Supplement - Beyond behavioural models: equifinality and overparameterisation undermine confidence in predictions by soil organic matter models

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Supplementary information

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S1 Supplementary figures

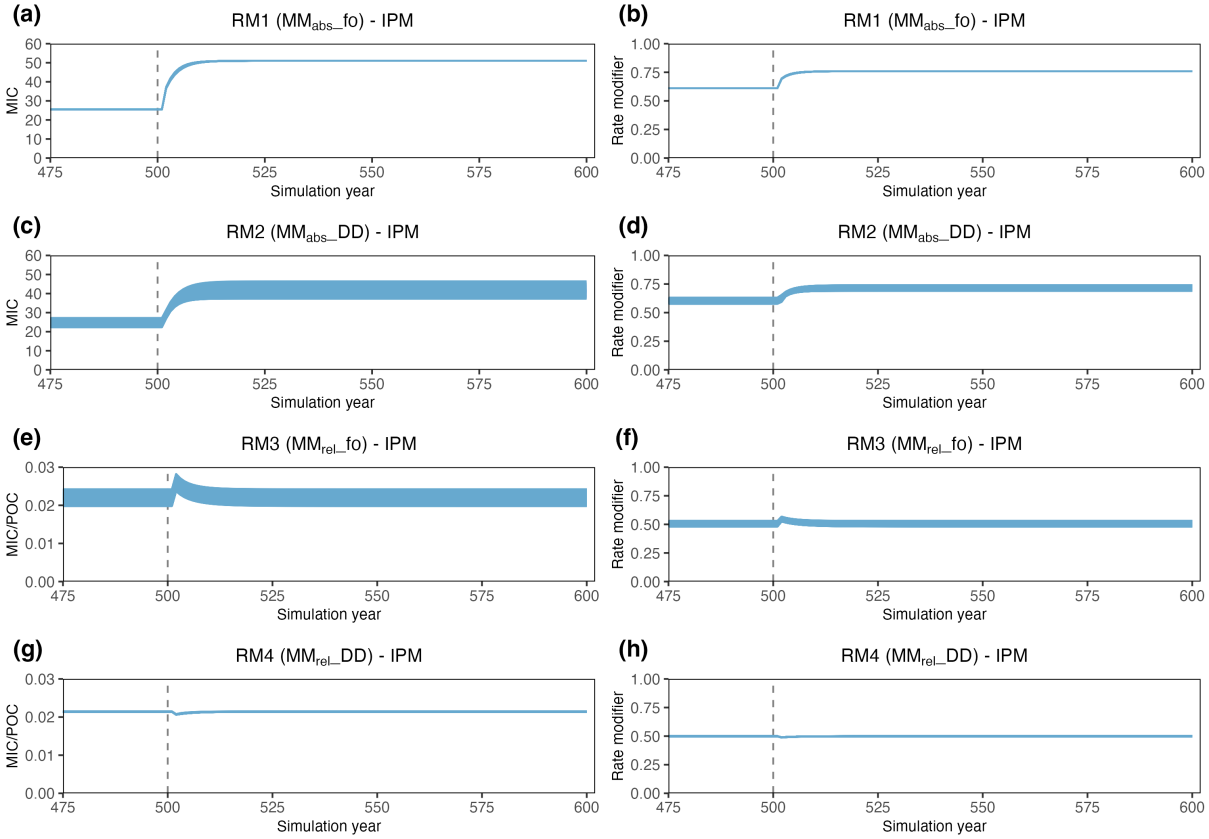

Figure S1. The effect of doubling OC inputs on changes in the rate modifiers for the depolymerisation of POC_{lit} in the rhizosphere models. Left column: model pools governing the magnitude of the rate modifiers (MIC for RM1 and RM2; MIC/POC for RM3 and RM4) before and after a doubling of OC inputs. Right column: changes in the value of the rate modifier before and after a doubling of OC inputs. The vertical dashed line at simulation year 500 shows from when the doubling of OC inputs took place.

