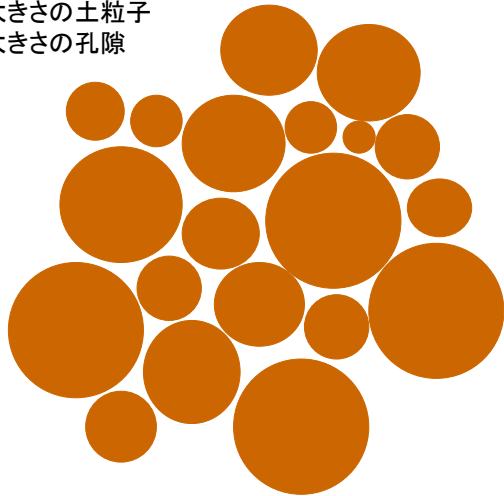


土壌(粒子)の模式図

様々な大きさの土粒子
様々な大きさの孔隙

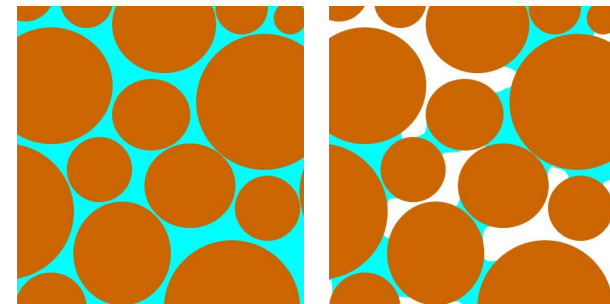


1

含水量

飽和

不飽和

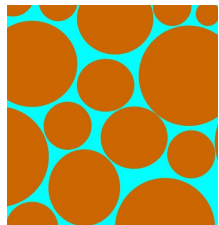


$$\text{体積含水率 } \theta = \frac{V_w}{V_s + V_a} \quad \theta_{sat} = \frac{V_a}{V_s + V_a}$$

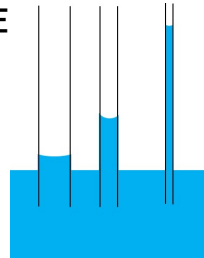
$$\text{質量含水率 } w = \frac{m_w}{m_d} \quad \rho_d = \frac{m_d}{V_s + V_a} \quad \theta = \frac{m_d / (V_s + V_a) m_w}{m_w / V_w} \frac{m_d}{m_d}$$

2

飽和から不飽和へ



毛管圧

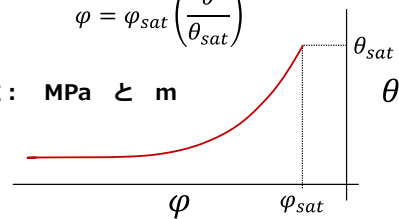


水はどこから抜けていく？

土壌水分特性曲線

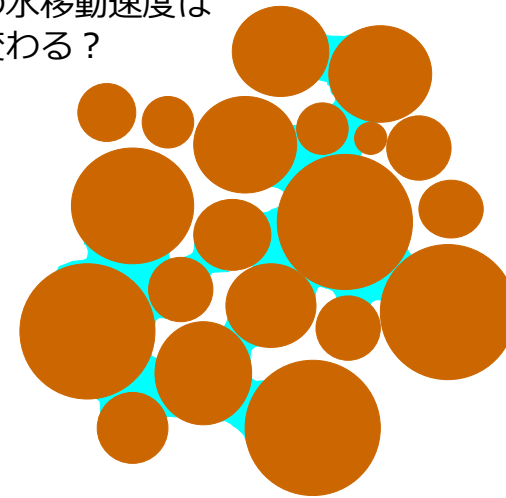
$$\varphi = \varphi_{sat} \left(\frac{\theta}{\theta_{sat}} \right)^{-b}$$

単位：MPa と m

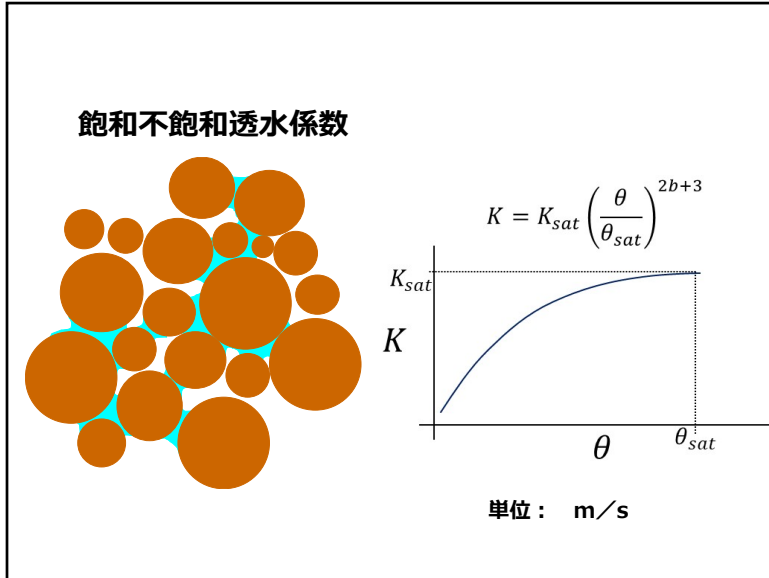


3

不飽和：土が乾いていくと
土中の水移動速度は
どう変わる？



4



5

Darcyの法則

$$F = -K_s(\psi) \frac{\partial(\psi + z)}{\partial z}$$

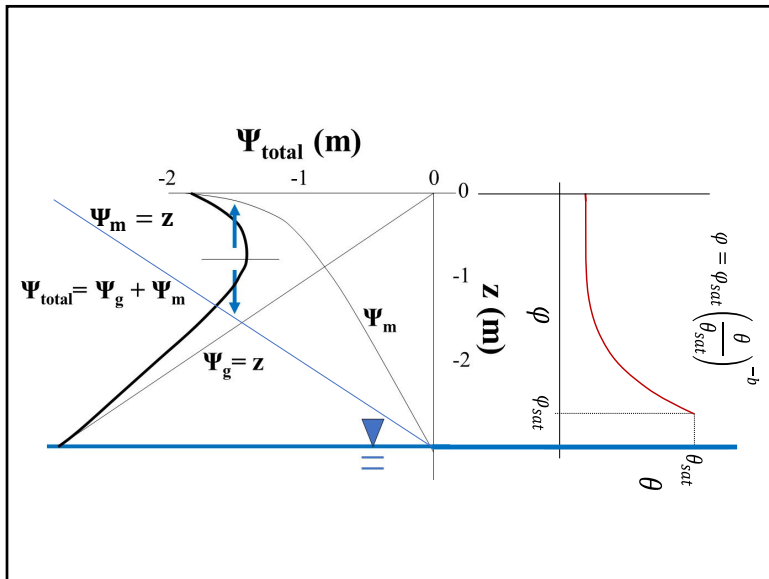
連続条件

$$\frac{\partial \theta}{\partial t} = -\frac{\partial F}{\partial z}$$

Richards方程式

$$\frac{\partial \theta}{\partial \psi} \frac{\partial \psi}{\partial t} = \frac{\partial}{\partial z} \left[K_s(\psi) \left(\frac{\partial \psi}{\partial z} + 1 \right) \right]$$

6



7



8