SUPPLEMENT

Table S1:. Range of variations and prior uncertainty (in parenthesis) of the optimised parameters.

Parameter	Plant functional type						
	Trop EBF	Temp ENF	Temp EBF	Temp DBF	Bor ENF	Bor DBF	C3 grass
Photosynthesis							
V_{cmax}	35 – 95 (24)	19 – 51 (12.8)	25 – 65 (16)	30 – 80 (20)	19 – 51 (12.8)	25 – 65 (16)	38 – 102 (25.6)
$G_{s,slope}$	6 – 12 (2.4)	6 – 12 (2.4)	6 – 12 (2.4)	6 – 12 (2.4)	6 – 12 (2.4)	6 – 12 (2.4)	6 – 12 (2.4)
c_{Topt}	29 – 45 (6.4)	17 – 33 (6.4)	24 – 40 (6.4)	18 – 34 (6.4)	17 – 33 (6.4)	17 – 33 (6.4)	19 – 35 (6.4)
c_{Tmin}	-3 – 7 (4)	-9 – 1 (4)	-8 – 2 (4)	-7 – 3 (4)	-9 – 1 (4)	-9 – 1 (4)	-8.25 – 1.75 (4)
c_{Tmax}	50 – 60 (4)	33 – 43 (4)	43 – 53 (4)	33 – 43 (4)	33 – 43 (4)	33 – 43 (4)	36 – 46 (4)
Soil water availability							
$F_{stressh}$	2 – 10 (3.2)	2 – 10 (3.2)	2 – 10 (3.2)	2 – 10 (3.2)	2 – 10 (3.2)	2 – 10 (3.2)	2 – 10 (3.2)
K_{wroot}	0.2 – 3 (1.12)	0.25 – 4 (1.5)	0.2 – 3 (1.12)	0.2 – 3 (1.12)	0.25 – 4 (1.5)	0.25 – 4 (1.5)	1 – 10 (3.6)
Phenology							
$K_{pheno,crit}$	0.7 – 1.8 (0.44)	0.7 – 1.8 (0.44)	0.7 – 1.8 (0.44)	0.7 – 1.8 (0.44)	0.7 – 1.8 (0.44)	0.7 – 1.8 (0.44)	0.7 – 1.8 (0.44)
C_{Tsen}	—	—	—	2 – 22 (8)	—	-3 – 17 (8)	—
LAI_{max}	4 – 10 (2.4)	3 – 8 (2)	3 – 8 (2)	3 – 8 (2)	2.5 – 6.5 (1.6)	2.5 – 6.5 (1.6)	1.5 – 3.5 (0.8)
SLA	0.007 – 0.03 (0.0092)	0.004 – 0.02 (0.0064)	0.01 – 0.04 (0.012)	0.013 – 0.05 (0.0148)	0.004 – 0.02 (0.0064)	0.013 – 0.05 (0.0148)	0.013 – 0.05 (0.0148)
L_{age_crit}	490 – 970 (192)	610 – 1210 (240)	490 – 970 (192)	90 – 240 (60)	610 – 1210 (240)	75 – 240 (66)	30 – 180 (60)
$K_{LAIhappy}$	0.35 – 0.7 (0.14)	0.35 – 0.7 (0.14)	0.35 – 0.7 (0.14)	0.35 – 0.7 (0.14)	0.35 – 0.7 (0.14)	0.35 – 0.7 (0.14)	0.35 – 0.7 (0.14)
$\tau_{leafinit}$	5 – 30 (10)	5 – 30 (10)	5 – 30 (10)	5 – 30 (10)	5 – 30 (10)	5 – 30 (10)	5 – 30 (10)
Respirations							
K_{soilC}	0.5 – 2 (0.6)						
Q_{10}	1 – 3 (0.8)						
MR_{offset}	0.5 – 2 (0.6)						
MR_{slope}	0.04 – 0.2 (0.064)	0.08 – 0.24 (0.064)	0.08 – 0.24 (0.064)	0.08 – 0.24 (0.064)	0.08 – 0.24 (0.064)	0.08 – 0.24 (0.064)	0.08 – 0.24 (0.064)
K_{GR}	0.2 – 0.36 (0.064)	0.2 – 0.36 (0.064)	0.2 – 0.36 (0.064)	0.2 – 0.36 (0.064)	0.2 – 0.36 (0.064)	0.2 – 0.36 (0.064)	0.2 – 0.36 (0.064)

Respirations responses on water availability	
HR_{Ha}	-1.4 – -0.8 (0.24)
HR_{Hb}	2.1 – 2.7 (0.24)
HR_{Hc}	-0.59 – 0.01 (0.24)
HR_{Hmin}	0.1 – 0.6 (0.2)
Z_{decomp}	0.1 – 1.5 (0.56)
Z_{crit_litter}	0.02 – 0.5 (0.192)
Energy balance	
K_{z0}	0.02 – 0.1 (0.032)
K_{albedo_veg}	0.8 – 1.2 (0.16)
K_{rsoil}	1.75 – 6.6 (1.94)

Table S2: Description of the FLUXNET sites used in the study.

PFT	Site	Latitude	Longitude	Data period	Reference
TropEBF	BR-Ban	-9.824	-50.159	2004-2005	Da Rocha et al., 2009
	BR-Cax	-1.72	-51.459	2000-2002	Carswell et al., 2002
	BR-Ji2	-10.083	-61.931	2000-2002	Von Randow et al., 2004
	BR-Sa3	-3.018	-54.971	2001-2002	Goulden et al., 2004
	ID-Pag	2.345	114.036	2002-2003	Hirano et al., 2007
TempENF	CA-Ca3	49.535	-124.9	2002	Jassal et al., 2008
	CA-TP4	42.71	-80.357	2004	Arain and Restrepo-Coupe, 2005
	DE-Bay	50.142	11.867	1998-1999	Staudt and Foken, 2007
	DE-Tha	50.964	13.567	1997-2003	Grünwald and Bernhofer, 2007
	DE-Wet	50.453	11.458	2002-2006	Rebmann et al., 2010
	FR-LBr	44.717	-0.769	2003-2006	Berbigier et al., 2001
	IT-Lav	45.955	11.281	2004	Marcolla et al., 2003
	IT-Ren	46.588	11.435	2002	Montagnani et al., 2009
	IT-SRo	43.728	10.284	2002-2004	Chiese et al., 2005
	NL-Loo	52.168	5.744	2001-2002	Dolman et al., 2002
	SE-Nor	60.086	17.48	1996-1997	Lagergren et al., 2008
	SE-Sk1	60.125	17.918	2005	Gioli et al., 2004
	SE-Sk2	60.13	17.84	2005	
	UK-Gri	56.607	-3.798	2000-2001	Clement et al., 2012
	US-Ho1	45.204	-68.74	2003-2004	Hollinger et al., 2004
	US-Ho2	45.209	-68.747	1999-2004	Davidson et al., 2006
	US-Me2	44.452	-121.557	2004-2005	Anthoni et al., 2002
	US-Me4	44.499	-121.622	2000	Anthoni et al., 2002
	US-NC2	35.803	-76.668	2005-2006	Noormets et al., 2010
	US-Wrc	45.82	-121.952	1999-2002	Falk et al., 2008
TempEBF	AU-Tum	-35.656	148.152	2001-2003	Leuning et al., 2005
	AU-Wac	-37.429	145.187	2006	Kilinc et al., 2013
TempDBF	DE-Hai	51.079	10.452	2000-2006	Mund et al. 2010
	FR-Fon	48.476	2.78	2006	Michelot et al., 2011
	FR-Hes	48.674	7.065	2001-2003	Granier et al., 2008
	JP-Tak	36.146	137.423	1999-2004	Ito et al., 2006
	UK-Ham	51.121	-0.861	2004-2005	Wilkinson et al., 2012
	US-Bar	44.065	-71.288	2004-2005	Jenkins et al., 2007
	US-Ha1	42.538	-72.172	2003-2006	Urbansky et al., 2007
	US-LPH	42.542	-72.185	2003-2004	Hadley et al., 2008
	US-MOz	38.744	-92.2	2005-2006	Gu et al., 2012
	US-UMB	45.56	-84.714	2000-2003	Nave et al., 2011
	US-WCr	45.806	-90.08	1999-2004	Cook et al., 2004

