

START

INPUT

READ MO: Soil moisture content (v/v), S: Soil salinity (ds/m), SSI: Soil stress index, PSI: Plant stress index, MP: Soil matric potential(Mpa), PC: Partially compensated uptake FC: Fully compensated uptake, Avg: Average plant stress index, OP: Soil osmotic potential(Mpa),  $\Psi = hS$ : Soil total potential(Mpa),  $\Psi^* = hfc$ : Soil total potential at field capacity(Mpa),  $K = K(h)$ : Unsaturated hydraulic conductivity(L/T),  $n^*$ : Days, (n,m,a): Van-Genuchten constants  $C(h) = c$ : water holding capacity, (S(i,j))= Root water uptake

PROCESSES

- $SSI = \frac{(1+(a\Psi)^n)^m}{(1+(a\psi^*)^n)^m} \quad (m=1/n)$
- $\beta = \left( \frac{1}{SSI(z,t)} \right) \left( \frac{1}{z_2-z_1} \left( k \frac{\psi_2-\psi_1}{z_2-z_1} - k \right) - c(h) \frac{\psi_2-\psi_1}{t_2-t_1} \right)$
- $S(h, z, t) = \beta \cdot SSI(h, z, t) \quad \beta = T_p \cdot \frac{PSI}{SSI}$
- $(PSI)_{j+1}^i = \left( \frac{(SSI)_{j+1}^i}{-(SSI)_j^i} \right) \left( (SSI)_{j+1}^i \right) \left( KC \left( \frac{\sum_{j=1}^n (PSI)}{n} \right) + \left( \frac{\sum_{j=1}^n (PSI)}{n} \right) \right)$
- $CRWU = (\theta v \cdot \Delta z^2 \cdot h^*/T_p) \left[ \left( \frac{(PSI)_n^{SSI+\Delta SSI}}{-(PSI)_s^{SSI+\Delta SSI}} \right) + \left( \frac{-(PSI)_n^{SSI}}{(PSI)_s^{SSI}} \right) \right] \left[ \left( \frac{(Tc)_n^{h+\Delta h}}{-(Tc)_s^{h+\Delta h}} \right) + \left( \frac{-(Tc)_n^h}{(Tc)_s^h} \right) \right]$

DECISION

$T_C = PSI \cdot T_P = \beta \cdot SSI$

Yes

Write Uncompensated Uptake

OUTPUT

DECISION

NO

$SSI > PSI, T_p > \beta$

Yes

Write Partially Compensated Uptake

OUTPUT

No

Write Fully Compensated Uptake

END

Figure 1. Graphical abstract of AMUN\_SHC pseudocode.