Table S1: Site-specific estimated monthly variation of ground cover including grass, crops, and flooding periods with ranges of monthly basal crop coefficient (K_{cb}), soil water evaporation coefficient (K_e), and root depth used in the scenarios.

Location	Month	Vegetation	Kcb	Ke	Root depth (m)
ST1	Jan	Sorghum	1.01 – 0.86	0.12	1.5 – 2.5
	Feb	Sorghum	0.35 – 0.35	0.48	1.5 – 2.5
	Mar	Bare soil	0.0	0.47 – 0.68	0.0
	Apr	Bare soil	0.0	0.27 – 0.41	0.0
	May	Grass	0.6 – 0.4	0.1 – 0.12	0.1 – 0.5
	June	Grass	0.85 – 0.6	0.05	0.2 – 0.7
	July	Grass	1.03 – 0.83	0.12	0.2– 0.7
	Aug	Flooded	0.3 – 0.2	0.9 – 1.0	0.2 – 0.7
	Sep	Flooded	0.0	1.08	0.0
	Oct	Flooded	0.0	1.08	0.0
	Nov	Sorghum	0.2 – 0.1	0.66	0.5 – 1.5
	Dec	Sorghum	1.01 – 0.86	0.12	1.5 – 2.5
ST2	Jan	Tree (Acacia)	0.5 – 0.8	0.2 – 0.34	Time invariant root distribution
	Feb	Tree	0.2 – 0.6	0.17 – 0.39	
	Mar	Tree	0.1 – 0.3	0.07 – 0.37	
	Apr	Tree	0.1 – 0.3	0.02 – 0.17	
	May	Tree, Grass	0.1 – 0.3	0.5	
	June	Tree, Grass	0.3 – 0.4	0.5	
	July	Tree, Grass	0.3 – 0.4	0.5	
	Aug	Tree, flooded	0.6 – 0.8	0.25	
	Sep	Tree, flooded	0.7 – 1.05	0.25	
	Oct	Tree, flooded	0.7 – 1.05	0.25	
	Nov	Tree, Grass	0.7 – 0.9	0.25	
	Dec	Tree	0.5 – 0.8	0.32 – 0.37	
ST3	Jan	Grass	0.05 – 0.1	0.13 – 0.39	0.1
	Feb	Dry Grass	0.0 – 0.05	0.04 – 0.13	0.1
	Mar	Dry Grass	0.0 – 0.05	0.0	0.1 – 0.2
	Apr	Grass	0.1 – 0.3	0.0	0.2 – 0.3
	May	Green grass	0.6	0.0	0.2 – 0.3
	June	Green grass	0.65 – 0.85	0.34 – 0.54	0.2 – 0.4
	July	Green grass	0.73 – 1.03	0.16 - 0.24	0.2 – 0.4
	Aug	Green grass	0.83 – 1.03	0.09 - 0.22	0.2 – 0.4
	Sep	Green grass	0.83 – 0.98	0.14 - 0.22	0.2 – 0.4
	Oct	Green grass	0.78 – 0.93	0.19 - 0.22	0.2 – 0.3
	Nov	Green grass	0.4 – 0.6	0.51	0.1 – 0.3
	Dec	Grass	0.05 – 0.1	0.4 – 0.67	0.1
WL1	Jan	Bare soil	0.0 – 0.1	0.29 – 0.63	0.0 – 0.2
	Feb	Bare soil	0.0 – 0.1	0.16 – 0.42	0.0 – 0.2
	Mar	Bare soil	0.10	0.07 – 0.25	0.05 – 0.3
	Apr	Grass	0.30 – 0.4	0.03 – 0.1	0.1 – 0.3
	May	Grass	0.40	0.02 – 0.08	0.1 – 0.5
	June	Grass	0.70 – 0.9	0.01 – 0.02	0.1 – 0.5
	July	Grass	0.89 – 1.09	0.13	0.1 – 0.5
	Aug	Flooded	0.1 – 0.2	0.92 - 1.01	0.1 – 0.4
	Sep	Flooded	0.1 – 0.2	0.92 - 1.01	0.0 – 0.1
	Oct	Flooded	0.1 – 0.2	0.92 - 1.01	0.0 – 0.1
	Nov	Grass	0.2 – 0.5	0.58 – 0.62	0.05 – 0.2
	Dec	Grass	0.2 – 0.4	0.37 – 0.57	0.05 – 0.2