BorENF	CA-Man	55.88	-98.481	1998-2003	Dunn et al., 2007
	CA-NS1	55.879	-98.484	2003-2004	Goulden et al., 2006
	CA-NS2	55.906	-98.525	2002-2004	Goulden et al., 2006
	CA-NS3	55.912	-98.382	2002-2004	Goulden et al., 2006
	CA-Obs	53.987	-105.118	2000-2005	Krishnan et al., 2008
	CA-Ojp	53.916	-104.692	2000-2005	Howard et al., 2004
	CA-Qfo	49.693	-74.342	2004-2006	Bergeron et al., 2007
	CA-SJ3	53.876	-104.645	2005	Zha et al., 2009
	FI-Hyy	61.847	24.295	1997-2006	Suni et al., 2003
	FI-Sod	67.362	26.638	2001-2006	Sánchez et al., 2009
	SE-Fla	64.113	19.457	2001-2002	Lindroth et al., 2008
	US-Bn1	63.92	-145.378	2003	Liu et al., 2005
	US-NR1	40.033	-105.546	2002-2003	Sacks et al., 2006
BorDBF	CA-Oas	53.629	-106.198	2001-2004	Black et al., 2000
	SE-Abi	68.362	18.795	2005	Christensen et al., 2007
	US-Bn2	63.92	-145.378	2003	Liu et al., 2005
C3grass	CA-Let	49.709	-112.94	1999-2005	Flanagan and Adkinson, 2011
	CA-NS6	55.917	-98.964	2002-2004	Goulden et al., 2006
	CA-NS7	56.636	-99.948	2003-2004	Goulden et al., 2006
	CN-HaM	37.37	101.18	2002-2003	Kato et al., 2006
	DE-Meh	51.275	10.656	2004-2005	Don et al., 2009
	ES-LMa	39.942	-5.773	2004-2005	
	ES-VDA	42.152	1.449	2004	Gilmanov et al., 2007
	HU-Bug	46.691	19.601	2003-2006	Nagy et al., 2007
	HU-Mat	47.847	19.726	2004-2006	Pintér et al., 2008
	IE-Dri	51.987	-8.752	2003-2004	Peichl et al., 2011
	IT-Amp	41.904	13.605	2005	Gilmanov et al., 2007
	IT-Mal	46.117	11.703	2003-2004	Gilmanov et al., 2007
	IT-MBo	46.016	11.047	2004-2006	Gianelle et al., 2009
	NL-Ca1	51.971	4.927	2003-2004	Jacobs et al., 2007
	NL-Hor	52.029	5.068	2004-2006	Hendriks et al., 2007
	SE-Deg	64.183	19.55	2001-2005	Sagerfors et al., 2008
	US-ARM	36.605	-97.488	2003-2005	Fischer et al., 2007
	US-Aud	31.591	-110.51	2005	Wilson and Meyers, 2007
	US-Bkg	44.345	-96.836	2005-2006	Gilmanov et al., 2010
	US-Bn3	63.923	-145.744	2003	Liu et al., 2005
	US-Goo	34.25	-89.97	2004	Wilson and Meyers, 2007
	US-IB2	41.841	-88.241	2006	Allinson et al. 2005
	US-Ivo	68.487	-155.75	2004-2005	Oechel et al., 2000
	US-Var	38.413	-120.951	2002	Ma et al., 2007

Table S3: Prior and posterior model-data RMSD based on the daily NEE time series at each site ($gC/m^2/day$), for different optimisation methods. For the posterior RMSD, three values are given: minimum-median-maximum RMSD obtained from a set of 16 independent optimisation tests using random first guess parameters. At the end of each block of PFT sites the average value across the sites is also given.

Site	Prior	Post S_{BFGS}	Post $S_{Genetic}$	Post M_{BFGS}	Post $M_{Genetic}$
PFT2					
BR-Ban	3.58	2.25-2.68-3.86	1.87-2.00-2.17	2.49-3.03-3.51	2.35-2.51-2.69
BR-Cax	3.02	1.00-1.10-3.53	0.95-1.04-1.11	1.65-2.03-2.79	1.50-1.63-2.05
BR-Ji2	2	0.63-0.70-1.63	0.63-0.79-0.92	0.87-1.10-1.54	0.71-0.85-1.00
BR-Sa3	2.48	1.38-1.66-2.65	1.06-1.18-1.31	1.69-2.49-3.13	1.62-1.80-2.37
ID-Pag	1.98	1.53-1.69-1.99	1.34-1.37-1.42	2.08-2.34-2.75	1.86-2.07-2.34
MEAN	2.61	1.36-1.56-2.73	1.17-1.28-1.39	1.76-2.20-2.74	1.61-1.77-2.09
PFT4					
CA-Ca3	0.78	0.58-0.68-0.80	0.51-0.61-0.67	0.85-1.13-1.25	0.79-0.89-1.02
CA-TP4	0.83	0.52-0.61-0.72	0.48-0.53-0.62	0.66-0.71-0.84	0.59-0.73-0.89
DE-Bay	0.79	0.49-0.58-0.68	0.47-0.51-0.54	0.81-0.88-1.04	0.70-0.79-0.88
DE-Tha	2.09	0.62-0.70-0.76	0.66-0.71-0.75	1.34-1.56-1.68	1.31-1.44-1.65
DE-Wet	1.16	0.76-0.84-1.00	0.78-0.82-0.88	0.98-1.03-1.11	0.93-1.01-1.12
FR-LBr	1.47	1.15-1.34-1.50	1.14-1.20-1.25	1.30-1.42-1.50	1.20-1.30-1.40
IT-Lav	4.61	0.75-0.83-0.90	0.79-0.91-1.14	3.51-3.87-4.32	3.54-3.95-4.57
IT-Ren	2.54	0.68-0.73-1.56	0.52-0.60-0.71	1.37-1.83-2.40	1.22-1.67-2.65
IT-SRo	1.29	0.54-0.67-0.93	0.58-0.63-0.74	0.96-1.13-1.26	0.74-0.89-1.07
NL-Loo	0.71	0.48-0.52-0.57	0.42-0.44-0.49	0.60-0.73-0.81	0.53-0.63-0.73
SE-Nor	1.18	0.71-0.77-0.85	0.66-0.69-0.73	0.99-1.15-1.34	0.90-1.13-1.36
SE-Sk1	1.28	0.34-0.46-0.54	0.31-0.36-0.41	1.32-1.73-2.08	1.26-1.61-1.95
SE-Sk2	1.28	0.73-0.77-0.86	0.65-0.71-0.77	0.99-1.03-1.09	0.84-0.91-1.04
UK-Gri	1.99	0.46-0.82-0.99	0.46-0.49-0.58	1.30-1.50-1.71	1.11-1.35-1.56
US-Ho1	1.21	0.43-0.55-0.66	0.51-0.55-0.61	0.55-0.71-0.82	0.46-0.56-0.75
US-Ho2	1	0.63-0.70-0.78	0.52-0.56-0.58	0.63-0.68-0.77	0.55-0.65-0.75
US-Me2	0.73	0.59-0.68-0.88	0.52-0.57-0.62	0.68-0.88-0.98	0.61-0.70-0.79
US-Me4	1.15	0.47-0.53-0.66	0.40-0.47-0.64	0.53-0.72-0.95	0.68-0.83-1.24
US-NC2	2.31	0.67-0.72-0.82	0.75-0.84-0.91	1.54-1.68-1.88	1.39-1.59-1.95
US-Wrc	1.19	0.65-0.76-1.09	0.66-0.69-0.91	1.06-1.12-1.26	0.95-1.09-1.19
MEAN	1.48	0.61-0.71-0.88	0.59-0.64-0.73	1.10-1.28-1.45	1.01-1.19-1.43
PFT5					
AU-Tum	1.22	0.79-1.08-1.44	0.81-0.83-0.86	0.81-1.03-1.28	0.83-0.88-1.02
AU-Wac	2.02	0.40-0.61-0.92	0.44-0.48-0.51	0.63-0.96-1.52	0.74-1.00-1.17
MEAN	1.62	0.59-0.84-1.18	0.62-0.65-0.68	0.72-1.00-1.40	0.79-0.94-1.09

