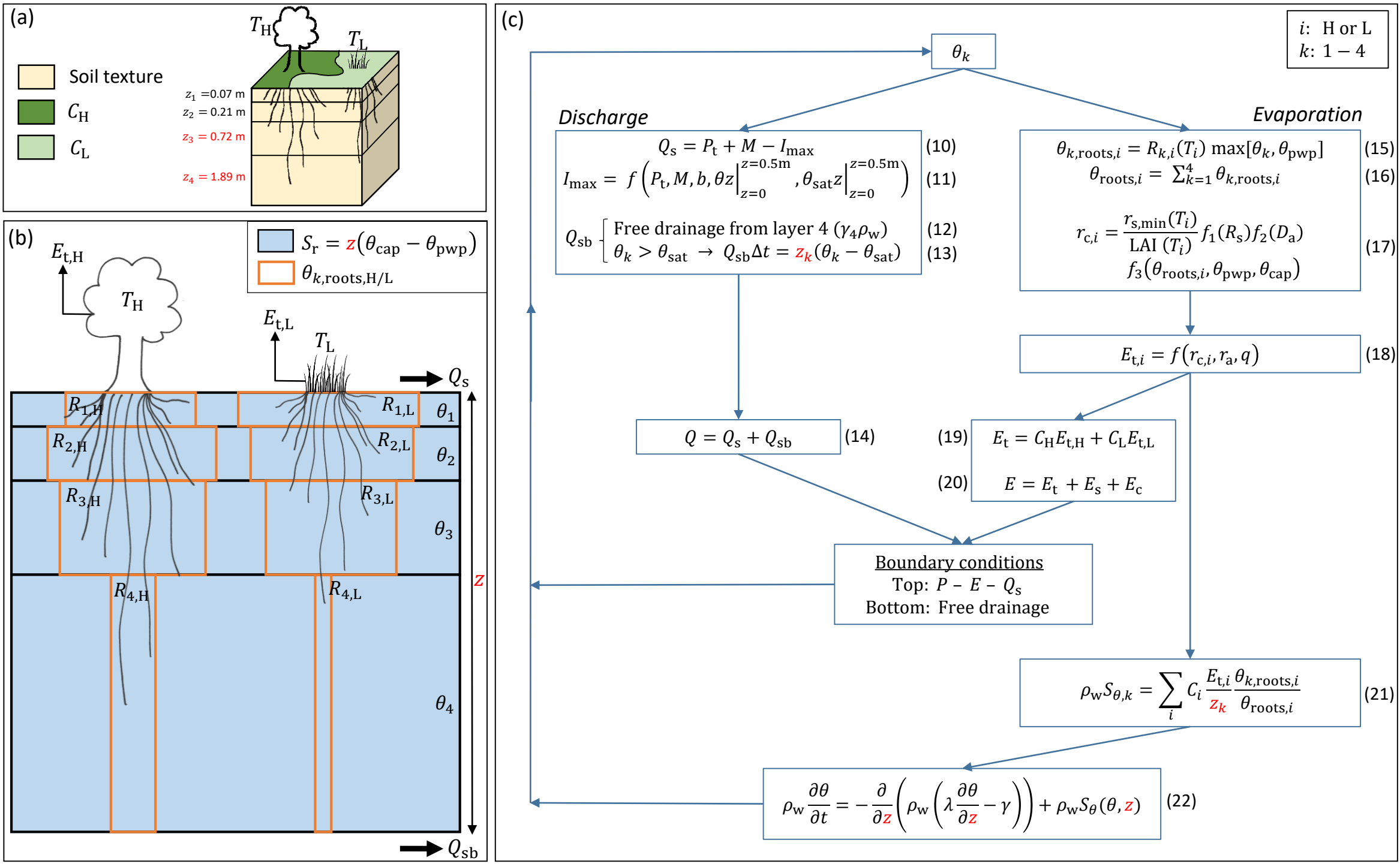
(a)
Soil texture
C_H
C_L
T_H
T_L
z_1 =0.07 m
z_2 = 0.21 m
z_3 = 0.72 m
z_4 = 1.89 m
(b)
$S_r = z(\theta_{cap} - \theta_{pwp})$
$\theta_{k,roots,H/L}$
$E_{t,H}$
$E_{t,L}$
Q_s
Q_{sb}
$R_{1,H}$
$R_{2,H}$
$R_{3,H}$
$R_{4,H}$
$R_{1,L}$
$R_{2,L}$
$R_{3,L}$
$R_{4,L}$
θ_1
θ_2
θ_3
θ_4
z
(c)
i: H or L
k: 1 – 4
θ_k
Discharge
Evaporation
$Q_s = P_t + M - I_{max}$ (10)
$I_{max} = f\left(P_t, M, b, \theta z\Big|_{z=0}^{z=0.5m}, \theta_{sat} z\Big|_{z=0}^{z=0.5m}\right)$ (11)
Q_{sb} { Free drainage from layer 4 ($\gamma_4 \rho_w$) (12)
$\theta_k > \theta_{sat} \rightarrow Q_{sb}\Delta t = z_k(\theta_k - \theta_{sat})$ (13)
$\theta_{k,roots,i} = R_{k,i}(T_i)\max[\theta_k, \theta_{pwp}]$ (15)
$\theta_{roots,i} = \sum_{k=1}^{4} \theta_{k,roots,i}$ (16)
$r_{c,i} = \frac{r_{s,min}(T_i)}{LAI\ (T_i)} f_1(R_s) f_2(D_a) f_3(\theta_{roots,i}, \theta_{pwp}, \theta_{cap})$ (17)
$E_{t,i} = f(r_{c,i}, r_a, q)$ (18)
$Q = Q_s + Q_{sb}$ (14)
(19) $E_t = C_H E_{t,H} + C_L E_{t,L}$
(20) $E = E_t + E_s + E_c$
Boundary conditions
Top: $P - E - Q_s$
Bottom: Free drainage
$\rho_w S_{\theta,k} = \sum_i C_i \frac{E_{t,i}}{z_k} \frac{\theta_{k,roots,i}}{\theta_{roots,i}}$ (21)
$\rho_w \frac{\partial \theta}{\partial t} = -\frac{\partial}{\partial z}\left(\rho_w\left(\lambda \frac{\partial \theta}{\partial z} - \gamma\right)\right) + \rho_w S_\theta(\theta, z)$ (22)