

Table S1. List of all the fluxnet sites used for the analysis.

SITE_ID	LOCATION_LONG	LOCATION_LAT	Year	IGBP	Reference
AR-Vir	-56.1886	-28.2395	2009–2012	ENF	
AT-Neu	11.3175	47.1167	2007–2012	GRA	
AU-Ade	131.1178	-13.0769	2007–2009	WSA	
AU-ASM	133.249	-22.283	2010–2013	ENF	
AU-Cpr	140.5891	-34.0021	2010–2013	SAV	
AU-DaP	131.3181	-14.0633	2008–2013	GRA	
AU-DaS	131.3881	-14.1593	2008–2013	SAV	
AU-Dry	132.3706	-15.2588	2008–2013	SAV	
AU-Emr	148.4746	-23.8587	2011–2013	GRA	
AU-Fog	131.3072	-12.5452	2007–2008	WET	
AU-GWW	120.6541	-30.1913	2013–2014	SAV	
AU-RDF	132.4776	-14.5636	2011–2013	WSA	
AU-Rig	145.5759	-36.6499	2011–2013	GRA	
AU-Rob	145.6301	-17.1175	2014	EBF	
AU-Tum	148.1517	-35.6566	2007–2013	EBF	[1]
BE-Bra	4.5206	51.3092	2007–2013	MF	[1]
BE-Lon	4.7461	50.5516	2007–2014	CRO	[2]
BE-Vie	5.9981	50.3051	2007–2014	MF	[3]
CA-Qfo	-74.3421	49.6925	2007–2010	ENF	[4]
CH-Cha	8.4104	47.2102	2007–2012	GRA	
CH-Fru	8.5378	47.1158	2007–2012	GRA	[5]
CH-Oe1	7.7319	47.2858	2007–2008	GRA	[4]
CN-Cng	123.5092	44.5934	2007–2010	GRA	
CN-Du2	116.2836	42.0467	2007–2008	GRA	[2]
DE-Akm	13.6834	53.8662	2009–2014	WET	
DE-Gri	13.5125	50.9495	2007–2014	GRA	[2]
DE-Hai	10.453	51.0792	2007–2012	DBF	[1]
DE-Kli	13.5225	50.8929	2007–2014	CRO	[2]
DE-Obe	13.7196	50.7836	2008–2014	ENF	[6]
DE-RuS	6.4472	50.8659	2011–2014	CRO	
DE-Spw	14.0337	51.8923	2010–2014	WET	
DE-Tha	13.5669	50.9636	2007–2014	ENF	[1]
DK-Sor	11.6446	55.4859	2007–2012	DBF	[1]
ES-LgS	-2.9658	37.0979	2007–2009	OSH	
FI-Hyy	24.295	61.8475	2007–2014	ENF	[3]
FR-Gri	1.9519	48.8442	2007–2013	CRO	[2]
FR-Pue	3.5958	43.7414	2007–2013	MF	[1]
IT-CA1	12.0266	42.3804	2011–2013	DBF	
IT-Isp	8.6336	45.8126	2013–2014	DBF	
IT-Lav	11.2813	45.9562	2007–2012	ENF	[1]