PFT6					
DE-Hai	1.77	0.75-0.80-1.37	0.69-0.73-0.82	0.93-1.04-1.52	0.91-1.04-1.23
FR-Fon	1.37	0.57-0.63-0.81	0.43-0.56-0.64	0.72-0.94-1.13	0.76-0.88-1.08
FR-Hes	1.93	0.62-1.07-1.28	0.68-0.72-0.80	1.16-1.32-1.86	1.21-1.39-1.67
JP-Tak	1.29	0.59-0.64-0.89	0.56-0.63-0.65	0.65-0.72-0.87	0.67-0.71-0.75
UK-Ham	2.34	0.95-1.17-1.53	0.93-1.08-1.19	1.57-1.80-2.51	1.54-1.73-2.20
US-Bar	1.48	0.57-0.74-0.90	0.54-0.59-0.64	0.67-0.75-0.85	0.70-0.78-0.93
US-Ha1	1.94	0.97-1.22-1.76	0.98-1.01-1.08	1.17-1.25-1.42	1.23-1.31-1.45
US-LPH	1.98	0.90-0.99-1.22	0.82-0.85-0.89	1.10-1.23-1.36	1.17-1.25-1.37
US-MOz	1.38	0.68-0.71-0.84	0.66-0.69-0.75	0.81-0.93-1.17	0.79-0.87-1.03
US-UMB	1.19	0.56-0.67-0.79	0.53-0.64-0.69	0.69-0.75-0.96	0.66-0.73-0.84
US-WCr	1.5	1.09-1.18-1.27	1.00-1.05-1.14	1.26-1.32-1.54	1.23-1.30-1.38
MEAN	1.65	0.75-0.89-1.15	0.71-0.78-0.84	0.97-1.09-1.38	0.99-1.09-1.26
PFT7					
CA-Man	0.67	0.43-0.47-0.67	0.38-0.39-0.44	0.46-0.50-0.58	0.42-0.47-0.52
CA-NS1	0.64	0.40-0.50-0.60	0.39-0.41-0.42	0.63-0.67-0.70	0.61-0.64-0.71
CA-NS2	0.47	0.32-0.35-0.54	0.28-0.30-0.33	0.43-0.53-0.72	0.41-0.47-0.58
CA-NS3	0.91	0.58-0.67-0.75	0.42-0.47-0.51	0.66-0.75-0.82	0.58-0.69-0.89
CA-Obs	0.6	0.43-0.48-0.69	0.37-0.42-0.47	0.46-0.50-0.57	0.44-0.46-0.54
CA-Ojp	0.59	0.37-0.41-0.50	0.31-0.35-0.37	0.37-0.44-0.58	0.38-0.43-0.52
CA-Qfo	0.44	0.25-0.30-0.41	0.21-0.24-0.28	0.26-0.33-0.45	0.25-0.28-0.33
CA-SJ3	0.51	0.16-0.19-0.31	0.15-0.16-0.19	0.23-0.32-0.42	0.29-0.33-0.53
FI-Hyy	0.65	0.40-0.50-0.56	0.41-0.42-0.43	0.51-0.60-0.72	0.46-0.53-0.65
FI-Sod	0.91	0.42-0.47-0.61	0.36-0.41-0.46	0.58-0.65-0.81	0.60-0.67-0.81
SE-Fla	0.69	0.43-0.48-0.58	0.37-0.41-0.44	0.47-0.54-0.62	0.47-0.51-0.59
US-Bn1	1.05	0.53-0.62-0.75	0.53-0.57-0.61	0.64-0.79-0.89	0.63-0.77-0.84
US-NR1	0.54	0.43-0.51-0.78	0.34-0.41-0.49	0.51-0.60-0.70	0.53-0.59-0.66
MEAN	0.67	0.40-0.46-0.60	0.35-0.38-0.42	0.48-0.56-0.66	0.47-0.53-0.63
PFT8					
CA-Oas	1.87	1.12-1.62-1.86	0.92-1.03-1.15	1.15-1.48-1.68	1.09-1.16-1.35
SE-Abi	1.48	0.64-0.67-0.73	0.52-0.59-0.70	0.76-0.92-1.74	0.84-0.90-1.04
US-Bn2	1.13	0.50-0.55-1.05	0.45-0.55-0.62	0.57-0.66-1.23	0.57-0.68-0.78
MEAN	1.49	0.76-0.95-1.22	0.63-0.72-0.83	0.83-1.02-1.55	0.83-0.91-1.06

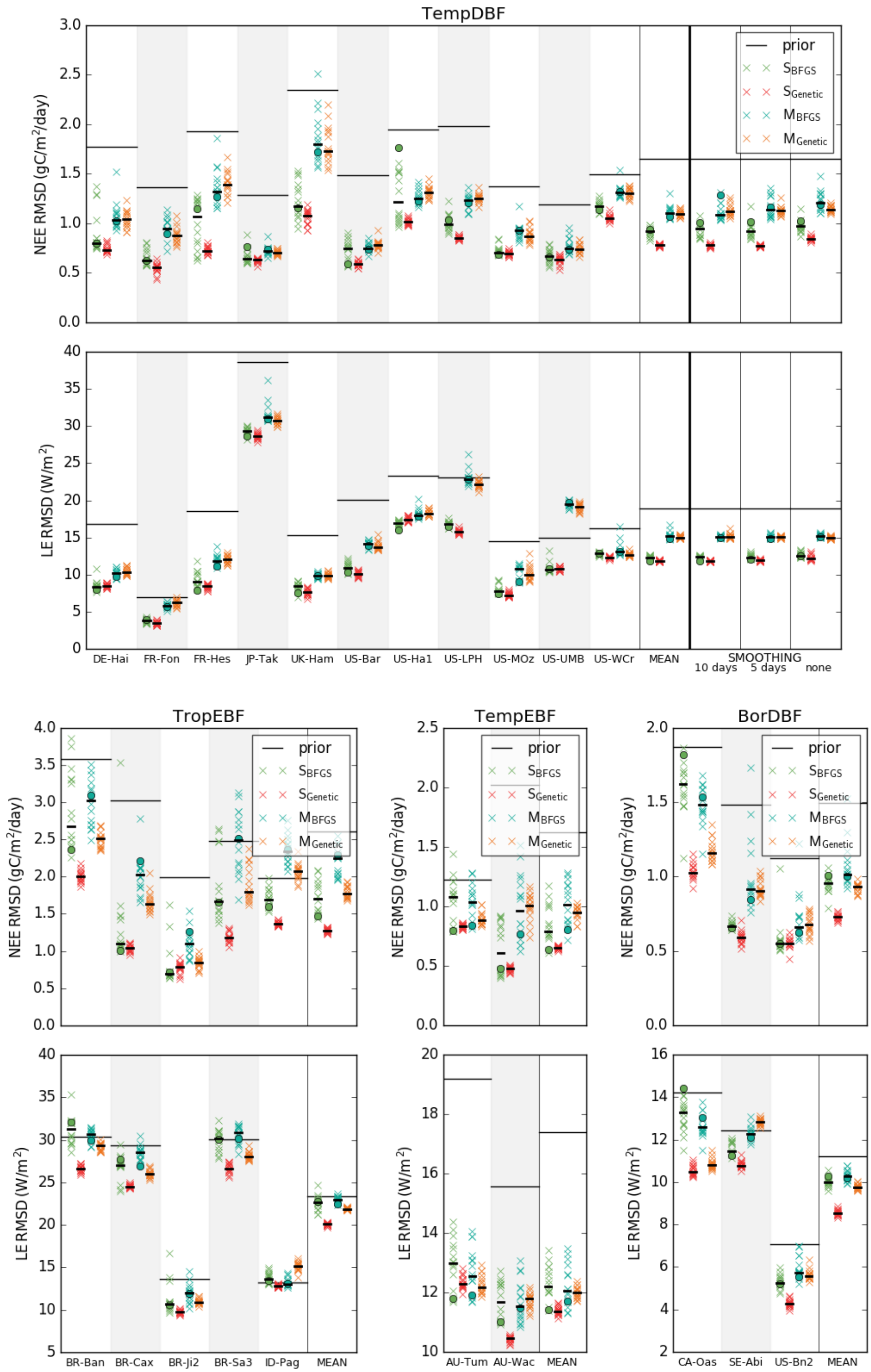
PFT10					
CA-Let	1.21	0.82-0.91-1.13	0.68-0.73-0.88	0.92-1.02-1.09	1.00-1.04-1.07
CA-NS6	0.94	0.29-0.41-0.93	0.28-0.32-0.35	0.63-0.82-0.95	0.74-0.82-0.90
CA-NS7	1.3	0.34-0.42-1.07	0.34-0.51-0.62	0.85-1.02-1.18	0.84-0.93-1.11
CN-HaM	1.35	0.34-0.47-1.21	0.26-0.38-0.44	0.48-0.71-1.03	0.46-0.64-0.72
DE-Meh	1.01	0.59-0.74-1.12	0.57-0.65-0.72	0.82-0.90-1.12	0.73-0.78-0.84
ES-LMa	0.97	0.63-0.74-0.86	0.55-0.62-0.67	0.64-0.80-1.05	0.73-0.78-0.97
ES-VDA	1.05	0.44-0.59-0.92	0.27-0.34-0.40	0.54-0.84-1.17	0.58-0.72-0.87
HU-Bug	1.03	0.84-1.01-1.30	0.74-0.79-0.84	0.85-0.98-1.18	0.80-0.87-0.95
HU-Mat	1.27	0.60-0.67-1.03	0.57-0.65-0.72	0.80-0.95-1.28	0.82-0.91-1.00
IE-Dri	1.38	0.99-1.01-1.70	0.83-0.88-0.95	1.12-1.30-1.68	1.20-1.28-1.48
IT-Amp	1.44	0.78-1.13-1.73	0.60-0.63-0.67	1.07-1.36-1.68	0.88-1.12-1.50
IT-MBo	1.42	0.73-1.12-1.93	0.66-0.78-0.93	1.27-1.55-1.79	1.13-1.26-1.39
IT-Mal	2.01	0.89-0.97-1.70	0.80-0.86-0.93	1.50-1.64-1.94	1.24-1.39-1.61
NL-Ca1	1.31	0.82-0.96-1.62	0.78-0.81-0.84	1.00-1.09-1.42	0.95-1.00-1.06
NL-Hor	1.1	0.59-0.65-0.74	0.58-0.60-0.64	0.90-0.96-1.23	0.74-0.88-1.09
SE-Deg	1.47	0.36-0.61-0.84	0.36-0.44-0.52	0.79-1.00-1.23	0.76-0.89-1.00
US-ARM	1.36	0.77-0.97-1.48	0.67-0.72-0.80	0.87-1.07-1.47	0.84-0.93-1.10
US-Aud	1.02	0.48-0.60-1.14	0.41-0.48-0.59	0.70-0.97-1.13	0.67-1.09-1.18
US-Bkg	1.16	0.58-0.75-1.52	0.58-0.63-0.68	0.74-0.89-1.08	0.72-0.84-0.95
US-Bn3	1.37	0.32-0.38-0.50	0.32-0.38-0.42	0.79-1.06-1.19	0.83-1.00-1.12
US-Goo	2.1	0.87-1.04-1.37	0.63-0.80-0.94	1.55-1.88-2.28	1.55-1.76-2.25
US-IB2	1.36	0.49-0.66-1.50	0.47-0.50-0.77	1.38-1.57-2.24	1.67-1.76-1.97
US-Ivo	1.72	0.29-0.37-0.43	0.31-0.38-0.41	1.11-1.30-1.46	1.16-1.27-1.48
US-Var	1.79	0.94-1.02-1.13	0.82-0.95-1.04	1.27-1.44-1.77	1.29-1.44-1.52
MEAN	1.34	0.62-0.76-1.20	0.55-0.62-0.70	0.94-1.13-1.40	0.93-1.06-1.21

