

Table S1. Tunable parameters and their variability ranges for Community Land Model version 4.0.

Index	Parameter	Default	Range	Description
P1	<i>fover</i>	0.5	(0.1, 5)	Decay factor of surface flow (m^{-1})
P2	<i>fdrai</i>	2.5	(0.1, 5)	Decay factor of sub-surface flow(m^{-1})
P3	<i>odm</i>	0.00 55	$(1.0 \times 10^{-6}, 1.0 \times 10^{-1})$	Maximum drainage when the water table depth is at the surface($\text{kg m}^{-2} \text{s}^{-1}$)
P4	<i>S_y</i>	0.2	(0.02, 0.27)	Fraction of water volume drained by gravity in an unconfined aquifer
P5	<i>poro_a</i>	0.00 126	(0.001134, 0.001386)	The slope of mineral soil porosity pedotransfer function (PTF)
P6	<i>poro_b</i>	0.48 9	(0.4401, 0.5379)	The intercept of mineral soil porosity PTF
P7	<i>bsw_a</i>	0.15 9	(0.1431, 0.1749)	The slope of PTF of exponent B in Clapp and Hornberger
P8	<i>bsw_b</i>	2.91	(2.619, 3.201)	The intercept of PTF of exponent B in Clapp and Hornberger
P9	<i>suc_a</i>	0.01 31	(0.01179, 0.01441)	The slope of PTF of saturated mineral soil matric potential
P10	<i>suc_b</i>	1.88	(1.692, 2.068)	The intercept of PTF of saturated mineral soil matric potential
P11	<i>xk1</i>	0.00 7056	(0.00635004, 0.00776116)	Parameter 1 of PTF saturated hydraulic conductivity for mineral soil
P12	<i>xk2</i>	0.88 4	(0.7956, 0.9724)	Parameter 2 of PTF of saturated hydraulic conductivity for mineral soil
P13	<i>xk3</i>	0.01 53	(0.01377, 0.01683)	Parameter 3 of PTF of saturated hydraulic conductivity for mineral soil
P14	<i>tk1</i>	8.8	(7.92, 9.68)	Parameter 1 of PTF of soil minerals' thermal conductivity
P15	<i>tk2</i>	2.92	(2.628, 3.212)	Parameter 2 of PTF of soil minerals' thermal conductivity
P16	<i>z0mr</i>	1	(0.7, 1.3)	Ratio of momentum roughness length to canopy top height
P17	<i>displar</i>	1	(0.7, 1.3)	Ratio of displacement height to canopy top height
P18	<i>dleaf</i>	1	(0.7, 1.3)	Characteristic leaf dimension
P19	<i>mp</i>	1	(0.7, 1.3)	Slope of conductance-to-photosynthesis relationship
P20	<i>qc25</i>	1	(0.7, 1.3)	Quantum efficiency at 25 degrees Celsius ($\mu\text{mol CO}_2/\mu\text{mol photon}^{-1}$)
P21	<i>leafcn</i>	1	(0.7, 1.3)	Leaf carbon-to -nitrogen ratio (gC/gN)
P22	<i>flnr</i>	1	(0.7, 1.3)	Fraction of leaf N in Rubisco enzyme
P23	<i>fnitr</i>	1	(0.7, 1.3)	Foliage nitrogen limitation factor/a prescribed nitrogen availability factor
P24	<i>slatop</i>	1	(0.7,1.3)	Specific Leaf Area at top of canopy, projected area basis (m^2/gC)
P25	<i>dsladlai</i>	1	(0.7, 1.3)	Through canopy, projected area basis: dSLA/dLAI (m^2/gC)
P26	<i>smpso</i>	1	(0.7, 1.3)	Soil water potential at full stomatal opening (mm)
P27	<i>smpsc</i>	1	(0.7, 1.3)	Soil water potential at full stomatal closure (mm)
P28	<i>roota_par</i>	1	(0.7, 1.3)	Community land model rooting distribution parameter a (m^{-1})
P29	<i>rootb_par</i>	1	(0.7, 1.3)	Community land model rooting distribution parameter b (m^{-1})
P30	<i>x1</i>	1	(0.7, 1.3)	Leaf/stem orientation index
P31	<i>rholvis</i>	1	(0.7, 1.3)	Leaf reflectance: visible
P32	<i>rholnir</i>	1	(0.7, 1.3)	Leaf reflectance: near-infrared radiation
P33	<i>rhosvis</i>	1	(0.7, 1.3)	Stem reflectance: visible
P34	<i>rhosnir</i>	1	(0.7, 1.3)	Stem reflectance: near-infrared radiation
P35	<i>taulvis</i>	1	(0.7, 1.3)	Leaf transmittance: visible
P36	<i>taulnir</i>	1	(0.7, 1.3)	Leaf transmittance: near-infrared radiation
P37	<i>tausvis</i>	1	(0.7, 1.3)	Stem transmittance: visible
P38	<i>tausnir</i>	1	(0.7, 1.3)	Stem transmittance: near-infrared radiation