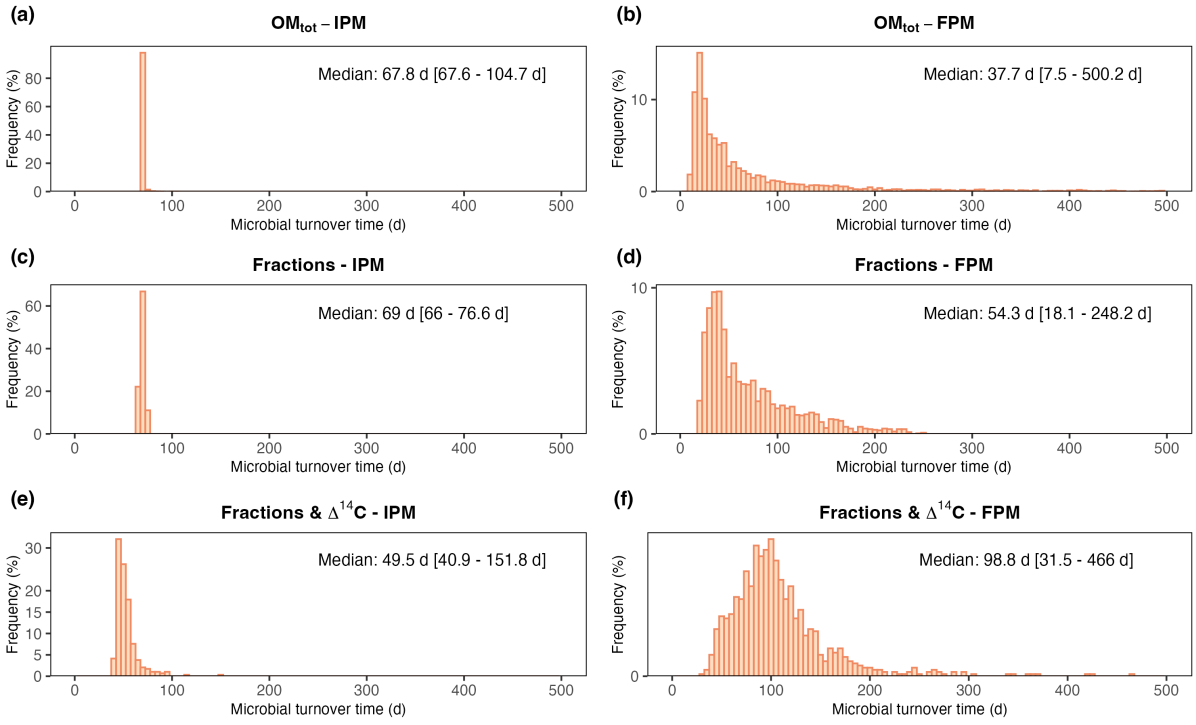

Figure S2. The simulated turnover time of the microbial biomass (in days) for the behavioural SOM models at steady state (i.e., the last year before OC inputs were doubled). The left column shows the results for the identifiable parameter models (IPM), while the right column shows the results for the full parameter model (FPM). The numbers between square brackets display the minimum and maximum values.