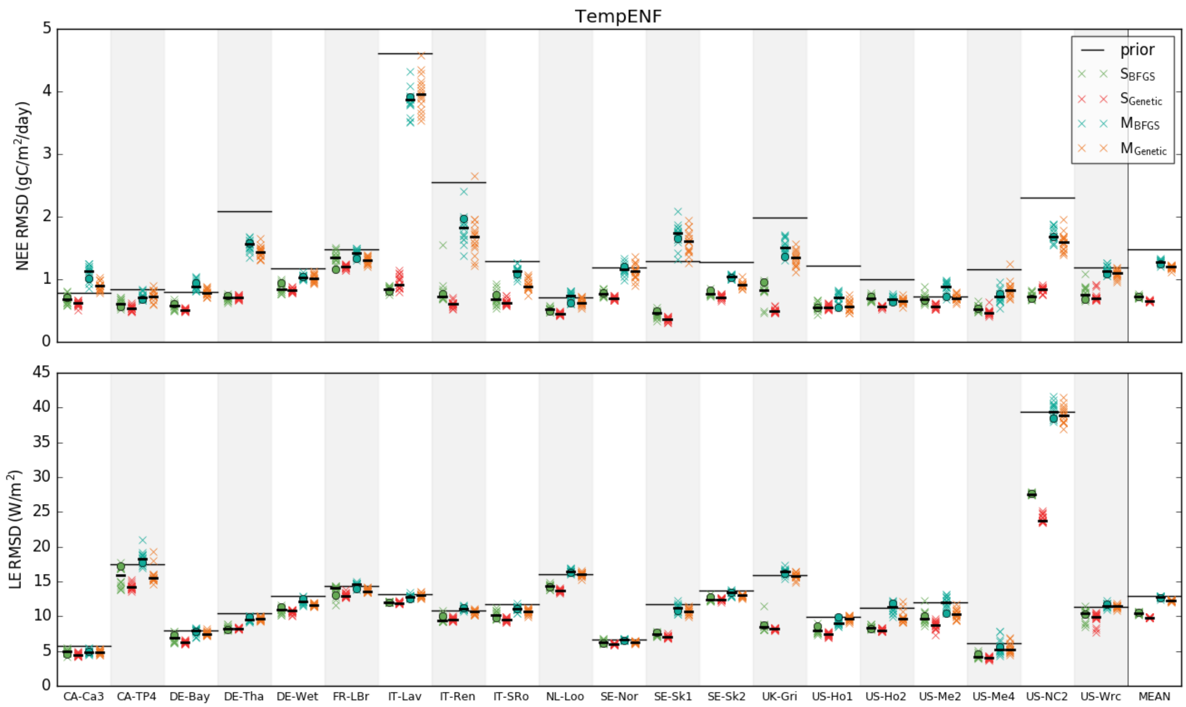
Table S4: Prior and posterior model-data RMSD for the daily LE time series at each site (W/m^2) for different optimisation methods. For the posterior RMSD three values are given: minimum-median-maximum RMSD achieved in a set of 16 independent optimisation tests. At the end of the block for each PFT the average value across the sites is also given.

Site	Prior	Post S_{BFGS}	Post $S_{Genetic}$	Post M_{BFGS}	Post $M_{Genetic}$
PFT2					
BR-Ban	30.4	28.6-31.2-35.3	25.9-26.6-27.2	29.2-30.7-31.5	28.5-29.3-30.1
BR-Cax	29.3	24.0-27.0-29.4	24.3-24.5-25.0	26.9-28.5-30.4	25.3-26.0-26.9
BR-Ji2	13.6	9.7-10.7-16.7	9.4-9.8-10.1	10.2-12.0-14.6	10.4-10.9-11.6
BR-Sa3	30	27.9-30.2-32.3	25.6-26.6-27.5	28.3-30.9-31.9	27.5-28.1-29.3
ID-Pag	13.2	13.0-13.7-15.0	12.6-12.8-13.1	12.6-13.0-14.3	13.9-15.1-16.0
MEAN	23.3	20.6-22.6-25.7	19.6-20.1-20.6	21.4-23.0-24.5	21.1-21.9-22.8
PFT4					
CA-Ca3	5.7	4.1-4.9-5.5	4.2-4.5-5.0	4.5-4.9-5.5	4.4-4.8-5.3
CA-TP4	17.4	13.9-15.9-17.7	13.6-14.2-15.2	17.0-18.3-20.9	14.7-15.5-19.3
DE-Bay	8	6.1-6.9-7.8	6.0-6.2-6.6	6.9-7.9-8.3	7.2-7.4-8.2
DE-Tha	10.4	8.0-8.2-8.8	8.1-8.2-8.4	9.1-9.5-10.1	9.3-9.6-10.1
DE-Wet	12.9	10.1-11.0-11.6	10.1-10.8-11.0	11.4-12.2-12.9	11.4-11.7-12.1
FR-LBr	14.3	11.7-14.1-14.4	12.6-12.9-13.8	13.8-14.6-15.0	13.4-13.6-14.3
IT-Lav	13.2	11.9-12.0-12.1	11.8-11.9-12.3	12.5-12.8-13.4	12.6-13.0-13.6
IT-Ren	10.8	9.3-9.3-10.8	9.3-9.6-10.0	10.7-11.1-11.6	10.2-10.7-11.1
IT-SRo	11.7	9.5-10.1-11.2	9.2-9.5-10.0	10.4-11.1-11.9	9.9-10.7-11.2
NL-Loo	16	13.9-14.3-14.8	13.3-13.7-14.1	16.1-16.4-16.9	15.3-16.1-16.5
SE-Nor	6.6	6.0-6.3-6.8	5.8-6.1-6.2	6.5-6.6-6.8	6.0-6.3-6.5
SE-Sk1	11.7	7.0-7.4-7.8	6.8-7.0-7.5	10.3-11.2-12.2	9.9-10.7-11.5
SE-Sk2	13.7	12.2-12.4-13.2	12.0-12.5-12.6	12.7-13.4-13.8	12.5-13.0-13.2
UK-Gri	15.9	8.0-8.5-11.4	8.0-8.2-8.3	15.4-16.4-17.3	14.9-15.8-16.5
US-Ho1	9.8	7.4-7.9-9.0	7.0-7.4-7.8	8.4-9.0-9.9	9.1-9.7-10.1
US-Ho2	11.3	8.1-8.4-8.9	7.8-8.0-8.3	9.9-11.4-12.2	9.1-9.6-12.1
US-Me2	12	8.6-9.7-12.2	7.3-8.7-9.6	10.5-11.9-13.2	9.4-10.3-11.7
US-Me4	6.1	3.9-4.2-5.1	3.7-4.0-4.3	4.4-5.2-7.8	4.4-5.2-6.9
US-NC2	39.3	27.4-27.6-27.9	23.4-23.8-25.2	37.9-39.4-41.7	36.9-38.9-41.4
US-Wrc	11.3	8.4-10.4-11.4	7.7-10.0-10.5	11.0-11.5-12.3	10.9-11.5-11.9
MEAN	12.9	9.8-10.5-11.4	9.4-9.9-10.3	12.0-12.7-13.7	11.6-12.2-13.2
PFT5					
AU-Tum	19.2	11.7-13.0-14.4	12.0-12.3-12.8	11.7-12.6-14.1	11.8-12.2-12.9
AU-Wac	15.6	10.9-11.7-12.7	10.2-10.5-10.6	10.8-11.5-13.1	11.2-11.8-12.2
MEAN	17.4	11.3-12.3-13.6	11.1-11.4-11.7	11.3-12.1-13.6	11.5-12.0-12.5