WL2	Jan	Bare soil	0.0 – 0.1	0.11 – 0.57	0.0 – 0.1
	Feb	Bare soil	0.0 – 0.1	0.03 – 0.24	0.0 – 0.1
	Mar	Bare soil	0.1 – 0.2	0.0 – 0.07	0.05 – 0.1
	Apr	Grass	0.2 – 0.3	0.0 – 0.02	0.05 – 0.2
	May	Grass	0.4 – 0.4	0.0 – 0.01	0.15 – 0.3
	June	Grass	0.45 – 0.6	0.0	0.15 – 0.3
	July	Grass	0.5 – 0.7	0.55 - 0.75	0.15 – 0.3
	Aug	Grass	0.45 – 1.0	0.12 - 0.22	0.1 – 0.3
	Sep	Flooded	0.3 – 1.0	0.12 - 0.22	0.1 – 0.3
	Oct	Grass	0.2 – 0.7	0.42 - 0.67	0.15 – 0.2
	Nov	Grass	0.1 – 0.2	0.77	0.15 – 0.2
	Dec	Grass	0.0 – 0.1	0.32 – 0.9	0.05 – 0.1
WL3	Jan	Bare soil	0.0 – 0.1	0.28 – 0.6	0.1 – 0.2
	Feb	Bare soil	0.0 – 0.1	0.15 – 0.4	0.1 – 0.2
	Mar	Bare soil	0.1 – 0.1	0.06 – 0.23	0.1 – 0.5
	Apr	Grass	0.2 – 0.4	0.03 – 0.09	0.2 – 0.5
	May	Grass	0.4	0.01 – 0.08	0.2 – 0.6
	June	Grass	0.4 – 0.9	0.01 - 0.01	0.2 – 0.6
	July	Grass	0.79 – 1.09	0.13	0.2 – 0.6
	Aug	Flooded	0.1 – 0.2	0.92 - 1.01	0.2 – 0.6
	Sep	Flooded	0.0 – 0.1	1.01	0.2 – 0.6
	Oct	Flooded	0.0 – 0.1	1.01	0.2 – 0.5
	Nov	Grass	0.2 – 0.5	0.58	0.1 – 0.5
	Dec	Grass	0.1 – 0.4	0.1 - 0.41	0.1 – 0.2

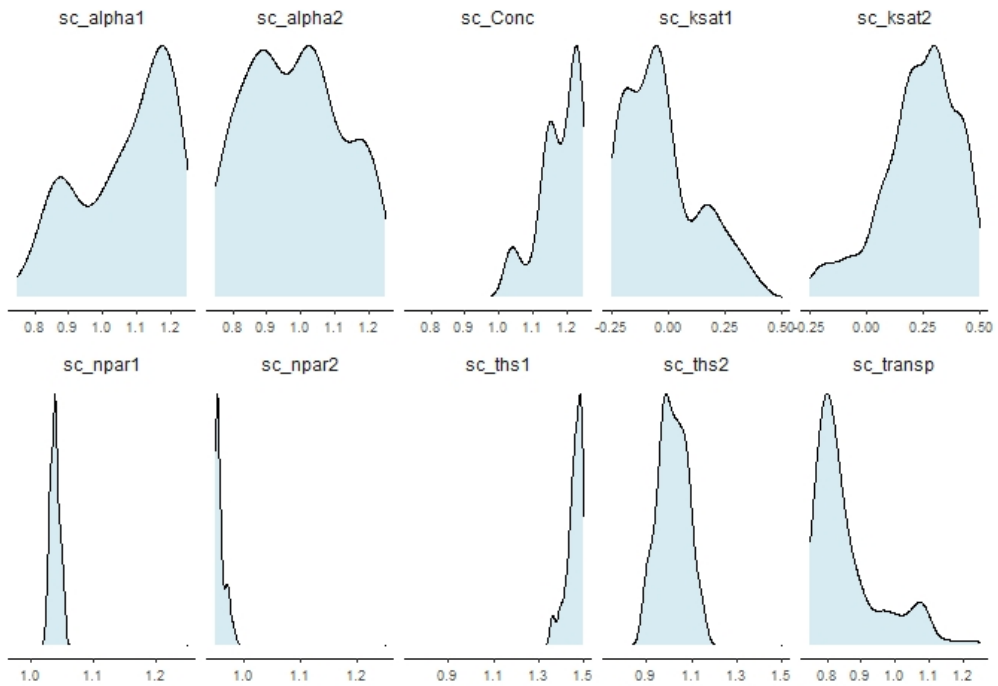

Fig. S1: posterior density distributions of the scaling factors used in the calibration of model ST1. Numbers indicate the individual model layers. Range of x-axes corresponds to prior distribution.