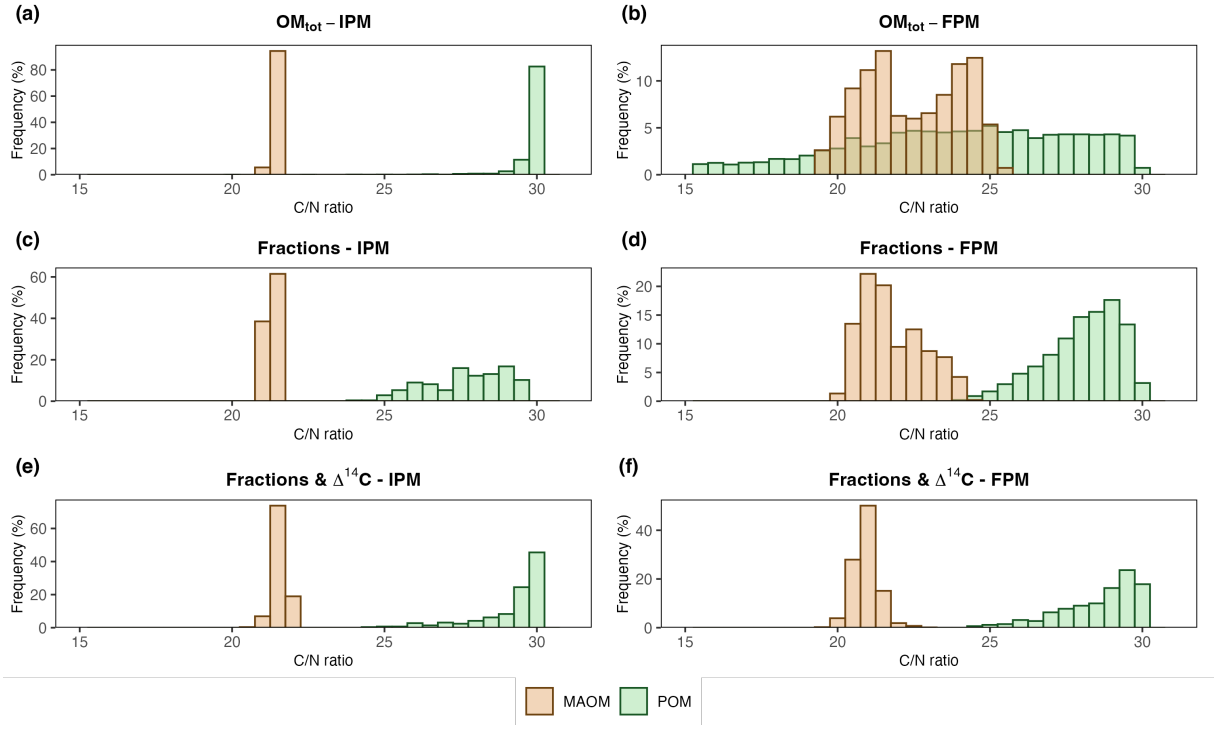

Figure S3. The simulated C/N ratio of particulate organic matter (POM) and mineral-associated organic matter (MAOM) for the behavioural SOM models at steady state (i.e., the last year before OC inputs were doubled). The calibration scenario *Fractions* and *Fractions and* $\Delta^{14}C$ (second and third row) were calibrated using an assumed C/N ratio of 29 for POM, and 20 for MAOM. The left column shows the results for the identifiable parameter models (IPM), while the right column shows the results for the full parameter model (FPM).

S2 Supplementary tables

Table S1. State variables of the rhizosphere models and their description. In the model, the pools are calculated down to 0.2 m depth for a unit surface area of 1 m^2, hence the unit of all pools is gC m^{-2} or gN m^{-2}. Pools with an * are simulated but are assumed to be in quasi steady-state (i.e., all mass entering those pools also leaves those pools within every time step), so their size is not kept track of.

State variable	Description
POM_{res}	Particulate organic matter of microbial origin (death microbes and decayed enzymes)
POM_{lit}	Particulate organic matter of plant origin (litter)
MIC	Microbial biomass
N_{min}	Mineral nitrogen in the soil solution
ENZ_{res}^*	Extracellular enzymes mediating the depolymerisation of POM_{res}
ENZ_{lit}^*	Extracellular enzymes mediating the depolymerisation of POM_{lit}
*DOM**	Dissolved organic matter

Table S2. Parameters used in the rhizosphere models, their description, unit, and value. In case the parameter was optimised using the differential evolution algorithm, this is indicated. The abbreviation RM refers to rhizosphere model. For a full description of the model parameters, reference is made to Wutzler et al. (2022).

Parameter	Description	Unit	Value
i_C	Inputs of organic carbon	gC m^{-2} d^{-1}	*Optimised*
$V_{max,res}$	Maximum rate of POM_{res} depolymerisation	d^{-1}	*Optimised*
$V_{max,lit}$	Maximum rate of POM_{lit} depolymerisation	d^{-1}	*Optimised*
K_{mN}	Half-saturation constant for depolymerisation of POM_{res} and POM_{lit} in RM1 and RM2	gC m^{-3}	*Optimised*
$K_{mN.res}$	Half-saturation constant for depolymerisation of POM_{res} in RM3 and RM4	gC m^{-3}	*Optimised*
$K_{mN.lit}$	Half-saturation constant for depolymerisation of POM_{lit} in RM3 and RM4	gC m^{-3}	*Optimised*
$k_{mic.fo}$	First-order mortality rate of microbes (RM1 and RM3)	d^{-1}	0.01
f_K	Carrying capacity of soil microbes, expressed as the portion of total POC (RM2 and RM4)	Unitless	*Optimised*
a_E	Enzyme production per unit of microbial biomass C	d^{-1}	0.002
m	Maintenance respiration as a portion of microbial biomass C	d^{-1}	0.02
CUE	Carbon use efficiency for microbial biomass and enzyme synthesis	Unitless	0.5
CN_{mic}	C:N ratio of microbial biomass	Unitless	10
CN_{enz}	C:N ratio of extracellular enzymes	Unitless	3
CN_{lit}	C:N ratio plant litter	Unitless	30
k_E	Portion of decayed enzymes being transferred to *DOM*	Unitless	0.8
e_{tvr}	Portion of death microbes that is not transformed to CO_2 by grazers	d^{-1}	0.45
ν_N	Nitrogen use efficiency	Unitless	0.9
i_{BN}	Maximum portion of N_{min} that can be taken up by microbes in one time step	d^{-1}	0.01
l_N	Portion of leached N_{min}	d^{-1}	0.01
f_{rhizo}	Portion of inputs as rhizodeposits	Unitless	0.2
sc	Combined silt and clay content	Unitless	0.5