PFT6					
DE-Hai	16.8	7.7-8.3-10.7	8.1-8.5-9.0	9.4-10.2-11.1	9.8-10.4-11.2
FR-Fon	6.9	3.3-3.8-4.3	3.2-3.5-3.9	5.1-5.7-6.4	5.5-6.2-6.9
FR-Hes	18.6	7.9-9.1-11.8	7.7-8.4-8.8	10.9-11.8-13.8	11.2-12.0-13.0
JP-Tak	38.6	28.2-29.4-30.0	27.8-28.6-29.4	30.7-31.1-36.2	29.9-30.7-31.7
UK-Ham	15.3	7.0-8.5-9.2	6.7-7.6-8.4	9.4-9.8-10.5	9.4-9.8-10.5
US-Bar	20.1	10.1-10.9-12.2	9.5-10.1-10.6	13.3-14.2-14.8	13.3-13.7-15.4
US-Ha1	23.3	16.0-16.9-17.4	17.0-17.4-18.0	17.5-17.9-20.1	17.8-18.2-19.0
US-LPH	23	16.3-16.8-17.6	15.4-15.8-16.5	22.0-22.8-26.2	21.1-22.1-23.1
US-MOz	14.5	7.4-7.7-9.3	7.0-7.2-8.0	8.9-10.7-11.5	9.1-9.9-12.8
US-UMB	14.9	10.3-10.6-13.3	10.4-10.8-11.2	18.8-19.5-20.1	18.2-19.2-19.8
US-WCr	16.2	12.5-12.8-13.1	11.9-12.3-12.5	12.6-13.1-16.4	12.4-12.6-13.5
MEAN	18.9	11.5-12.3-13.5	11.3-11.8-12.4	14.4-15.2-17.0	14.3-15.0-16.1
PFT7					
CA-Man	12.2	9.9-10.6-12.0	10.1-10.2-10.4	10.0-10.2-11.8	10.0-10.2-10.4
CA-NS1	8.8	3.4-4.3-7.5	3.0-3.4-4.1	6.9-10.5-12.3	5.8-10.0-10.7
CA-NS2	8.3	7.2-7.6-10.4	7.1-7.3-7.5	7.4-8.1-9.4	7.3-7.9-8.2
CA-NS3	9.1	6.8-7.9-9.0	6.7-6.9-7.0	7.5-8.4-10.2	7.1-7.6-8.8
CA-Obs	11.6	8.3-8.7-10.5	8.3-8.5-8.9	8.4-8.6-10.4	8.4-8.7-9.5
CA-Ojp	14.2	7.9-9.2-11.2	8.0-8.3-9.5	9.1-10.5-11.8	10.7-11.0-12.8
CA-Qfo	11.4	9.4-9.9-10.3	9.2-9.5-9.8	9.1-9.5-9.8	9.4-9.6-10.2
CA-SJ3	18.8	11.2-13.6-15.8	9.3-10.1-10.8	14.3-15.9-17.3	15.3-16.3-19.3
FI-Hyy	7.5	6.7-7.1-7.6	6.6-6.8-7.0	6.7-7.1-7.8	6.3-6.8-7.1
FI-Sod	15.6	12.7-13.7-15.3	12.5-12.8-13.1	13.3-13.4-15.2	13.2-13.4-13.5
SE-Fla	17.9	10.4-12.6-15.0	9.9-10.5-11.5	12.1-13.4-16.2	13.0-13.5-14.7
US-Bn1	9.8	4.1-4.8-6.1	3.8-4.0-4.5	6.2-7.8-9.1	5.8-7.7-9.4
US-NR1	22.8	16.3-19.4-23.5	16.0-16.8-17.5	17.6-18.7-23.6	16.9-18.1-18.6
MEAN	12.9	8.8-9.9-11.9	8.5-8.9-9.4	9.9-10.9-12.7	9.9-10.8-11.8
PFT8					
CA-Oas	14.2	11.5-13.3-14.4	10.2-10.5-11.1	11.5-12.6-13.8	10.5-10.8-11.5
SE-Abi	12.4	11.1-11.5-12.0	10.5-10.8-11.3	11.8-12.3-13.1	12.5-12.8-13.1
US-Bn2	7.1	4.7-5.2-6.0	4.0-4.3-4.6	5.2-5.7-7.0	5.3-5.6-6.4
MEAN	11.2	9.1-10.0-10.8	8.2-8.5-9.0	9.5-10.2-11.3	9.4-9.7-10.3

PFT10					
CA-Let	12.5	11.1-12.5-13.8	9.6-10.3-11.5	11.8-12.4-13.4	11.6-12.6-13.1
CA-NS6	6.8	5.6-5.9-7.6	5.2-5.3-5.5	5.7-6.8-7.8	4.8-5.6-6.1
CA-NS7	7.2	6.7-6.9-7.6	5.1-5.4-6.5	6.4-7.0-7.9	5.5-6.2-6.8
CN-HaM	8.4	4.7-5.9-11.7	4.6-4.9-5.5	6.7-7.5-8.8	7.4-8.2-9.4
DE-Meh	6.5	6.1-6.4-7.0	5.3-5.8-6.5	6.3-6.9-8.7	6.0-6.5-7.1
ES-LMa	19	15.3-18.8-23.7	14.6-16.4-17.2	16.6-19.3-20.1	17.8-18.8-20.1
ES-VDA	12.3	7.9-9.4-11.1	7.7-7.9-8.2	10.8-11.6-12.2	10.5-11.7-12.9
HU-Bug	12.6	10.8-12.4-14.1	10.2-10.4-11.1	11.9-13.2-15.9	11.6-12.1-12.8
HU-Mat	8.1	7.5-8.1-9.5	7.0-7.6-7.9	7.7-8.3-8.9	8.1-8.6-9.0
IE-Dri	10.6	5.3-5.6-10.9	5.3-5.6-6.1	9.4-11.9-14.5	9.0-10.6-11.7
IT-Amp	17.3	15.2-17.5-21.3	13.6-14.2-14.8	16.4-18.8-20.2	16.4-17.6-19.2
IT-MBo	14	8.6-10.2-15.8	8.3-8.7-9.6	13.1-16.1-18.3	12.8-13.8-15.1
IT-Mal	10.3	7.6-8.3-11.1	7.2-7.6-8.0	9.5-10.6-11.8	9.1-9.6-10.5
NL-Ca1	13.5	6.7-8.8-14.5	6.7-7.0-7.3	12.9-14.8-16.3	12.5-13.4-14.2
NL-Hor	22	15.6-16.4-18.0	15.3-16.0-17.3	20.5-22.8-24.0	20.4-21.3-22.1
SE-Deg	12.4	9.5-10.4-12.6	9.2-9.6-9.9	11.7-12.2-12.6	11.0-11.7-12.1
US-ARM	22	15.5-16.3-18.8	15.2-15.8-16.6	19.0-20.4-21.9	18.3-20.9-22.8
US-Aud	13.6	5.7-8.4-9.4	5.1-5.5-6.8	9.3-12.2-15.3	11.5-12.7-14.5
US-Bkg	34.6	30.5-34.2-38.1	25.6-27.3-30.2	34.3-36.5-39.3	33.7-34.4-35.5
US-Bn3	13.7	5.2-5.7-5.9	4.9-5.2-5.5	9.7-11.8-13.0	9.6-11.8-13.5
US-Goo	11.3	6.7-7.2-8.4	6.5-6.7-7.5	10.5-12.5-15.0	10.7-12.4-14.3
US-IB2	12.1	5.3-6.5-11.0	5.0-5.6-6.9	10.4-13.3-15.4	12.0-13.9-15.3
US-Ivo	18.8	12.8-13.2-13.6	12.6-12.9-13.3	16.8-17.6-18.6	16.2-17.2-18.4
US-Var	13	7.3-9.1-9.9	5.0-6.5-7.2	9.9-13.3-15.6	8.7-11.9-14.4
MEAN	13.9	9.7-11.0-13.6	8.9-9.5-10.3	12.4-14.1-15.6	12.3-13.5-14.6


TempDBF
NEE RMSD (gC/m2/day)
LE RMSD (W/m2)
prior
SBFGS
SGenetic
MBFGS
MGenetic
DE-Hai FR-Fon FR-Hes JP-Tak UK-Ham US-Bar US-Ha1 US-LPH US-MOz US-UMB US-WCr MEAN
SMOOTHING
10 days 5 days none
TropEBF
BR-Ban BR-Cax BR-Ji2 BR-Sa3 ID-Pag MEAN
TempEBF
AU-Tum AU-Wac MEAN
BorDBF
CA-Oas SE-Abi US-Bn2 MEAN


TempENF
NEE RMSD (gC/m²/day)
LE RMSD (W/m²)
prior
S_BFGS
S_Genetic
M_BFGS
M_Genetic
CA-Ca3
CA-TP4
DE-Bay
DE-Tha
DE-Wet
FR-LBr
IT-Lav
IT-Ren
IT-SRo
NL-Loo
SE-Nor
SE-Sk1
SE-Sk2
UK-Gri
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US-Ho2
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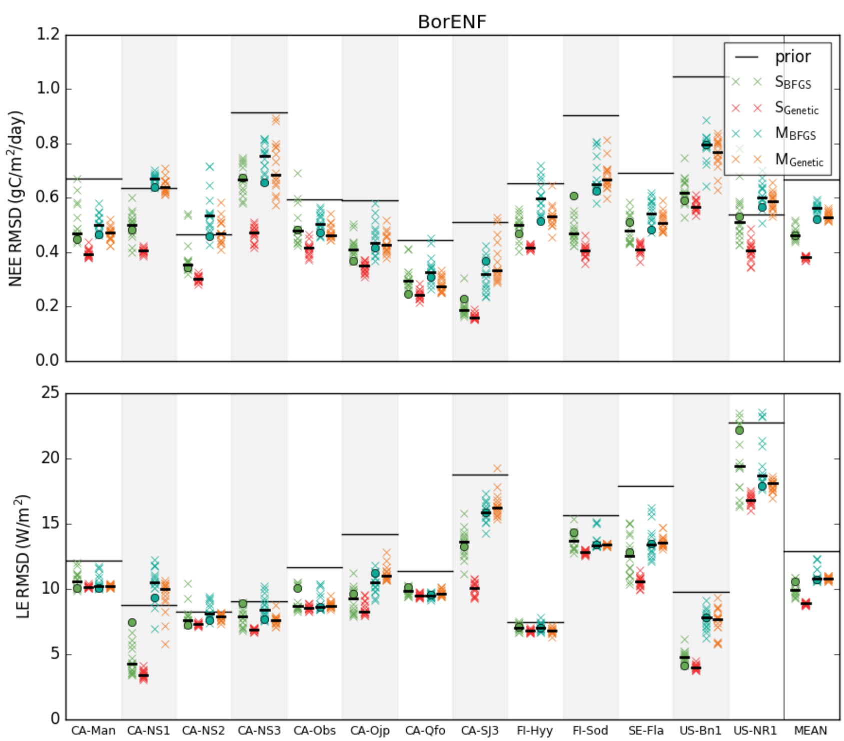
US-Me4
US-NC2
US-Wrc
MEAN


