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Simulating carbon and water fluxes using a coupled process-based terrestrial biosphere model and joint assimilation of leaf area index and surface soil moisture

Sinan Li et al.

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Supplement Materials :

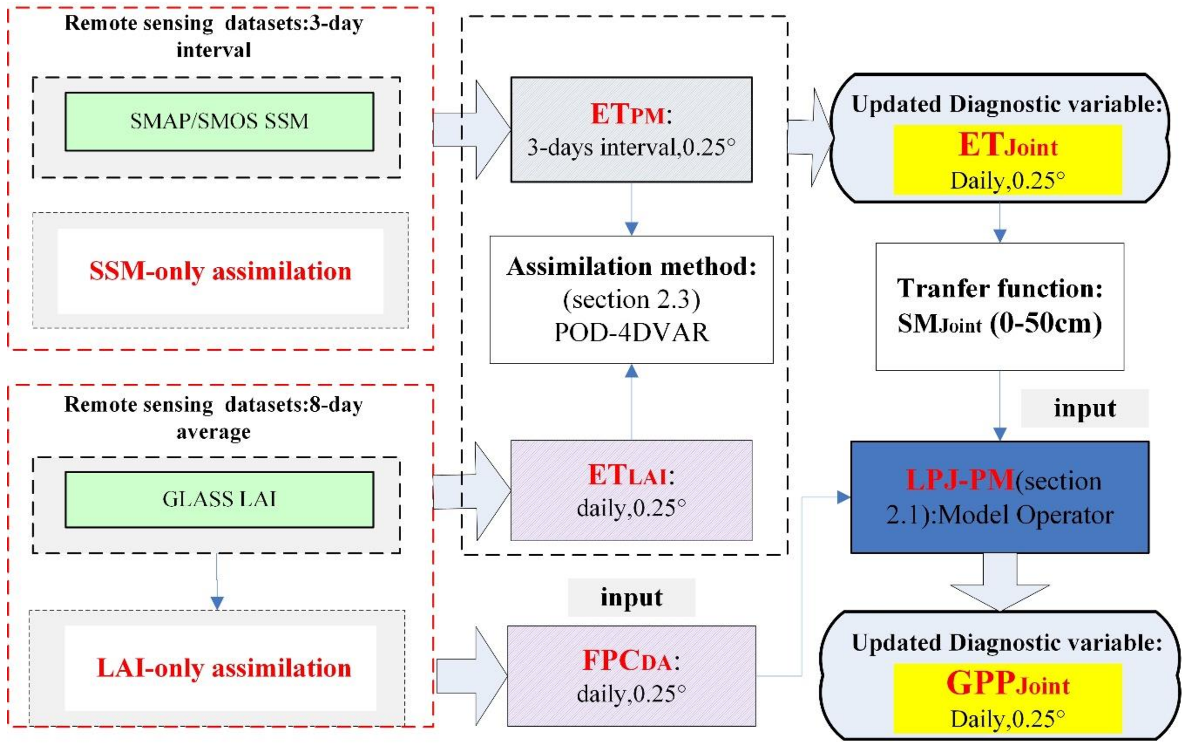

Figure S1. Flowchart of LPJ-VSJA assimilation scheme 3: joint assimilation of LAI and ET.