Table S3. State variables used in the SOM model and their description. In the model, the pools are calculated down to 0.2 m depth for a unit surface area of 1 m^2, hence the unit of all pools is gC m^{-2} or gN m^{-2}. Pools with an * are simulated but are assumed to be in quasi steady-state (i.e., all mass entering those pools also leaves those pools within every time step), so their size is not kept track of. For every pool containing C, an additional pool keeps track of the ^{14}C content of that pool. The latter are not shown in this table.

State variable	Description
POM_{res}	Particulate organic matter of microbial origin (death microbes and decayed enzymes)
POM_{lit}	Particulate organic matter of plant origin (litter)
MIC	Microbial biomass
N_{min}	Mineral nitrogen in the soil solution
MAOM	Mineral-associated organic matter
ENZ_{res}^*	Extracellular enzymes mediating the depolymerisation of POM_{res}
ENZ_{lit}^*	Extracellular enzymes mediating the depolymerisation of POM_{lit}
DOM	Dissolved organic matter

Table S4. Parameters used in the SOM model, their description, unit, and value. In case the parameter was optimised using the differential evolution algorithm, this is indicated. For a full description of the model parameters, reference is made to Wutzler et al. (2022).

Parameter	Description	Unit	Value
i_C	Inputs of organic carbon	gC m^{-2} d^{-1}	*Optimised*
$V_{max,res}$	Maximum rate of POM_{res} depolymerisation	d^{-1}	*Optimised*
$V_{max,lit}$	Maximum rate of POM_{lit} depolymerisation	d^{-1}	*Optimised*
$K_{mN.res}$	Half-saturation constant for depolymerisation of POM_{res}	gC m^{-3}	*Optimised*
$K_{mN.lit}$	Half-saturation constant for depolymerisation of POM_{lit}	gC m^{-3}	*Optimised*
f_K	Carrying capacity of soil microbes, expressed as the portion of total POC	Unitless	*Optimised*
$K_{m,U}$	Affinity constant for the uptake of DOM by microbes	gC m^{-3}	*Optimised*
$K_{m,ads}$	Affinity constant for the adsorption of DOM by minerals	gC m^{-3}	*Optimised*
k_{des}	Rate of organic matter desorption from minerals	d^{-1}	*Optimised*
a_E	Enzyme production per unit of microbial biomass C	d^{-1}	0.002
m	Maintenance respiration as a portion of microbial biomass C	d^{-1}	0.02
CUE	Carbon use efficiency for microbial biomass and enzyme synthesis	Unitless	0.5
CN_{mic}	C:N ratio of microbial biomass	Unitless	10
CN_{enz}	C:N ratio of extracellular enzymes	Unitless	3
CN_{lit}	C:N ratio plant litter	Unitless	30
k_E	Portion of decayed enzymes being transferred to *DOM*	Unitless	0.8
e_{tvr}	Portion of death microbes that is not transformed to CO_2 by grazers	d^{-1}	0.45
ν_N	Nitrogen use efficiency	Unitless	0.9
i_{BN}	Maximum portion of N_{min} that can be taken up by microbes	d^{-1}	0.01
l_N	Portion of leached N_{min}	d^{-1}	0.01
f_{rhizo}	Fraction of inputs as rhizodeposits	Unitless	0.2
V_{rhizo}	Volume of the rhizosphere, expressed as a portion of total soil volume	Unitless	0.1
sc	Combined silt and clay content	Unitless	0.5
$\delta^{13}C_{input}$	$\delta^{13}C$ value of input OC	‰	-28

Table S5. Parameters of the rhizosphere models (RM1 to RM4) optimized during the differential evolution calibration, and the ranges over which parameter values were tested (min and max). The same ranges were used for the parameter optimisation using the Bayesian calibration. Note that in models RM1 and RM2, K_{mN} is the half-rate constant for the absolute variant of the Michaelis-Menten equations, while in RM3 and RM4, $K_{mN,res}$ and $K_{mN,lit}$ are the half-rate constants for the relative variants.