BorENF
NEE RMSD (gC/m²/day)
LE RMSD (W/m²)
prior
S_BFGS
S_Genetic
M_BFGS
M_Genetic
CA-Man
CA-NS1
CA-NS2
CA-NS3
CA-Obs
CA-Ojp
CA-Qfo
CA-SJ3
FI-Hyy
FI-Sod
SE-Fla
US-Bn1
US-NR1
MEAN

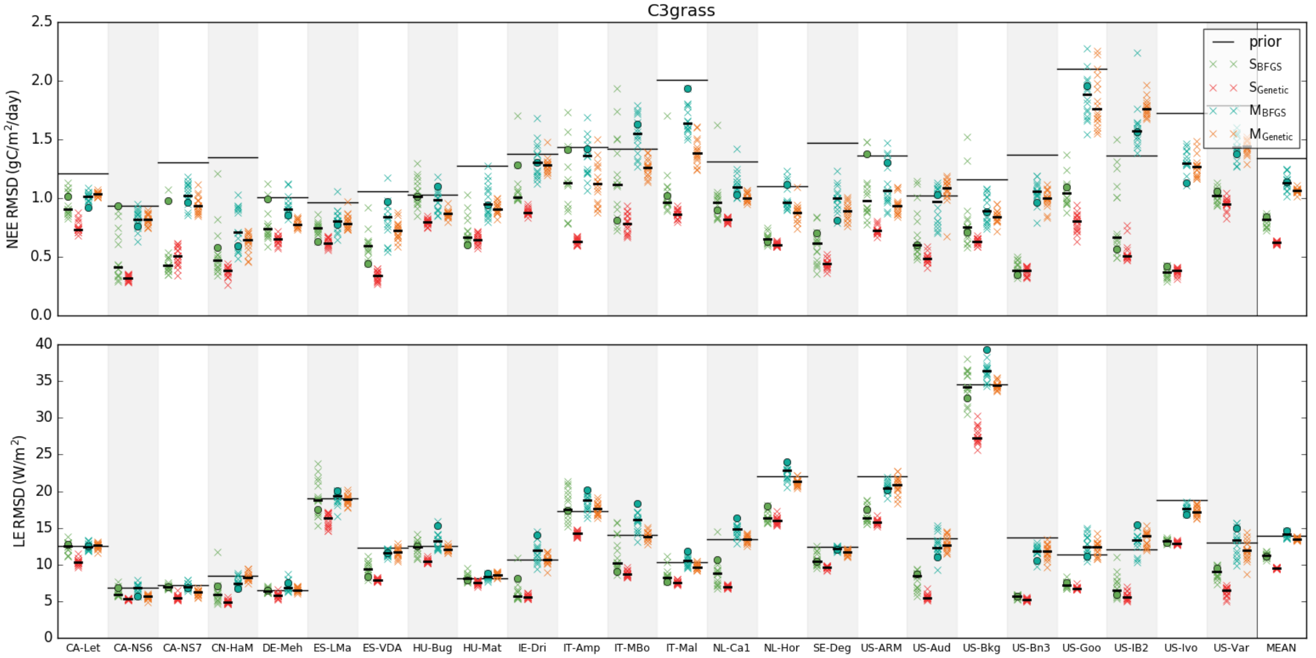


Figure S1: Model–data RMSD for the daily NEE (upper panels) and LE (lower panels) flux time series smoothed with a 15-days moving-average window obtained at different FLUXNET sites with the four optimisation schemes: single-site BFGS (green), single-site genetic (red), multi-site BFGS (blue) and multi-site genetic (orange). Each optimisation is done starting from the 16 different first-guess parameter values (shown by crosses), one of which corresponds to the standard ORCHIDEE values (shown by circles for BFGS). The median values are indicated by the short horizontal bars, the prior model–data RMSD values – by the long horizontal bars. The graphs are grouped by PFTs with the last column showing the mean values for the PFT averaged across the sites for each first-guess parameter set. The graph for TempDBF also shows the influence of data smoothing on the final results.

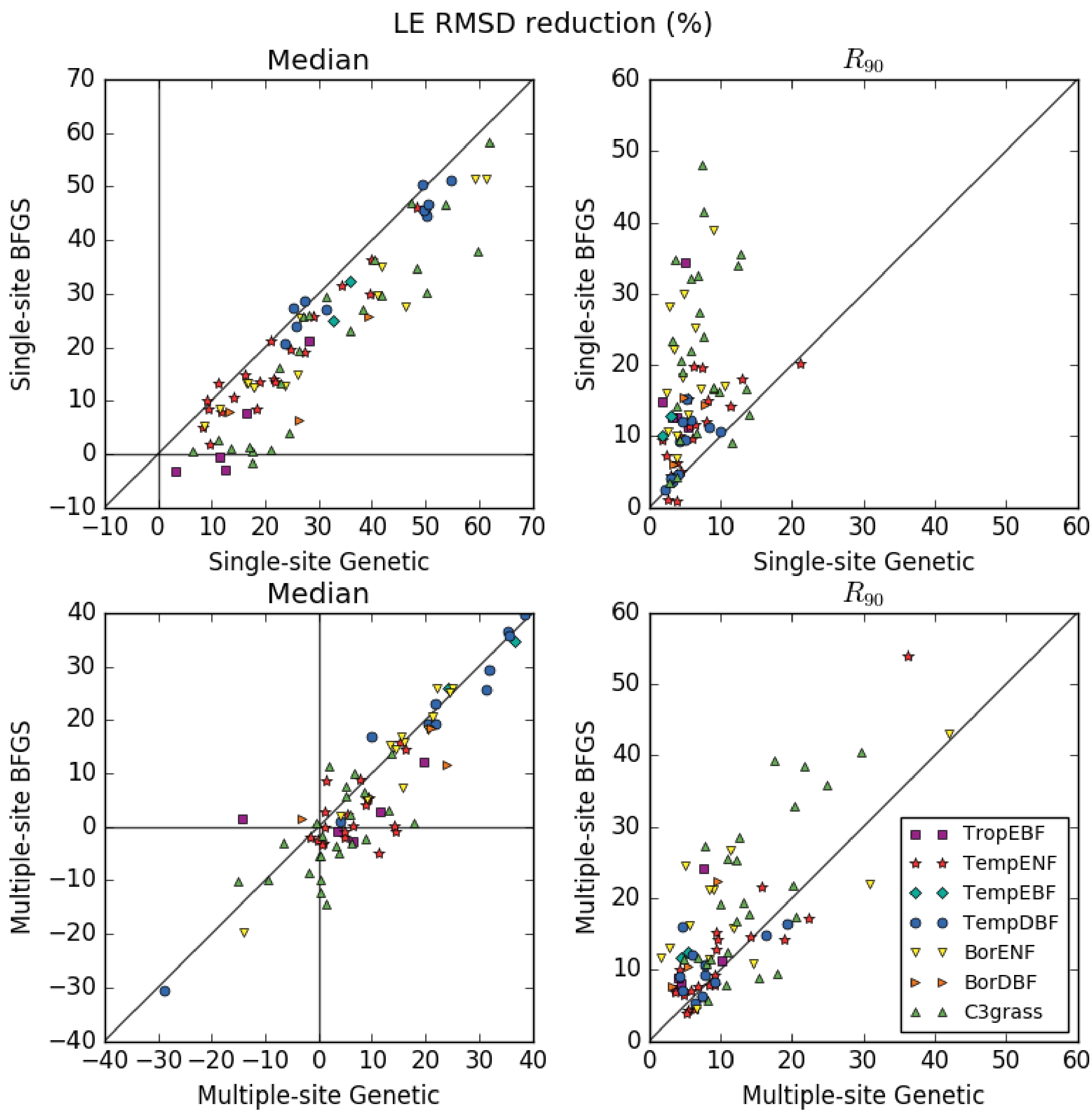


Figure S2: Comparison of the performances between the gradient-based and genetic methods in terms of model–data RMSD reduction (%) obtained for the daily LE fluxes. The left panels show the medians across the results obtained within 16 optimisation tests with random first-guess parameter values for each site; the right panels – the spreads between the 5th and 95th percentiles (R_{90}) of the same distributions.

