

**Electronic Supplementary Material to:  
Modeling the Impacts of Nitrogen Dynamics on Regional Terrestrial  
Carbon and Water Cycles over China with Noah-MP-CN\***

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**Table S1.** Parameterization scheme options used in this study.

Physical Process	Option
Dynamic vegetation	Dynamics vegetation
Canopy stomatal resistance	Ball–Berry
Soil moisture limitation for transpiration	Noah
Runoff and groundwater	SIMGM
Surface layer drag coefficient	Monin–Obukhov
Supercooled liquid water	Niu–Yang06
Frozen soil permeability	Niu–Yang06
Radiation transfer	Modified two-stream scheme
Snow surface albedo	BATS
Rainfall and snowfall	Jordan91
Lower boundary of soil temperature	Noah
Snow and soil temperature	Semi-implicit

\* The online version of this article can be found at <https://doi.org/10.1007/s00376-020-9231-6>.

**Table S2.** Model input variables and parameters.

Parameter	Description	Controlling process	Units	Value
rC:N	C:N ratios for each component of the plant	N demand	–	2D-varing*
<i>a</i>	Empirical curve-fitting parameter	Fixation	–	–3.62
<i>b</i>	Empirical curve-fitting parameter	Fixation	–	0.27
<i>c</i>	Empirical curve-fitting parameter	Fixation	–	25.15
<i>s</i>	Scaling factor	Fixation	–	2D-varing*
<i>k<sub>N</sub></i>	Empirical curve-fitting parameter	Active uptake	kg C m <sup>-2</sup>	1
<i>k<sub>C</sub></i>	Empirical curve-fitting parameter	Active uptake	kg C m <sup>-2</sup>	1
Fert	Fertilizer amount	Fertilization	g N m <sup>2</sup>	2D-varing*
<i>f<sub>nh4n</sub></i>	Fraction of mineral N in fertilizer that is ammonium	Fertilization	–	0.4
<i>f<sub>surfn</sub></i>	Fraction of fertilizer that is applied to the top 10 mm of soil	Fertilization	–	0.2
<i>e<sub>mix</sub></i>	Mixing efficiency of tillage operation	Tillage	–	0.3
<i>β<sub>min</sub></i>	Rate coefficient for mineralization of the humic organic nitrogen	Mineralization	–	0.003
<i>β<sub>rsd</sub></i>	Rate coefficient for mineralization of the fresh organic nitrogen in residue	Mineralization	–	0.05
<i>β<sub>denit</sub></i>	Rate coefficient for denitrification	Denitrification	–	1.4
<i>γ<sub>sw,thr</sub></i>	Threshold value of soil water factor for denitrification to occur	Denitrification	–	2D-varing*
<i>R<sub>no3</sub></i>	Concentration of nitrate in rain	Deposition	mg kg <sup>-1</sup>	1.5
<i>R<sub>nh4</sub></i>	Concentration of ammonium in rain	Deposition	mg kg <sup>-1</sup>	1
<i>D<sub>no3</sub></i>	Constant of nitrate rate with dry deposition	Deposition	g N m <sup>-2</sup> yr <sup>-1</sup>	0.2
<i>D<sub>nh4</sub></i>	Constant of ammonium rate with dry deposition	Deposition	g N m <sup>-2</sup> yr <sup>-1</sup>	0.2
<i>θ<sub>e</sub></i>	Fraction of porosity from which anions are excluded	Leaching	–	0.15
<i>β<sub>no3</sub></i>	Nitrate percolation coefficient	Leaching	–	0.3

Note: \*2D-varing: Spatially varying 2D input data created by this study.