SITE_ID	LOCATION_LONG	LOCATION_LAT	Year	IGBP	Reference
IT-Ren	11.4337	46.5869	2007–2013	ENF	[3]
IT-Tor	7.5781	45.8444	2008–2013	GRA	
MY-PSO	102.3062	2.973	2007–2009	EBF	
NL-Hor	5.0713	52.2404	2007–2011	GRA	
NL-Loo	5.7436	52.1666	2007–2013	ENF	[1]
RU-Cok	147.4943	70.8291	2007–2013	OSH	[1]
RU-Fyo	32.9221	56.4615	2007–2013	ENF	[7]
SD-Dem	30.4783	13.2829	2007–2009	SAV	
US-AR1	-99.42	36.4267	2009–2012	GRA	
US-AR2	-99.5975	36.6358	2009–2012	GRA	
US-ARM	-97.4888	36.6058	2007–2012	CRO	[8]
US-Ha1	-72.1715	42.5378	2007–2012	DBF	[9]
US-Los	-89.9792	46.0827	2007–2014	WET	[1]
US-Me6	-121.608	44.3233	2010–2012	ENF	[10]
US-MMS	-86.4131	39.3232	2007–2014	DBF	[11]
US-Ne1	-96.4766	41.1651	2007–2013	CRO	[12]
US-Ne2	-96.4701	41.1649	2007–2013	CRO	[2]
US-SRM	-110.866	31.8214	2007–2014	WSA	[13]
US-Syv	-89.3477	46.242	2007–2014	MF	[14]
US-Ton	-120.966	38.4316	2007–2014	WSA	[15]
US-Tw3	-121.647	38.1159	2013–2014	CRO	
US-Var	-120.951	38.4133	2007–2014	GRA	[14]
US-WCr	-90.0799	45.8059	2007–2014	DBF	[14]
US-Whs	-110.052	31.7438	2007–2014	OSH	[16]
US-Wkg	-109.942	31.7365	2007–2014	GRA	[16]
ZA-Kru	31.4969	-25.0197	2007–2010	SAV	[17]
ZM-Mon	23.2528	-15.4378	2007–2009	DBF	[18]

References:

1. Stoy, P. C.; Trowbridge, A. M.; Bauerle, W. L. Controls on seasonal patterns of maximum ecosystem carbon uptake and canopy-scale photosynthetic light response: contributions from both temperature and photoperiod. *Photosynth. Res.* 2014, **119**, 49–64.
2. Stoy, P. C.; Mauder, M.; Foken, T.; Marcolla, B.; Boegh, E.; Ibrom, A.; Arain, M. A.; Arneth, A.; Aurela, M.; Bernhofer, C.; Cescatti, A.; Dellwik, E.; Duce, P.; Ganelle, D.; van Gorsel, E.; Kiely, G.; Knohl, A.; Margolis, H.; McCaughey, H.; Merbold, L.; Montagnani, L.; Papale, D.; Reichstein, M.; Saunders, M.; Serrano-Ortiz, P.; Sottocornola, M.; Spano, D.; Vaccari, F.; Varlagin, A. A data-driven analysis of energy balance closure across FLUXNET research sites: The role of landscape scale heterogeneity. *Agric. For. Meteorol.* 2013, **171–172**, 137–152.
3. Sulkava, M.; Luyssaert, S.; Zaehle, S.; Papale, D. Assessing and improving the representativeness of monitoring networks: The European flux tower network example. *J. Geophys. Res.* 2011, **116**, G00J04.