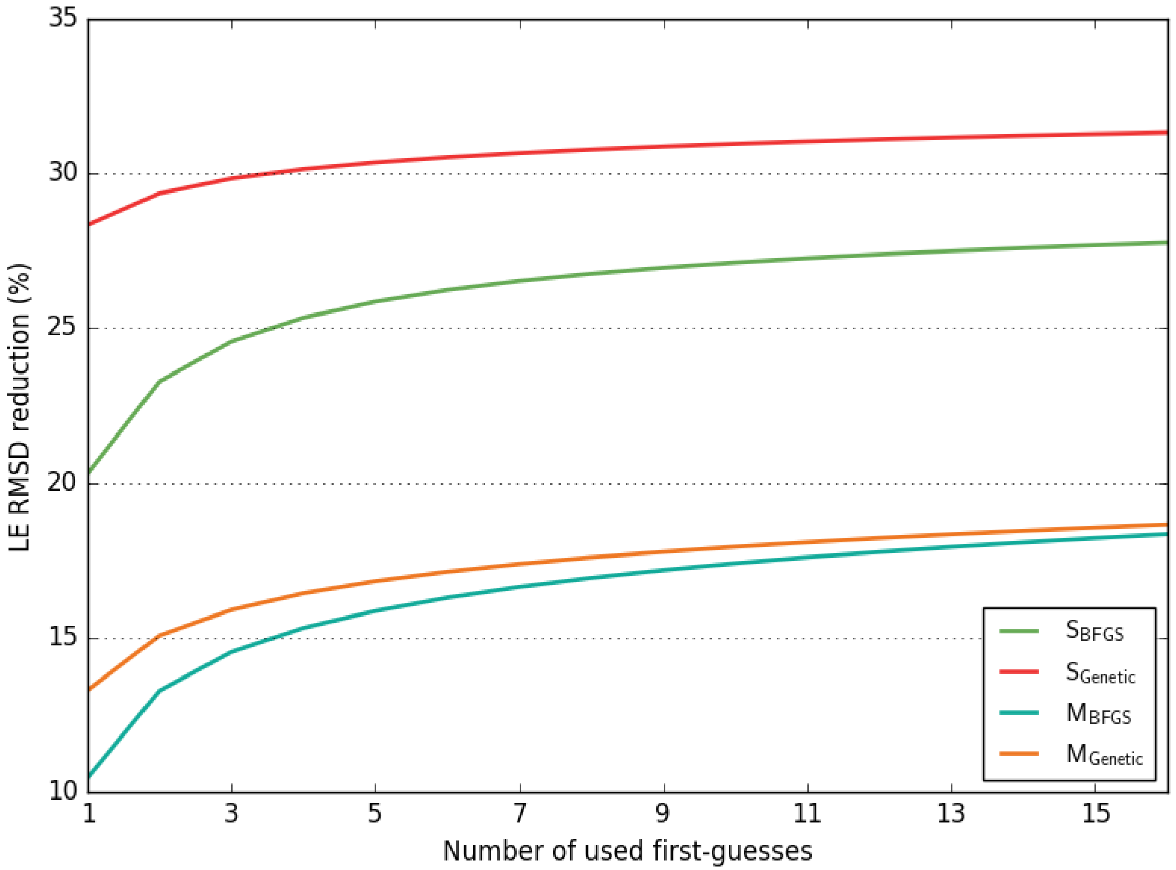
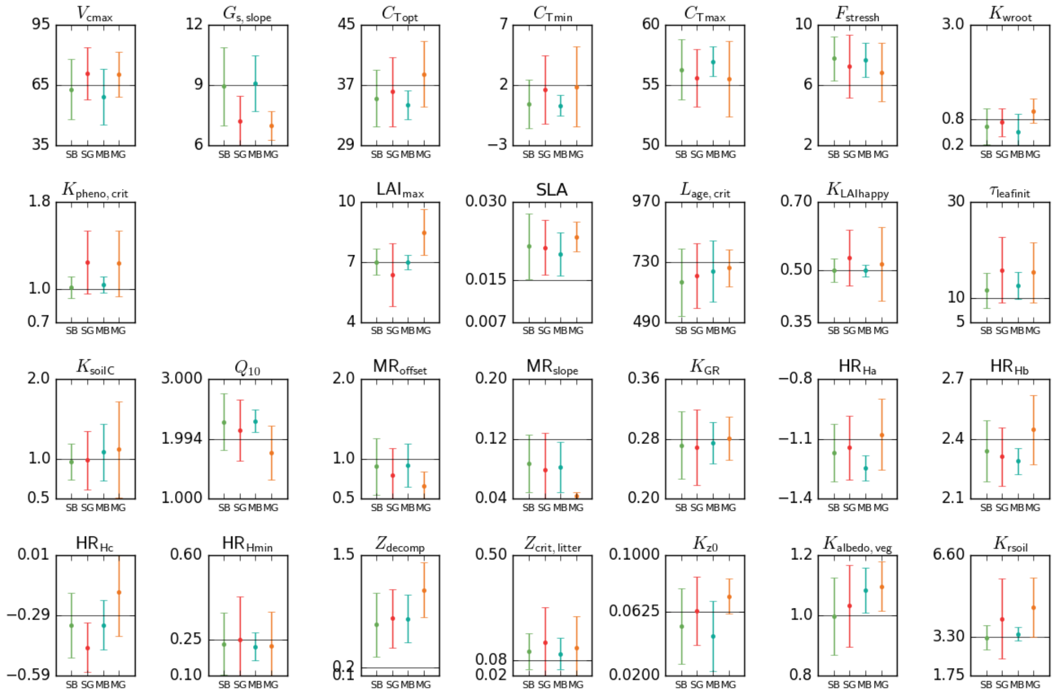
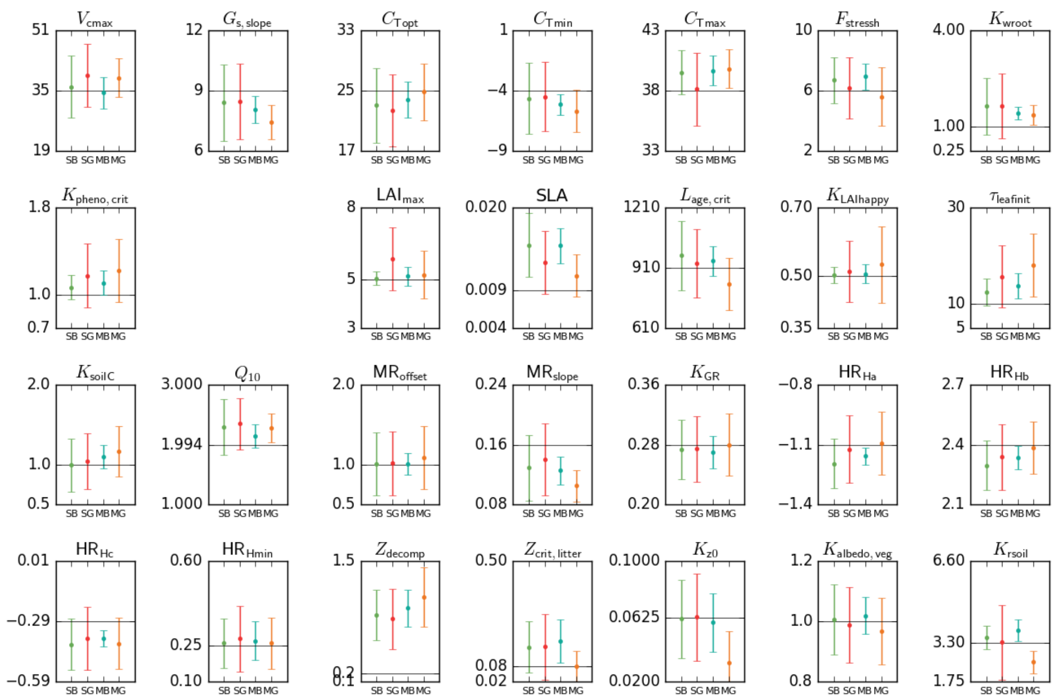