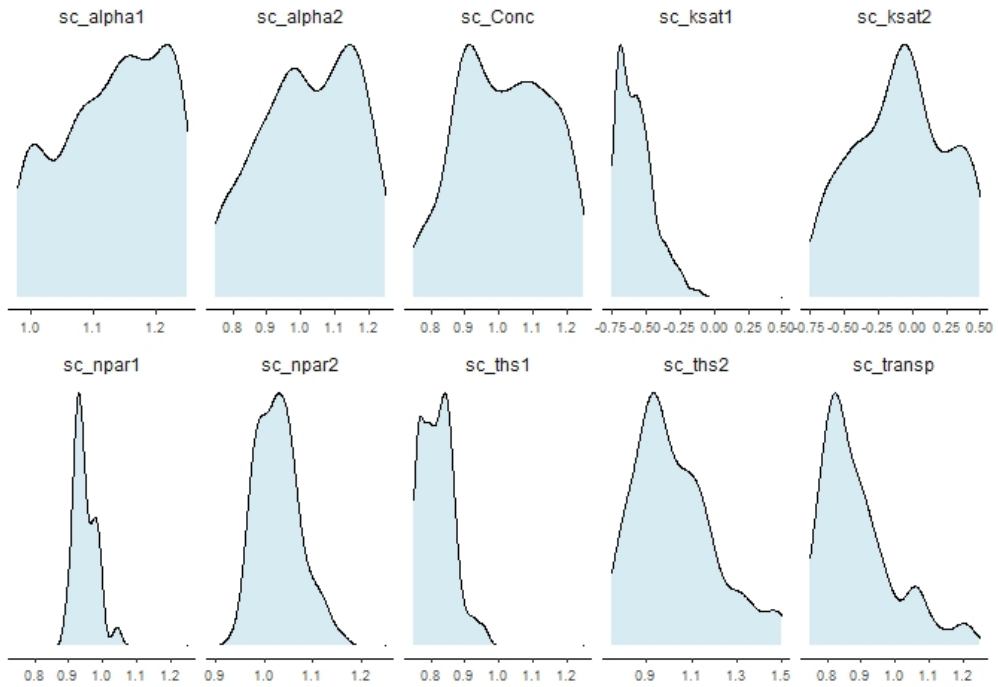

Fig. S2: posterior density distributions of the scaling factors used in the calibration of model ST2. Numbers indicate the individual model layers. Range of x-axes corresponds to prior distribution.