	RM1.min	RM1.max	RM2.min	RM2.max	RM3.min	RM3.max	RM4.min	RM4.max
$V_{max,res}$	1 x 10^{-5}	1 x 10^{-1}	1 x 10^{-5}	1 x 10^{-1}	1 x 10^{-5}	1 x 10^{-1}	1 x 10^{-5}	1 x 10^{-1}
$V_{max,lit}$	1 x 10^{-5}	1 x 10^{-1}	1 x 10^{-5}	1 x 10^{-1}	1 x 10^{-5}	1 x 10^{-1}	1 x 10^{-5}	1 x 10^{-1}
K_{mN}	1 x 10^{-6}	1 x 10^{1}	1 x 10^{-6}	1 x 10^{1}	-	-	-	-
$K_{mN,res}$	-	-	-	-	1 x 10^{-6}	1 x 10^{-2}	1 x 10^{-6}	1 x 10^{-2}
$K_{mN,lit}$	-	-	-	-	1 x 10^{-6}	1 x 10^{-2}	1 x 10^{-6}	1 x 10^{-2}
f_K	-	-	1 x 10^{-4}	1 x 5^{-2}	-	-	1 x 10^{-4}	1 x 5^{-2}

Table S6. Ranges over which parameters of the SOM model were allowed to vary during the differential evolution (DE) and Bayesian calibration. i_C is the annual C input to the soil.

	DE.min	DE.max	Bayesian.min	Bayesian.max
$V_{max,res}$	9.13 x 10^{-4}	2.74 x 10^{-1}	1.37 x 10^{-3}	2.74 x 10^{-1}
$V_{max,lit}$	2.74 x 10^{-4}	5.48 x 10^{-3}	9.13 x 10^{-4}	9.13 x 10^{-3}
$K_{mN,res}$	1 x 10^{-6}	1 x 10^{-3}	9.67 x 10^{-6}	8.61 x 10^{-3}
$K_{mN,lit}$	1 x 10^{-6}	3.9 x 10^{-3}	9.17 x 10^{-6}	8.18 x 10^{-3}
$K_{m,U}$	1 x 10^{-1}	1 x 10^{1}	1 x 10^{-1}	1 x 10^{1}
$K_{m,ads}$	1	1 x 10^{3}	1	1 x 10^{3}
k_{des}	6.85 x 10^{-6}	5.48 x 10^{-4}	7.83 x 10^{-6}	5.48 x 10^{-4}
f_K	1 x 10^{-4}	5 x 10^{-2}	1 x 10^{-3}	5 x 10^{-2}
i_C	50	350	-	-

Table S7. Optimised parameter values for the rhizosphere models, using the differential evolution algorithm.

Parameter	RM1	RM2	RM3	RM4
$V_{max,res}$	1.00 x 10^{-1}	1.00 x 10^{-1}	1.00 x 10^{-1}	9.998 x 10^{-2}
$V_{max,lit}$	1.049 x 10^{-3}	1.051 x 10^{-3}	1.282 x 10^{-3}	1.282 x 10^{-3}
K_{mN}	1.154 x 10^{-1}	1.143 x 10^{-1}	-	-
$K_{mN,res}$	-	-	3.706 x 10^{-4}	3.705 x 10^{-4}
$K_{mN,lit}$	-	-	4.196 x 10^{-5}	4.196 x 10^{-5}
f_K	-	2.108 x 10^{-2}	-	2.132 x 10^{-2}

Table S8. Optimised parameter values for the SOM model, using the differential evolution algorithm.

Parameter	Optimised value
$V_{max,res}$	3.170 x 10^{-2}
$V_{max,lit}$	1.389 x 10^{-3}
$K_{mN,res}$	2.134 x 10^{-4}
$K_{mN,lit}$	4.358 x 10^{-5}
$K_{m,U}$	1.200
$K_{m,ads}$	7.875 x 10^{2}
k_{des}	1.303 x 10^{-5}
f_K	2.294 x 10^{-2}
i_C	3.490 x 10^{2}

Table S9. Parameter importance for the simulation of total SOC of the variables of the rhizosphere models, quantified using the δ^{msqr} measure from Brun et al. (2001), calculated around the size of the parameter values at steady state. These are the parameters that were optimised during the Bayesian calibration for the *full parameter model* (*FPM*) scenario.