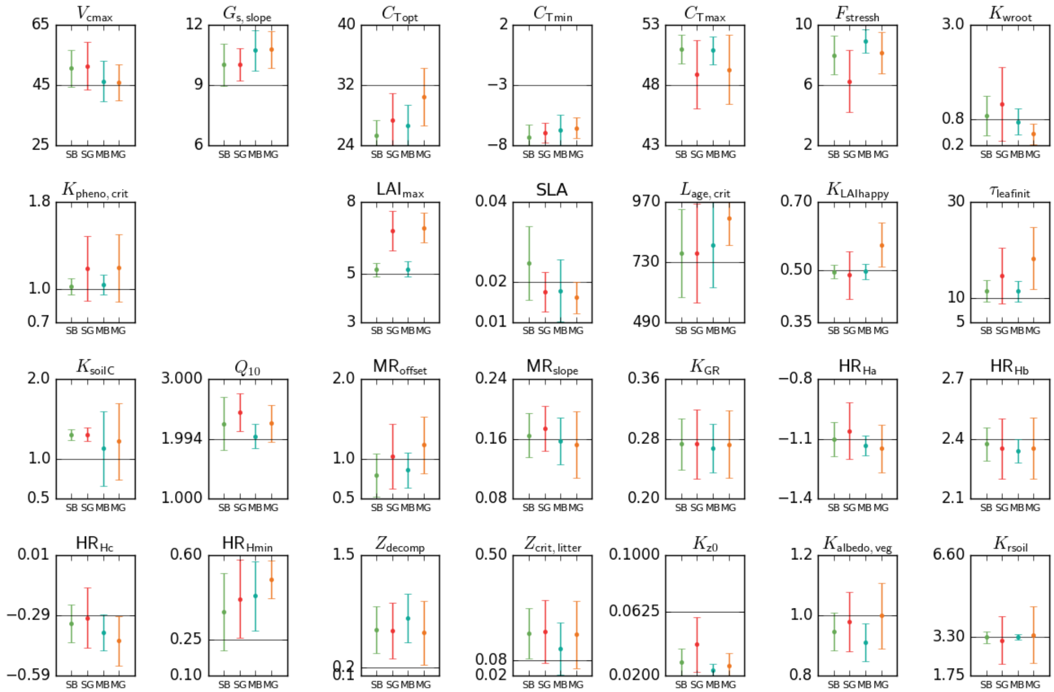
Figure S3: Model–data RMSD reduction (in %) obtained for the LE fluxes as a function of the number of runs performed with random first guess parameter values (for each configuration, S_{BFGS}, $S_{Genetic}$, M_{BFGS} and $M_{Genetic}$). For each number of first guesses (X-axis) all possible combinations across the 16 optimisation tests (i.e. 16 first-guesses) are considered and the maximum RMSD reductions are calculated; the mean of these maximums is reported on the Y-axis. The results are averaged across all sites for each configuration.



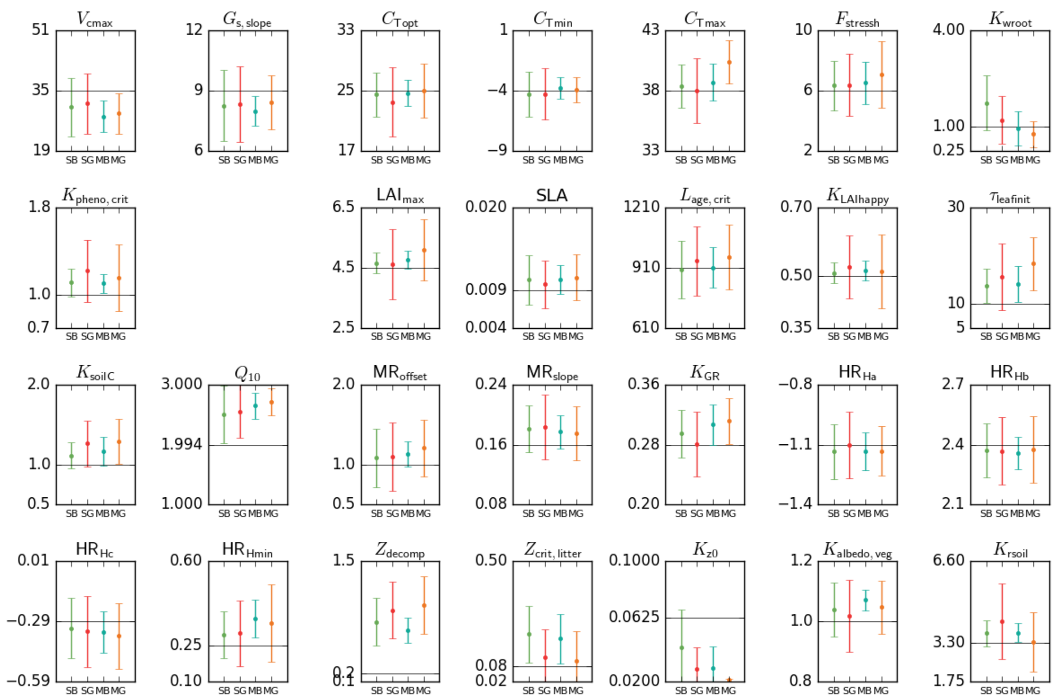
(a) Posterior parameters for TropEBF



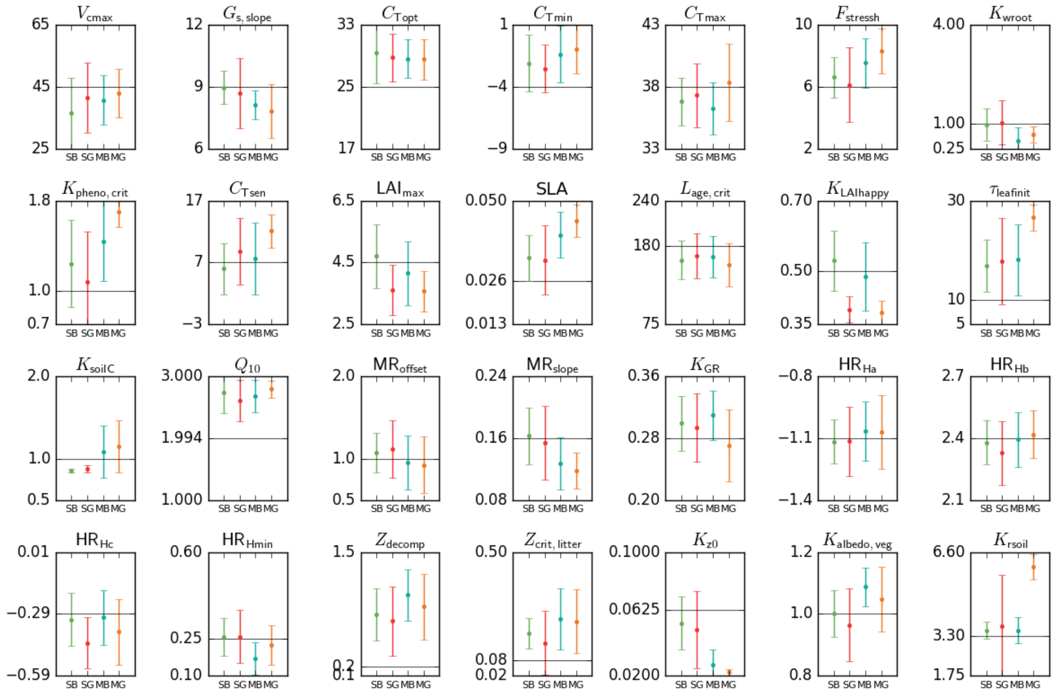
(b) Posterior parameters for TempENF



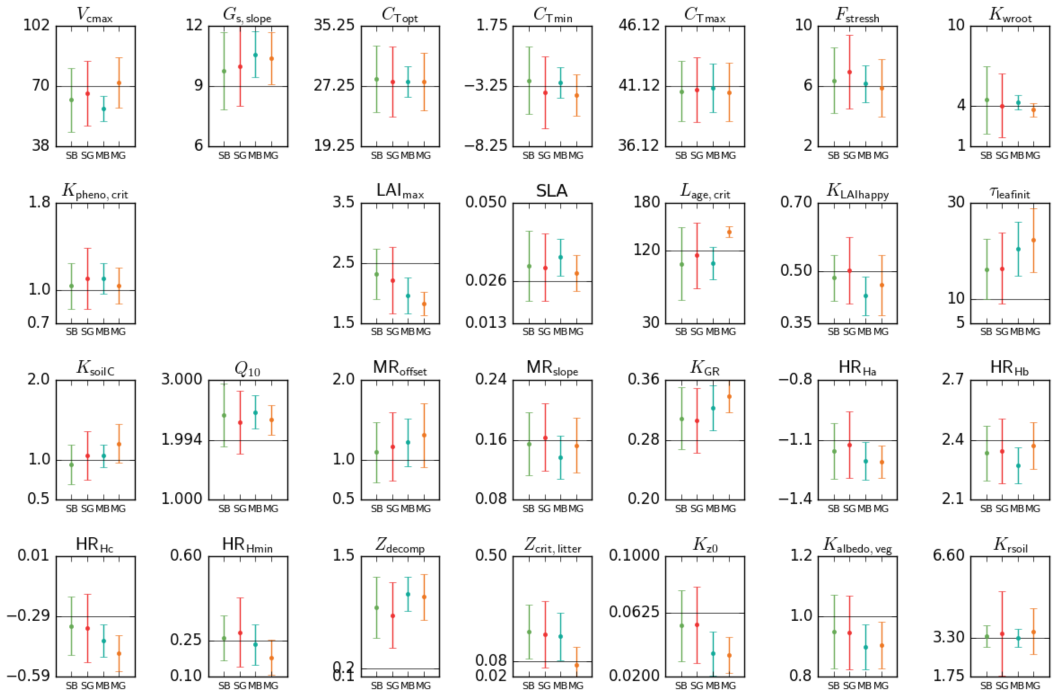
(c) Posterior parameters for TempEBF



(d) Posterior parameters for BorENF



(e) Posterior parameters for BorDBF



(f) Posterior parameters for C3grass

Figure S4: Mean posterior model parameter values for different PFTs (a-f). Results for the four optimisation methods S_{BFGS} (SB), $S_{Genetic}$ (SG), M_{BFGS} (MB) and $M_{Genetic}$ (MG) are displayed: mean value and standard deviation across 16 random first-guess tests. Grey horizontal lines represent prior values, which are equal to the default ORCHIDEE model values. The vertical axis limits represent the range of parameter variation.