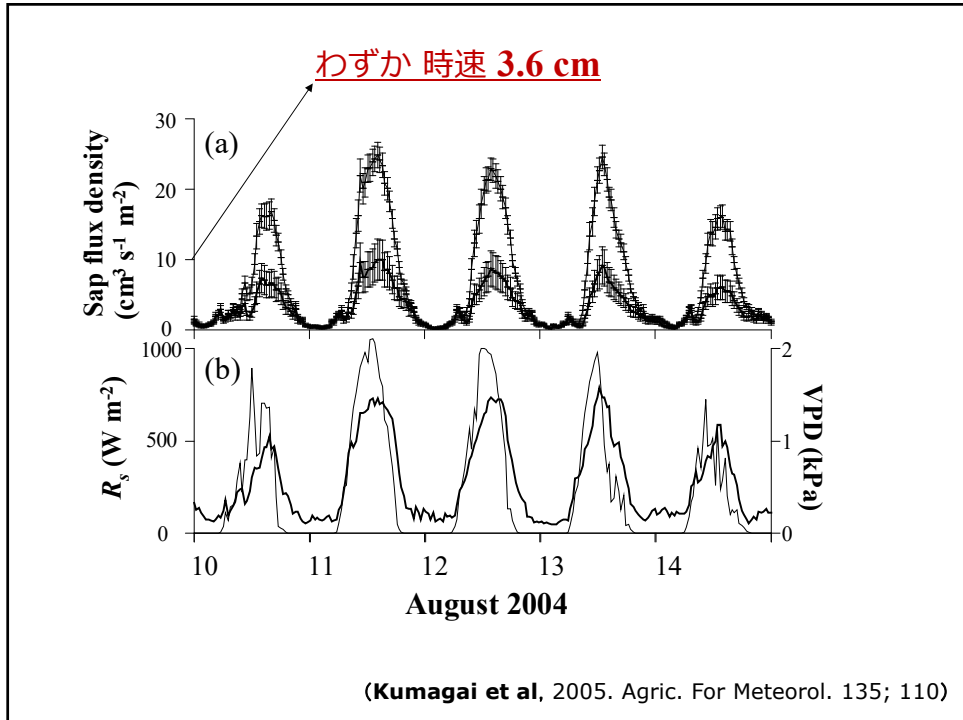
11



12

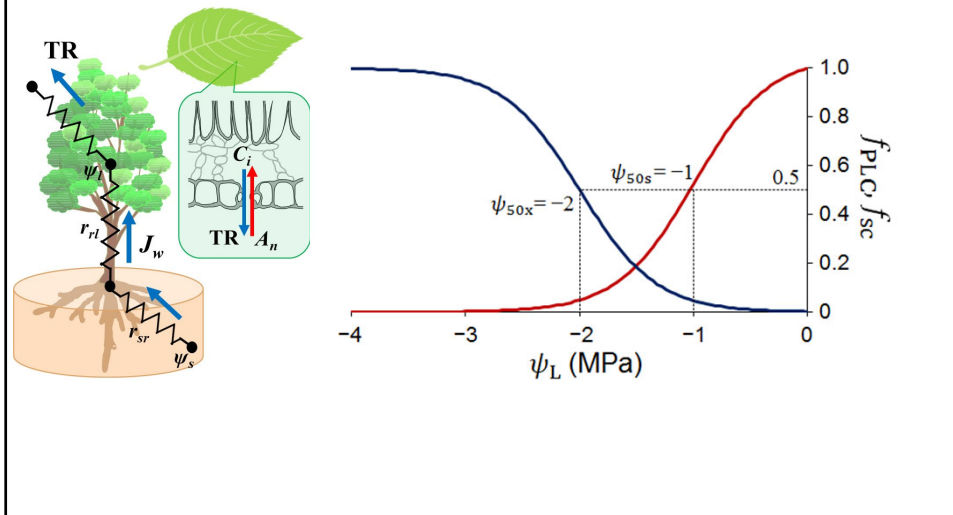


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通水性の喪失・気孔閉鎖 そして、両者のバランス

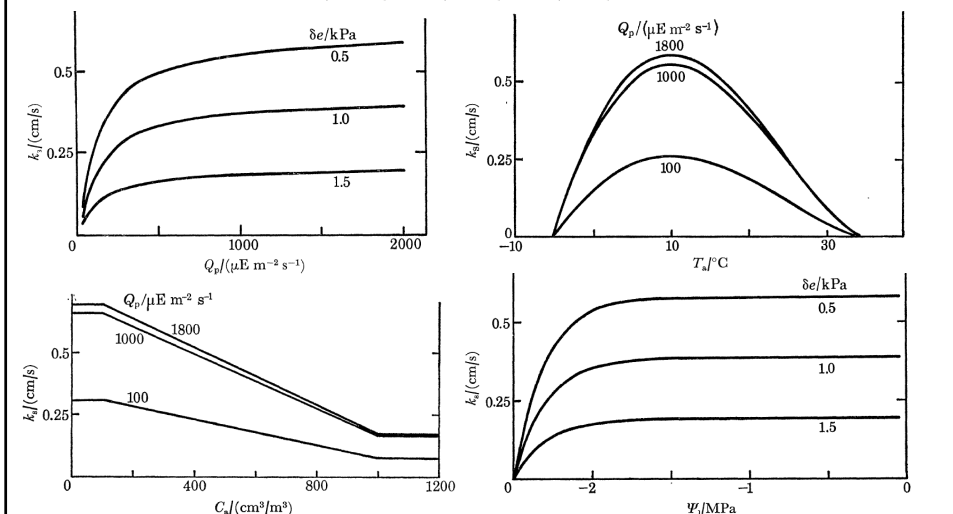


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色々な g_s (個葉でも群落でも)の表現

1. Jarvis モデル

$$g_s = g_{smax} f_1(Q_0) f_2(D_s) f_3(T_a) \dots$$



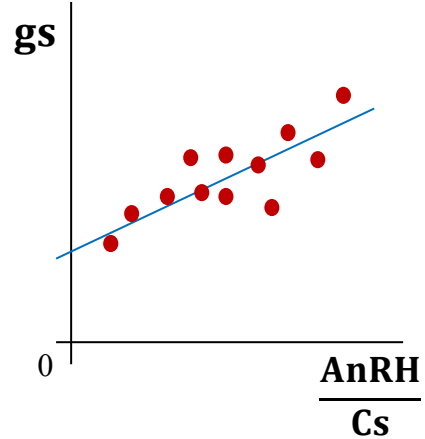
16

2. Ball-Berry モデル

$\frac{C_i}{C_s} = \text{const.}$ からの修正

$$\frac{C_i}{C_s} = 1 - \frac{e_{\text{sat}}(T)}{m e_a} = 1 - \frac{An}{gs C_s}$$

$$gs = m \frac{AnRH}{C_s} + g_0$$

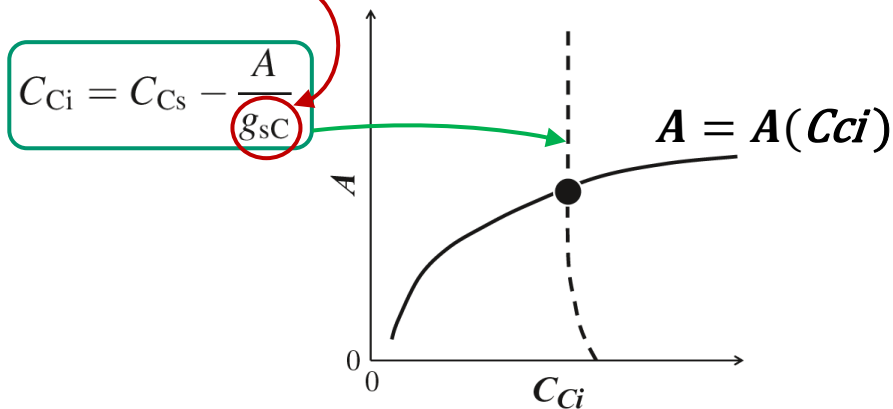


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3. Leuning モデル

※Ball-Berryモデルの改造

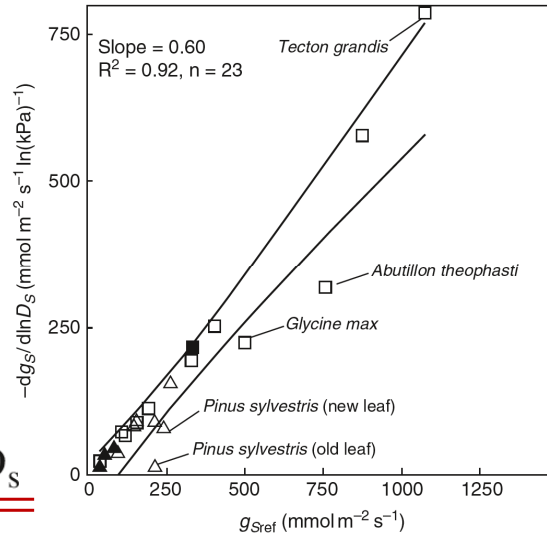
$$g_{sC} = a_{sC} \frac{A f(D_s)}{C_{Cs} - \Gamma} + g_{sC0}, \quad f(D_s) = \left(1 + \frac{D_s}{D_0}\right)^{-1}$$