	Model 1	**Model 2**	**Model 3**	**model 4**
$V_{max,res}$	0.0026	0.0019	0.0146	0.0074
$V_{max,lit}$	0.98	0.68	1.94	0.98
K_{mN}	0.38	0.27	-	-
$K_{mN,res}$	-	-	0.0073	0.0037
$K_{mN,lit}$	-	-	0.97	0.49
$k_{mic.fo}$	0.18	-	0.41	-
f_K	-	0.29	-	0.49
CUE	0.19	0.06	0.60	0.01

Table S10. Parameter importance for the simulation of total SOC of the variables of the full SOM model, quantified using the δ^{msqr} measure from Brun et al. (2001), calculated around the size of the parameter values at steady state. These are the parameters that were optimised during the Bayesian calibration for the *full parameter model* (*FPM*) scenario.

	δ^{msqr}
$V_{max,res}$	0.00044
$V_{max,lit}$	0.10
$K_{mN,res}$	0.00023
$K_{mN,lit}$	0.049
f_K	0.19
$K_{m,U}$	0.48
$K_{m,ads}$	0.82
k_{des}	0.69

Table S11. Identifiable parameter combinations in rhizosphere model 1 (with a collinearity index < 10), for a calibration when data on total SOC and the CN is available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN	k.mic	CUE	collinearity
2.00	X	X				1.23
2.00		X	X			1.24
2.00		X		X		1.17
2.00		X			X	1.13
2.00			X		X	9.86

Table S12. Identifiable parameter combinations in rhizosphere model 1 (with a collinearity index < 10), for a calibration when data on total POC, MIC and the CN of total SOC is available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN	k.mic	CUE	collinearity
2.00	X	X				1.24
2.00	X			X		1.31
2.00	X				X	1.21
2.00		X	X			1.25
2.00		X		X		1.07
2.00		X			X	1.04
2.00			X	X		1.31
2.00			X		X	1.21
3.00	X	X		X		1.40
3.00	X	X			X	1.33
3.00		X	X	X		1.41
3.00		X	X		X	1.34

Table S13. Identifiable parameter combinations in rhizosphere model 2 (with a collinearity index < 10), for a calibration when data on total SOC and the CN is available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN	k.mic	CUE	collinearity
2.00	X	X				1.17
2.00		X	X			1.18
2.00		X		X		1.09
2.00		X			X	1.24
2.00				X	X	7.10

Table S14. Identifiable parameter combinations in rhizosphere model 2 (with a collinearity index < 10), for a calibration when data on total POC, MIC and the CN of total SOC is available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN	k.mic	CUE	collinearity
2.00	X	X				1.26
2.00	X			X		1.24
2.00		X	X			1.27
2.00		X		X		1.10
2.00		X			X	1.32
2.00			X	X		1.24
2.00				X	X	1.24
3.00	X	X		X		1.32
3.00		X	X	X		1.33
3.00		X		X	X	1.38

Table S15. Identifiable parameter combinations in rhizosphere model 3 (with a collinearity index < 10), for a calibration when data on total SOC and the CN is available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN.L	KmN.R	k.mic	CUE	collinearity
2.00	X	X					3.24
2.00	X			X			3.24
2.00		X	X				3.24
2.00		X			X		3.02
2.00		X				X	2.95
2.00			X	X			3.24
2.00				X	X		3.02
2.00				X		X	2.95

Table S16. Identifiable parameter combinations in rhizosphere model 3 (with a collinearity index < 10), for a calibration when data on total POC, MIC and the CN of total SOC is available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN.L	KmN.R	k.mic	CUE	collinearity
2.00	X	X					3.30
2.00	X			X			3.30
2.00	X				X		1.88
2.00	X					X	1.83
2.00		X	X				3.30
2.00		X			X		1.67
2.00		X				X	1.63
2.00			X	X			3.30
2.00			X		X		1.88
2.00			X			X	1.83
2.00				X	X		1.67
2.00				X		X	1.63
3.00	X	X			X		3.43
3.00	X	X				X	3.43
3.00	X			X	X		3.43
3.00	X			X		X	3.43
3.00		X	X		X		3.43
3.00		X	X			X	3.43
3.00			X	X	X		3.43
3.00			X	X		X	3.43

