Model Name ___DLEM___

Part I. General Information

1. Include prognostic/explicit N cycle in model structure? ⊠ Yes ☐ No

   If yes, is it an open N cycle (N inside ecosystem can exchange with exterior N sources/sinks)

   ⊠ Yes ☐ No

   ☐ Partly open

   If partly open, please describe _____

3. What C and N pools are included in your model? _____

DLEM partitions C and N cycles into vegetation, litter, soil, microbe and product components. Vegetation pool is composed of 5 boxes for woody species (leaf, heartwood, sapwood, fine root and coarse root) and 4 boxes for herbaceous species (leaf, stem, fine root and coarse root). Both aboveground and belowground litter pools include 3 boxes with different turnover rate (slow, labile, very labile). Soil organic C and N are partitioned into microbial (SMB1, SMB2) and soil organic matter pools (SMR, NOM, and IOM), while soil inorganic N pool includes $NO_3^-\_N$ and $NH_4^+\_N$. Product pool is divided into 3 boxes with 1-, 10- and 100-year lifetime.

4. C-N Coupling? ⊠ Yes ☐ No

   ☐ Other,

   If "other", please describe _____

Part II. Input Information

5. Is N deposition Included? ⊠ Yes ☐ No
6. Is chemical N fertilizer use considered for cropland? ⊠ Yes ☐ No
7. Is manure application considered for cropland? ☐ Yes ⊠ No
8. Is N fixation considered? ⊠ Yes ☐ No

Part III. Output Information

9. Please check the N output included in your model

⊠ DIN (Dissolved inorganic N) leaching

⊠ DON (Dissolved organic N) leaching

☐ PON (Particulate organic N) leaching

☒ N$_2$O emission

☒ NO emission

☒ N$_2$ emission

☒ NH$_3$ volatilization

☒ Harvest

☒ Nitrous gas emission due to burning

☐ Other,_____

Part IV. C-N coupling

10. Is GPP limited by N availability?   ☒ Yes   ☐ No

If yes, briefly describe **DLEM estimates the C assimilation rate following the modified Farquhar Equation. The actual maximum carboxylation rate (V$_m$) depends on the N content of leaf. After GPP has been scaled up from leaf to canopy, the production will be modified based on the ratio of plant N level (N$_{av}$) to N required (N$_{require}$) for phtosynthate allocation and biomass formation.**

11. Is plant autotrophic respiration limited by N availability?   ☐ Yes   ☒ No

If yes, briefly describe _____

12. Is heterotrophic respiration limited by N availability?   ☒ Yes   ☐ No

If yes, briefly describe **In DLEM, soil N availability modifies SOM decomposition through mineralization and immobilization. If soil available N couldn't meet the N requirement for potential immobilization, the actual SOM decomposition would be lowered. SOM decomposition will be stimulated when soil available N is too low.**

13. Is carbon allocation limited by N availability?   ☒ Yes   ☐ No

If yes, briefly describe **N is allocated along with carbon to maintain fixed C/N ratio of plant tissue during biomass construction. Plants are prone to balance the acquisition of aboveground and belowground resources, therefore, more carbon will be allocated into roots to exploit N when soil N availability is low. To estimate the relative allocation among leaf, stem and root pools, DLEM follows the relative allocation scheme developed by Friendlingstein et al. (1999). The most limiting one of water (*W*) and nitrogen (*N*) is**

adopted to represent the belowground stress, controlling the available carbon allocated to root, while aboveground resource (light, *L*) controls the stem/sapwood allocation

14. Does your model consider plant uptake of N? ☒ Yes ☐ No

If yes, describe how considered in model **Currently, DLEM only considers plant uptake of soil inorganic N ions (NH_4^+ and NO_3^-) through root systems, but does not include uptake of nitrous gases (NH_3, NO, NO_2) by leaf stoma or bark, which is simplified by assigning all of dry deposition to soil inorganic N pool. DLEM assumes that the N uptake is controlled by the N requirements ($N_{deficit}$), N availability (N_{av}), and the plant uptake capability ($N_{pot,uptake}$) determined by microclimate.**

15. Is microbial activity included for modifying N cycle? ☐ Yes ☒ No

If yes, briefly describe