<u>Equation 1:</u>

Equation 2:

Where;

and

Note that

***Litter***

<u>Equation 3:</u>

Where is the decomposition rate of C at time step for litter layer (),

is the user specified decomposition rate or "Decomp rate" (),

is the carbon pool at time step for litter layer (), and

the temperature limiting factor is given by:

<u>Equation 4:</u>

Where is the average air temperature from the weather data file,

is the optimal temperature of decomposition, and

is a function parameter.

<u>Equation 5:</u>

Where is the flux of nutrient (),

is the concentration of nutrient at time for litter  
layer () , and

is the user-specified nutrient release factor for each litter layer .

***Weathering***

<u>Equation 6:</u>

where is the Weathering Rate of mineral ,

is the rate coefficient of each species for each mineral,

and is the reaction order (or weathering dependence) of each species.

The reaction rate coefficient of a specific reaction is calculated by the equation:

<u>Equation 7:</u>

Where is the rate coefficient of the reaction at the temperature T=280°K, expressed as ,

is the Arrhenius activation energy (),

is the universal gas constant (), and

is the absolute temperature ().

<u>Equation 8:</u>

<u>Equation 9:</u>

<u>Equation 10:</u>

<u>Equation 11:</u>

Where the , , and are saturation concentration parameters,

and the , , and are reaction orders.

<u>Equation 12:</u>

Where is the specific mineral weathering rate,

is the user-specified exposed mineral area surfaces (),

is the user-specified fraction exposed mineral area which mineral occupies,

is the soil moisture saturation,

is the soil layer thickness (m),

and is the number of base cation charges released per mol of weathered mineral ().

<u>Equation 13:</u>

Where is the soil volumetric water content (),

is the solid density of soil (),

is the bulk density of soil (), and

is the density of water ().

<u>Equation 14:</u>

Where the is the specific leaching rate coefficient of ionic nutrient (), and

is the concentration of ionic nutrient at time in the foliage (), and

is the hydrogen concentration of throughfall to the power of leaching rate dependence (mol/L, unitless).

<u>Equation 15:</u>

Where foliar adsorption for nutrient at time () (),

is the specific adsorption constant (),

is the throughfall concentration of nutrients at time (),

is the throughfall flux at time (mm or ), and

is the rate dependence of adsorption (unitless).

<u>Equation 16:</u>

Where foliar exudation ()) at time step for nutrient ,

{} is the effective leaf turnover rate of ionic species (),

is the concentration of ionic nutrient in the foliage (), and

is the dry weight of the leaf at time step ().

<u>Equation 17:</u>

Where is the translocation of nutrient at time ,

is the concentration of nutrient in the foliage at time ,

is the dry weight of litterfall at time , and

is the user-specified fraction of foliar nutrient translocated during each litterfall event.