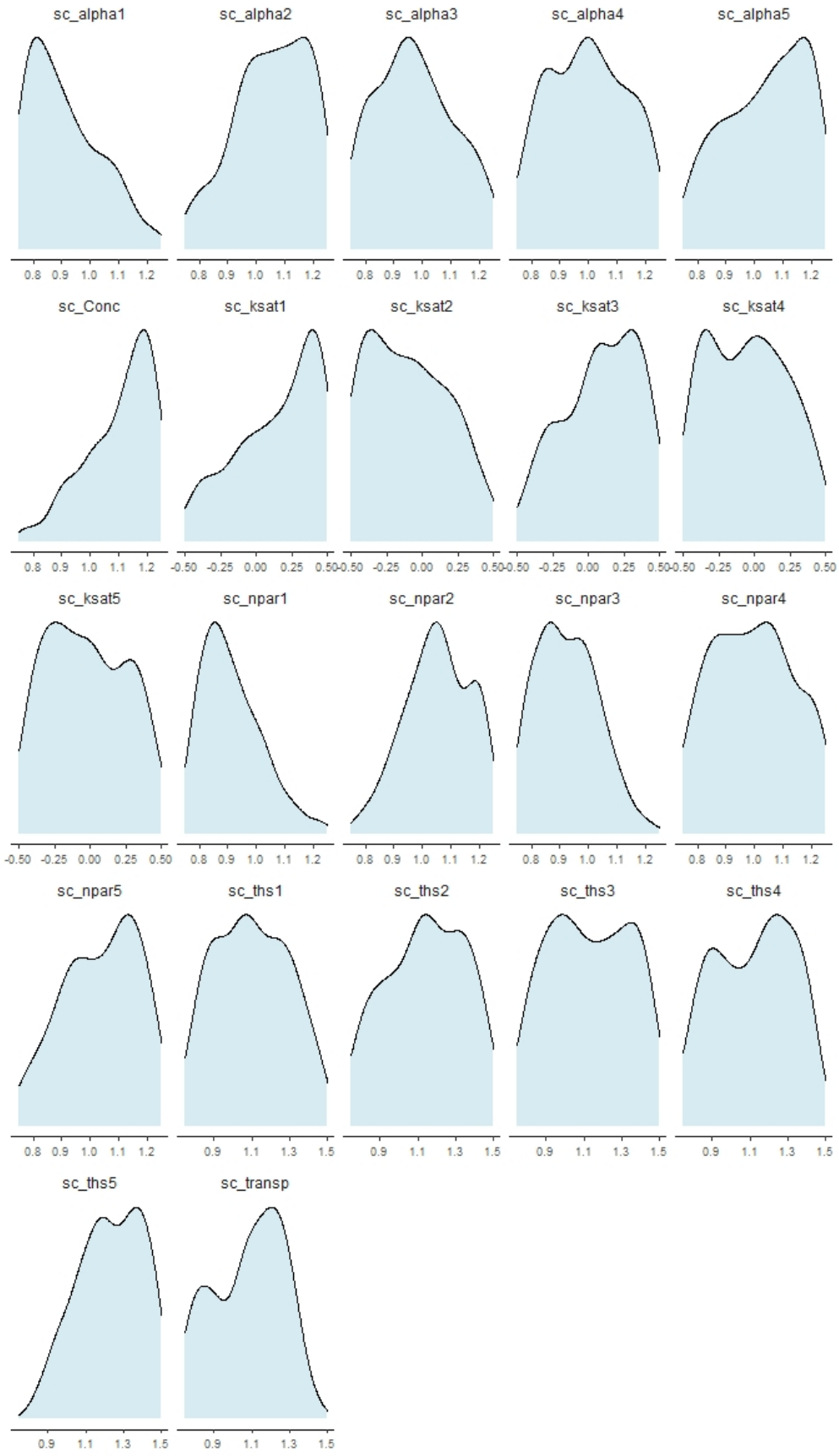

Fig. S3: posterior density distributions of the scaling factors used in the calibration of model ST3. Numbers indicate the individual model layers. Range of x-axes corresponds to prior distribution.