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4. Oren モデル

$$g_s = K_s \frac{A_s}{A_L} \frac{1}{D} \frac{1}{h} [\psi_s - (\psi_L + h\rho_w g)] \quad \text{からの変形}$$



$$\underline{\underline{g_s = g_{sref} - \delta \ln D_s}}$$

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5. Medlyn モデル

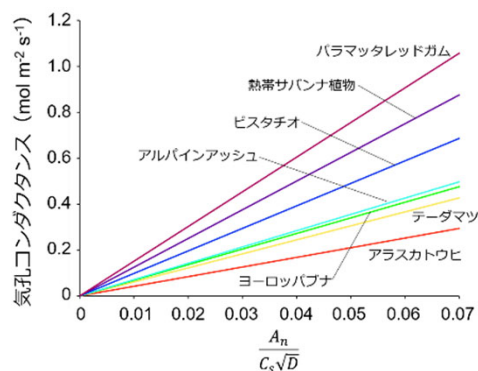
TR - λA_n の時間積分が最小となる問題 $\frac{\partial TR}{\partial A_n} - \lambda = 0$

$$\frac{A_n}{TR} = \frac{C_s - C_i}{1.6D} \quad A_j = J \frac{C - \Gamma^*}{4C + 8\Gamma^*} \quad \text{の3式から、} C_i \text{の2次方程式を導く。}$$

$$\underline{\underline{g_{sh}^* \approx g_0 + 1.6 \left(1 + \frac{g_l}{\sqrt{D}} \right) \frac{A_n}{C_s}}}$$

光合成生産に対する最適水利用

$$\text{※ } g_l \propto \sqrt{\Gamma^* \lambda}$$



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