Table S17. Identifiable parameter combinations in rhizosphere model 4 (with a collinearity index < 10), for a calibration when data on total SOC and the CN is available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN.L	KmN.R	fK	CUE	collinearity
2.00	X	X					1.94
2.00	X			X			1.94
2.00	X					X	3.75
2.00		X	X				1.94
2.00		X			X		1.79
2.00		X				X	3.87
2.00			X	X			1.94
2.00			X			X	3.75
2.00				X	X		1.79
2.00				X		X	3.87
2.00					X	X	3.20

Table S18. Identifiable parameter combinations in rhizosphere model 4 (with a collinearity index < 10), for a calibration when data on total POC, MIC and the CN of total SOC is available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN.L	KmN.R	fK	CUE	collinearity
2.00	X	X					2.48
2.00	X			X			2.48
2.00	X				X		1.01
2.00	X					X	5.17
2.00		X	X				2.48
2.00		X			X		1.01
2.00		X				X	4.69
2.00			X	X			2.48
2.00			X		X		1.01
2.00			X			X	5.17
2.00				X	X		1.01
2.00				X		X	4.68
2.00					X	X	1.00
3.00	X	X			X		2.49
3.00	X			X	X		2.49
3.00	X				X	X	5.18
3.00		X	X		X		2.49
3.00		X			X	X	4.69
3.00			X	X	X		2.49
3.00			X		X	X	5.18
3.00				X	X	X	4.69

Table S19: Identifiable parameter combinations in the full SOM model (with a collinearity index < 10), for a calibration when only data on total SOC and N is available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN.L	KmN.R	KmU	KmAds	kdes	fK	collinearity
2.00	X	X							2.33
2.00	X			X					2.33
2.00		X	X						2.33
2.00		X			X				2.23
2.00		X				X			2.23
2.00		X					X		2.23
2.00		X						X	2.68
2.00			X	X					2.33
2.00				X	X				2.23
2.00				X		X			2.23
2.00				X			X		2.23
2.00				X				X	2.68

Table S20: Identifiable parameter combinations in the full SOM model (with a collinearity index < 10), for a calibration when data on the OC and N content of POM and MAOM are available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN.L	KmN.R	KmU	KmAds	kdes	fK	collinearity
2.00	X	X							3.06
2.00	X			X					3.06
2.00	X				X				1.53
2.00	X					X			1.53
2.00	X						X		1.53
2.00	X							X	1.25
2.00		X	X						3.06
2.00		X			X				1.23
2.00		X				X			1.23
2.00		X					X		1.23
2.00		X						X	1.46
2.00			X	X					3.06
2.00			X		X				1.53
2.00			X			X			1.53
2.00			X				X		1.53
2.00			X					X	1.25
2.00				X	X				1.23
2.00				X		X			1.23
2.00				X			X		1.23
2.00				X				X	1.46
2.00					X			X	1.50
2.00						X		X	1.50
2.00							X	X	1.50
3.00	X	X			X				3.88
3.00	X	X				X			3.88
3.00	X	X					X		3.88
3.00	X	X						X	3.43
3.00	X			X	X				3.88
3.00	X			X		X			3.88

Table S20: continued

N	Vmax.L	Vmax.R	KmN.L	KmN.R	KmU	KmAds	kdes	fK	collinearity
3.00	X			X			X		3.88
3.00	X			X				X	3.43
3.00		X	X		X				3.88
3.00		X	X			X			3.88
3.00		X	X				X		3.88
3.00		X	X					X	3.43
3.00		X			X			X	4.68
3.00		X				X		X	4.68
3.00		X					X	X	4.68
3.00			X	X	X				3.88
3.00			X	X		X			3.88
3.00			X	X			X		3.88
3.00			X	X				X	3.43
3.00				X	X			X	4.68
3.00				X		X		X	4.68
3.00				X			X	X	4.68

Table S21: Identifiable parameter combinations in the full SOM model (with a collinearity index < 10), for a calibration when data on the OC, N and $\Delta^{14}C$ content of POM and MAOM are available. For each row, identifiable parameter combinations are marked with an 'X'. N is the number of identifiable parameters in the same row. Note that parameter combinations which are not identifiable are not shown.