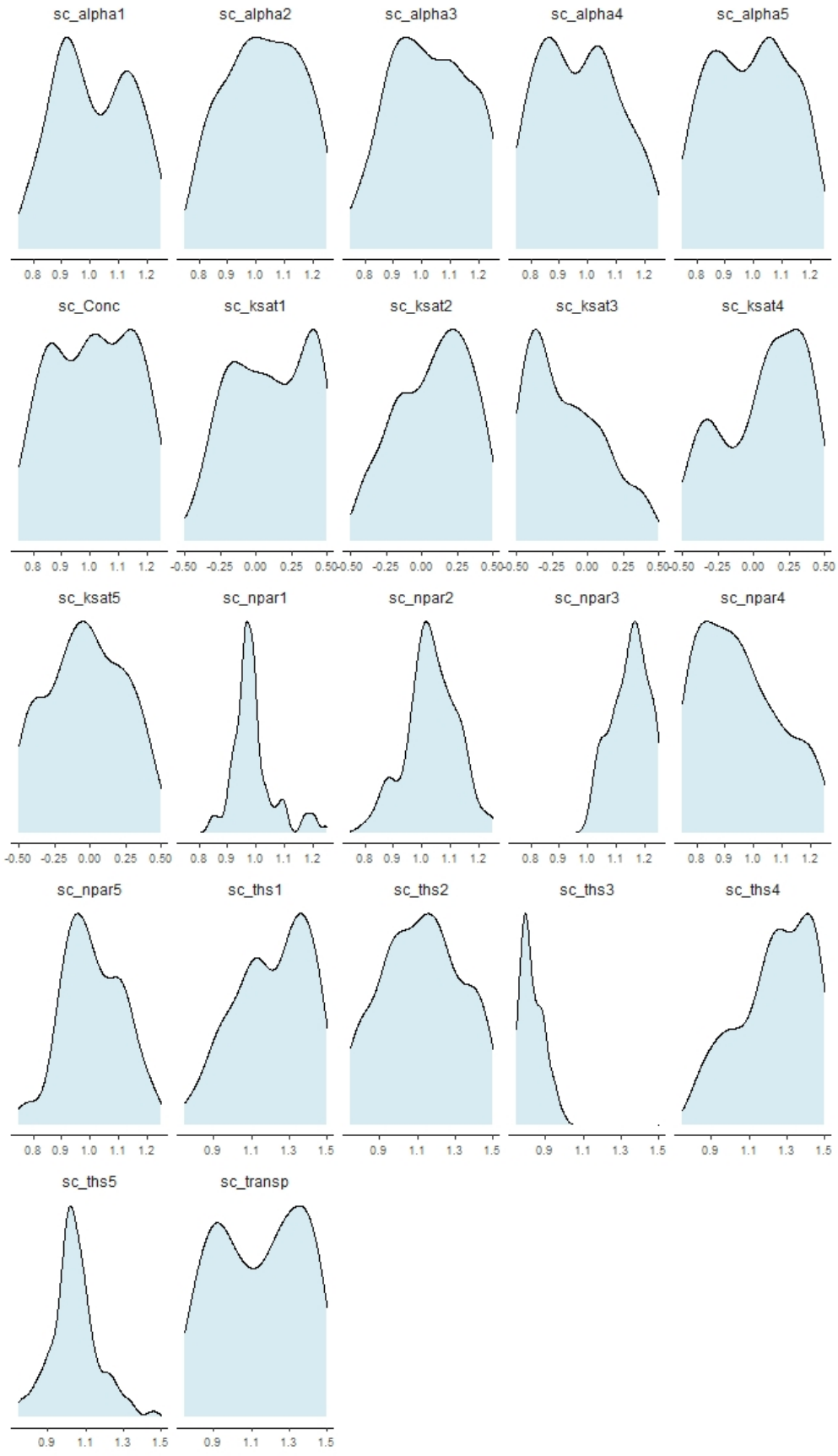

Fig. S4: posterior density distributions of the scaling factors used in the calibration of model WL1. Numbers indicate the individual model layers. Range of x-axes corresponds to prior distribution.

