Supplement I

The water income of stems includes: (1) the direct rain falling on the stems, $(1-c_{l,j})c_s P_{G,j}$, (2) the water draining from leaf canopy, $p_t c_{l,j}(P_{G,j}-P'_{G,j})(1-\overline{E_j}/\overline{R_j})$. The water outcome of the stems before stemflow generation is the stems (not shaded by leaves) evaporation, $(1-c_{l,j})c_s\overline{E_j}P_{G,j}/\overline{R_j}$. The evaporation from stems shaded by the leaf were ignored. The water balance of stem when the stemflow generation is:

$$(1-c_{l,j})c_s P_{G,j}+p_t c_{l,j}(P_{G,j}-P'_{G,j})(1-\overline{E_j}/\overline{R_j})-(1-c_{l,j})c_s\overline{E_j}P_{G,j}/\overline{R_j}=S_s \qquad (1)$$

The magnitude of rainfall required to saturate the stem (P''_G) is the solve of the $P_{G,j}$ in eq. (2):

$$P''_{G,j}=(S_s\overline{R_j}/(\overline{R_j}-\overline{E_j})+c_{l,j}P'_{G,j})/(c_s+p_t c_{l,j}-c_s c_{l,j}) \qquad (2)$$

Considering the assumption that the stem evaporation happens in the whole rainfall period but not only in the drying out period, the evaporation from stem in *n*–*q* storms insufficient to saturate the stem ($P_{G,j}<P''_{G,j}$) includes: (1) the direct rain falling on the stem, $(1-c_{l,j})c_s P_{G,j}$, (2) the water draining from leaf canopy, $p_t c_{l,j}(P_{G,j}-P'_{G,j})(1-\overline{E_j}/\overline{R_j})$; the evaporation from stem in *q* storms sufficient to saturate the stem ($P_{G,j}\geq P''_{G,j}$) includes: (1) stem evaporation during the rain period, $\sum_{j=1}^{q}\overline{E}_j c_s(1-c_{l,j})P_{G,j}/\overline{R}_j$, and (2) the stem water storage capacity qS_s.

The stemflow could be recalculated by following equation:

$$\sum_{j=1}^{q}SF_j=\sum_{j=1}^{q}p_t(1-\overline{R_j}/\overline{E_j})(c_{l,j}(P_{G,j}-P''_{G,j})+c_s(1-c_{l,j})(P_{G,j}-P''_{G,j})) \qquad (3)$$

The stemflow includes two parts: (1) the rain drains from leaf canopy after the stem is saturated with a ratio of p_t, $\sum_{j=1}^{q}p_t(1-\overline{R_j}/\overline{E_j})c_{l,j}(P_{G,j}-P''_{G,j})$, and (2) the rain fall on the stem directly, and converts to stemflow at a ratio of p_t, $\sum_{j=1}^{q}p_t(1-\overline{R_j}/\overline{E_j})c_s(1-c_{l,j})(P_{G,j}-P''_{G,j})$.

Abbreviations:

p_t: stemflow ratio that rainfall is diverted to the trunks;

$c_{l,j}$: leaf coverage in storm *j*;

c_s: stem coverage;

$P_{G,j}$: rainfall depth of storm *j*, mm;

$P'_{G,j}$: the amount of rainfall required to saturate the leaf canopy, mm;

$\overline{E_j}$: the evaporation rate during storm j, mm h^{-1};

$\overline{R_j}$: the rainfall intensity during storm j, mm h^{-1};

S_s: stem water storage capacity, mm;

P''_G : the magnitude of rainfall required to saturate the stem, mm;

q: The number of rains which generated stemflow;