N	Vmax.L	Vmax.R	KmN.L	KmN.R	KmU	KmAds	kdes	fK	collinearity
2.00	X	X							2.91
2.00	X			X					2.89
2.00	X				X				1.48
2.00	X					X			1.40
2.00	X						X		1.10
2.00	X							X	1.26
2.00		X	X						2.91
2.00		X			X				1.22
2.00		X				X			1.21
2.00		X					X		1.06
2.00		X						X	1.44
2.00			X	X					2.89
2.00			X		X				1.48
2.00			X			X			1.40
2.00			X				X		1.10
2.00			X					X	1.26
2.00				X	X				1.22
2.00				X		X			1.21
2.00				X			X		1.06
2.00				X				X	1.44
2.00					X	X			6.24
2.00					X		X		1.25
2.00					X			X	1.52
2.00						X	X		1.25
2.00						X		X	1.53
2.00							X	X	1.15
3.00	X	X			X				3.40
3.00	X	X				X			3.21
3.00	X	X					X		2.93

Table S21: continued

N	Vmax.L	Vmax.R	KmN.L	KmN.R	KmU	KmAds	kdes	fK	collinearity
3.00	X	X						X	3.12
3.00	X			X	X				3.36
3.00	X			X		X			3.18
3.00	X			X			X		2.91
3.00	X			X				X	3.09
3.00	X				X	X			6.47
3.00	X				X		X		1.55
3.00	X					X	X		1.48
3.00	X					X		X	5.33
3.00	X						X	X	1.46
3.00		X	X		X				3.40
3.00		X	X			X			3.21
3.00		X	X				X		2.93
3.00		X	X					X	3.12
3.00		X			X	X			6.26
3.00		X			X		X		1.34
3.00		X			X			X	4.55
3.00		X				X	X		1.33
3.00		X				X		X	4.40
3.00		X					X	X	1.61
3.00			X	X	X				3.36
3.00			X	X		X			3.18
3.00			X	X			X		2.91
3.00			X	X				X	3.09
3.00			X		X	X			6.47
3.00			X		X		X		1.55
3.00			X			X	X		1.48
3.00			X			X		X	5.33
3.00			X				X	X	1.46
3.00				X	X	X			6.25
3.00				X	X		X		1.34
3.00				X	X			X	4.53

Table S21: continued

N	Vmax.L	Vmax.R	KmN.L	KmN.R	KmU	KmAds	kdes	fK	collinearity
3.00				X		X	X		1.33
3.00				X		X		X	4.41
3.00				X			X	X	1.61
3.00					X	X	X		6.24
3.00					X	X		X	6.24
3.00					X		X	X	1.55
3.00						X	X	X	1.57
4.00	X	X			X	X			7.04
4.00	X	X			X		X		3.40
4.00	X	X				X	X		3.22
4.00	X	X				X		X	5.63
4.00	X	X					X	X	3.12
4.00	X			X	X	X			7.07
4.00	X			X	X		X		3.37
4.00	X			X		X	X		3.18
4.00	X			X		X		X	5.66
4.00	X			X			X	X	3.09
4.00	X				X	X	X		6.47
4.00	X					X	X	X	5.33
4.00		X	X		X	X			7.04
4.00		X	X		X		X		3.40
4.00		X	X			X	X		3.22
4.00		X	X			X		X	5.62
4.00		X	X				X	X	3.12
4.00		X			X	X	X		6.26
4.00		X			X	X		X	6.27
4.00		X			X		X	X	4.55
4.00		X				X	X	X	4.40
4.00			X	X	X	X			7.07
4.00			X	X	X		X		3.37
4.00			X	X		X	X		3.18
4.00			X	X		X		X	5.66

Table S21: continued

N	Vmax.L	Vmax.R	KmN.L	KmN.R	KmU	KmAds	kdes	fK	collinearity
4.00			X	X			X	X	3.09
4.00			X		X	X	X		6.47
4.00			X			X	X	X	5.33
4.00				X	X	X	X		6.25
4.00				X	X	X		X	6.26
4.00				X	X		X	X	4.53
4.00				X		X	X	X	4.41
4.00					X	X	X	X	6.24
5.00	X	X			X	X	X		7.04
5.00	X	X				X	X	X	5.63
5.00	X			X	X	X	X		7.07
5.00	X			X		X	X	X	5.66
5.00		X	X		X	X	X		7.04
5.00		X	X			X	X	X	5.63
5.00		X			X	X	X	X	6.28
5.00			X	X	X	X	X		7.07
5.00			X	X		X	X	X	5.66
5.00				X	X	X	X	X	6.26

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