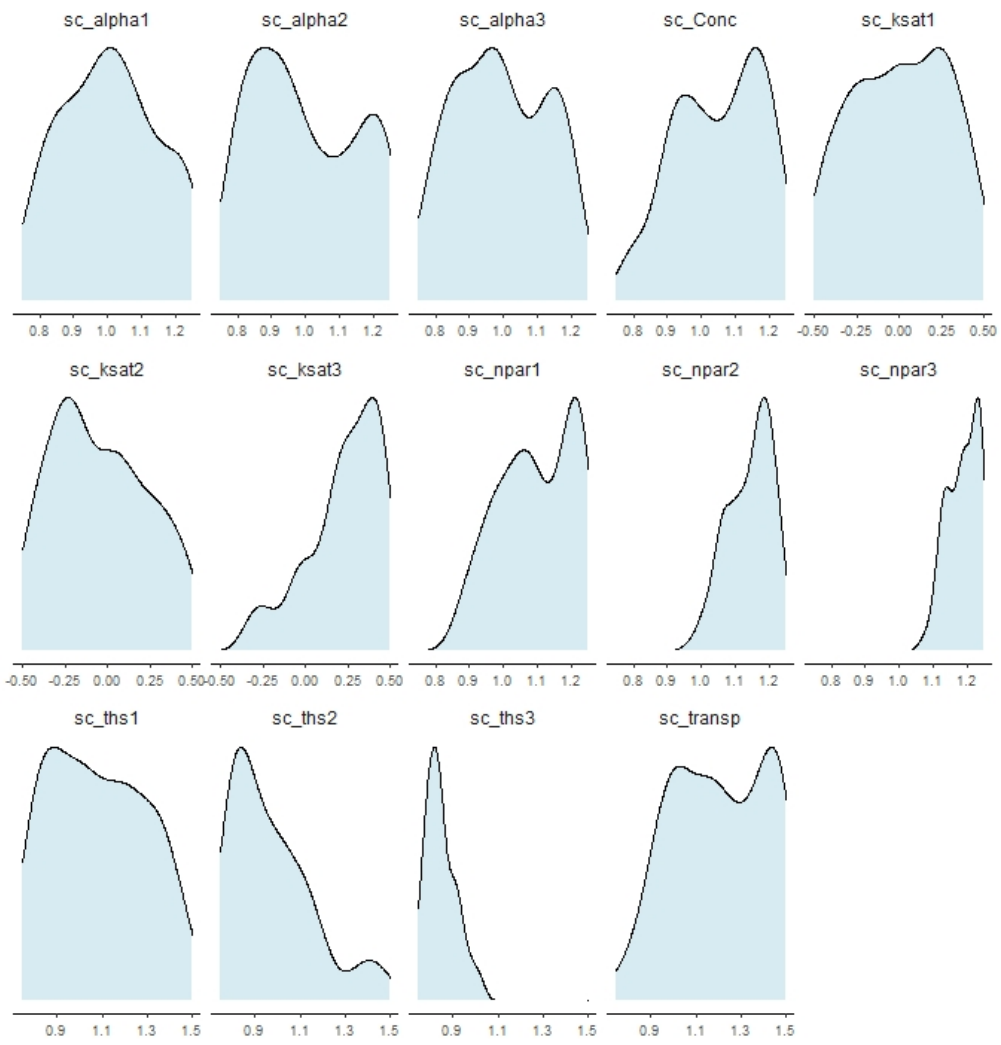

Fig. S5: posterior density distributions of the scaling factors used in the calibration of model WL2. Numbers indicate the individual model layers. Range of x-axes corresponds to prior distribution.

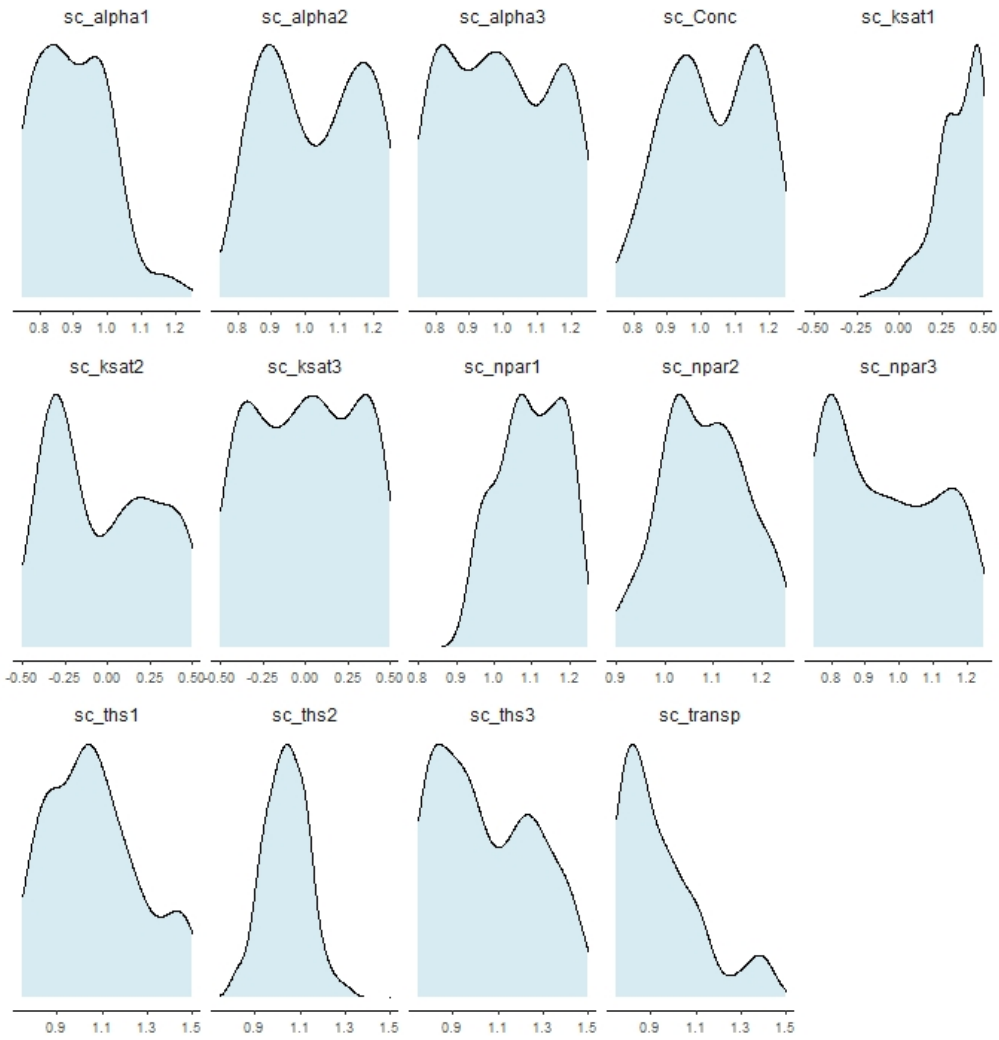

Fig. S6: posterior density distributions of the scaling factors used in the calibration of model WL3. Numbers indicate the individual model layers. Range of x-axes corresponds to prior distribution.