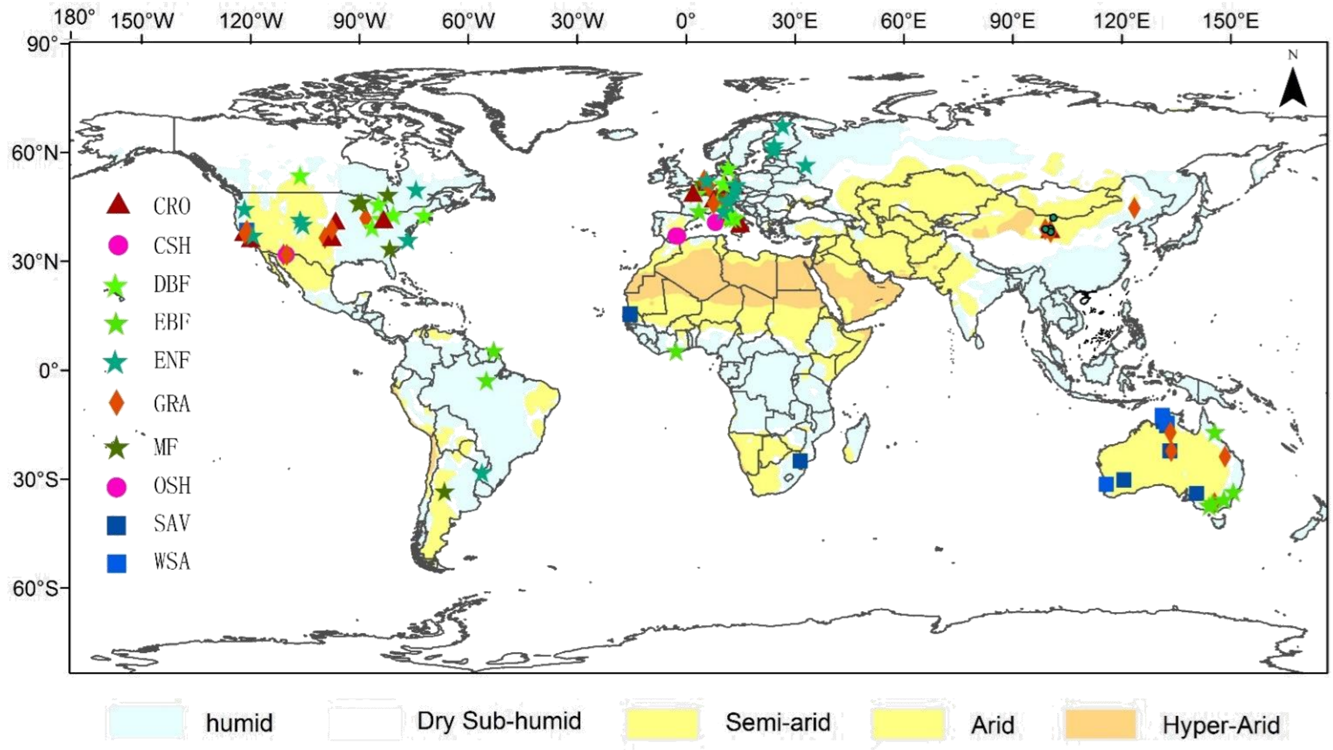

Fig. S2 Flux sites (from Fluxnet2015) for evaluation of GPP and ET simulations (section 3.1).

Global distribution of ecosystems determined by the UNEP classification system. (Middleton and Thomas (1997))

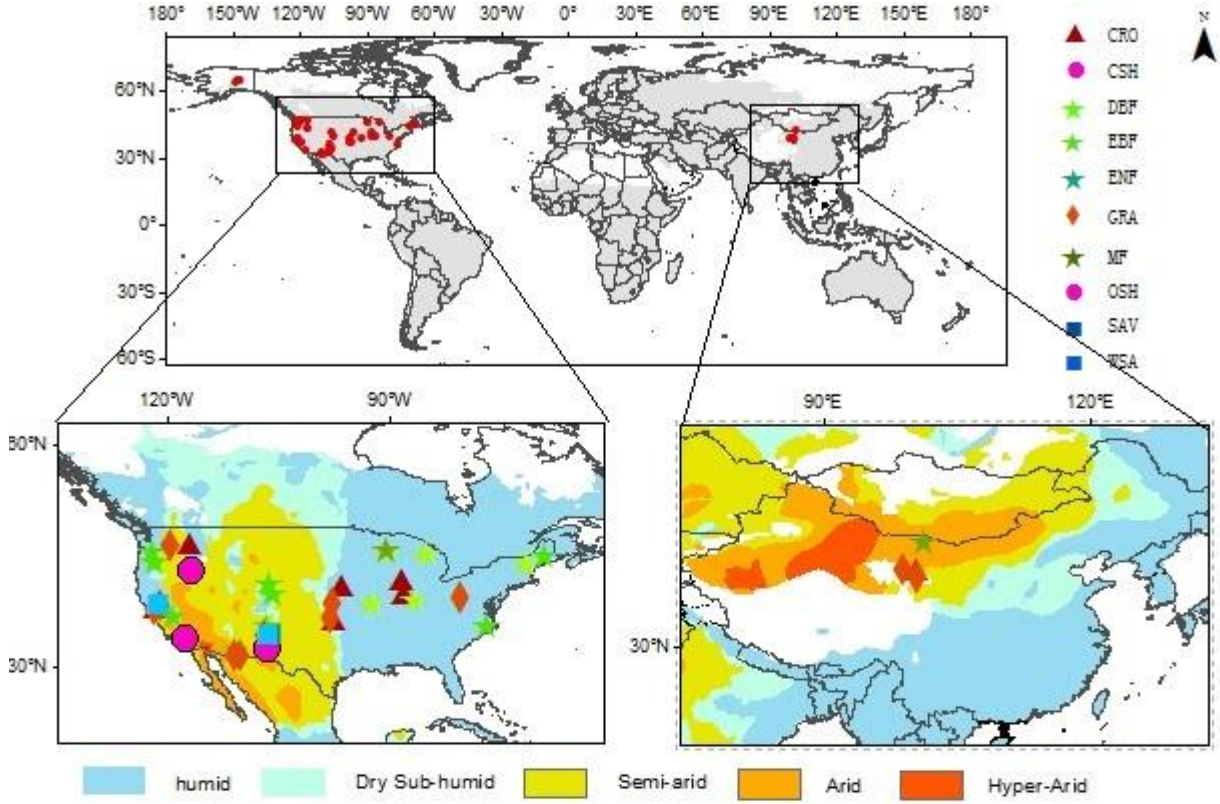

Fig. S3 Flux sites (Americaflux and HeiHe) for evaluation of ET assimilation based on different soil moisture data.