4. Bonan, G. B.; Lawrence, P. J.; Oleson, K. W.; Levis, S.; Jung, M.; Reichstein, M.; Lawrence, D. M.; Swenson, S. C. Improving canopy processes in the Community Land Model version 4 (CLM4) using global flux fields empirically inferred from FLUXNET data. *J. Geophys. Res.* 2011, *116*, G02014.
5. Imer, D.; Merbold, L.; Eugster, W.; Buchmann, N. Temporal and spatial variations of soil CO₂, CH₄ and N₂O fluxes at three differently managed grasslands. *Biogeosciences* 2013, *10*, 5931–5945.
6. Jung, M.; Reichstein, M.; Bondeau, a. Towards global empirical upscaling of FLUXNET eddy covariance observations: validation of a model tree ensemble approach using a biosphere model. *Biogeosciences* 2009, *6*, 2001–2013.
7. Richardson, A. D.; Black, T. A.; Ciais, P.; Delbart, N.; Friedl, M. a; Gobron, N.; Hollinger, D. Y.; Kutsch, W. L.; Longdoz, B.; Luyssaert, S.; Migliavacca, M.; Montagnani, L.; Munger, J. W.; Moors, E.; Piao, S.; Rebmann, C.; Reichstein, M.; Saigusa, N.; Tomelleri, E.; Vargas, R.; Varlagin, A. Influence of spring and autumn phenological transitions on forest ecosystem productivity. *Philos. Trans. R. Soc. Lond. B. Biol. Sci.* 2010, *365*, 3227–3246.
8. Hilton, T. W.; Davis, K. J.; Keller, K. Evaluating terrestrial CO₂ flux diagnoses and uncertainties from a simple land surface model and its residuals. *Biogeosciences* 2014, *11*, 217–235.
9. Zhang, J.; Wu, L.; Huang, G.; Notaro, M. Relationships between large-scale circulation patterns and carbon dioxide exchange by a deciduous forest. *J. Geophys. Res.* 2011, *116*, D04102.
10. Yan, H.; Shugart, H. H. An air relative-humidity-based evapotranspiration model from eddy covariance data. *J. Geophys. Res. Atmos.* 2010, *115*.
11. Dragoni, D.; Schmid, H. P.; Wayson, C. a.; Potter, H.; Grimmond, C. S. B.; Randolph, J. C. Evidence of increased net ecosystem productivity associated with a longer vegetated season in a deciduous forest in south-central Indiana, USA. *Glob. Chang. Biol.* 2011, *17*, 886–897.
12. Gilmanov, T. G.; Aires, L.; Barcza, Z.; Baron, V. S.; Belelli, L.; Beringer, J.; Billesbach, D.; Bonal, D.; Bradford, J.; Ceschia, E.; Cook, D.; Corradi, C.; Frank, a.; Gianelle, D.; Gimeno, C.; Gruenwald, T.; Guo, H.; Hanan, N.; Haszpra, L.; Heilman, J.; Jacobs, a.; Jones, M. B.; Johnson, D. a.; Kiely, G.; Li, S.; Magliulo, V.; Moors, E.; Nagy, Z.; Nasirov, M.; Owensby, C.; Pinter, K.; Pio, C.; Reichstein, M.; Sanz, M. J.; Scott, R.; Soussana, J. F.; Stoy, P. C.; Svejcar, T.; Tuba, Z.; Zhou, G. Productivity, Respiration, and Light-Response Parameters of World Grassland and Agroecosystems Derived From Flux-Tower Measurements. *Rangel. Ecol. Manag.* 2010, *63*, 16–39.
13. Barron-Gafford, G. a.; Scott, R. L.; Jenerette, G. D.; Huxman, T. E. The relative controls of temperature, soil moisture, and plant functional group on soil CO₂ efflux at diel, seasonal, and annual scales. *J. Geophys. Res.* 2011, *116*, G01023.
14. Horn, J. E.; Schulz, K. Identification of a general light use efficiency model for gross primary production. *Biogeosciences* 2011, *8*, 999–1021.
15. Lasslop, G.; Reichstein, M.; Papale, D.; Richardson, A. D.; Arneth, A.; Barr, A.; Stoy, P.; Wohlfahrt, G. Separation of net ecosystem exchange into assimilation and respiration using a light response curve approach: critical issues and global evaluation. *Glob. Chang. Biol.* 2010, *16*, 187–208.
16. Scott, R. L. Using watershed water balance to evaluate the accuracy of eddy covariance evaporation measurements for three semiarid ecosystems. *Agric. For. Meteorol.* 2010, *150*, 219–225.
17. Yi, C.; Ricciuto, D.; Li, R.; Wolbeck, J.; et.al. Climate control of terrestrial carbon exchange across

biomes and continents. *Environ. Res. Lett.* 2010, 5, 34007.

18. Ciais, P.; Bombelli, A.; Williams, M.; Piao, S. L.; Chave, J.; Ryan, C. M.; Henry, M.; Brender, P.; Valentini, R. The carbon balance of Africa: synthesis of recent research studies. *Philos. Trans. R. Soc. A Math. Phys. Eng. Sci.* 2011, 369, 2038–2057.