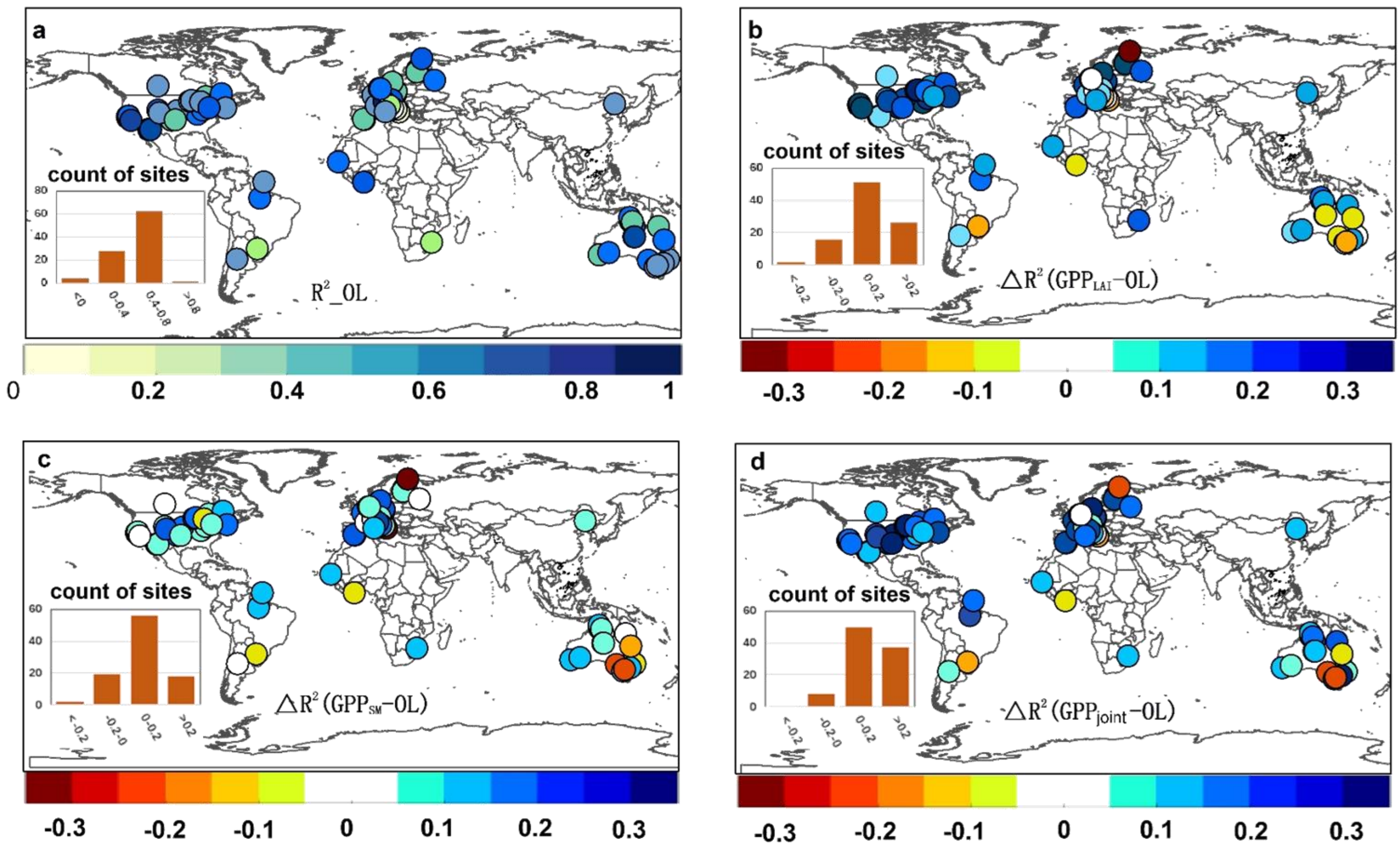

Fig. S4 **(a) The squared correlation coefficient (R^2) between the GPP_{LPJ} and the site observations, the yellow/blue indicating low/high correlation ; (b) △R^2(difference between GPP_{LAI} and GPP_{LPJ});(c) △R^2 (difference between GPP_{SM} and GPP_{LPJ}) ; (d) △R^2 (difference between GPP_{Joint} and GPP_{LPJ}) , blue/red represent positive/negative values.**

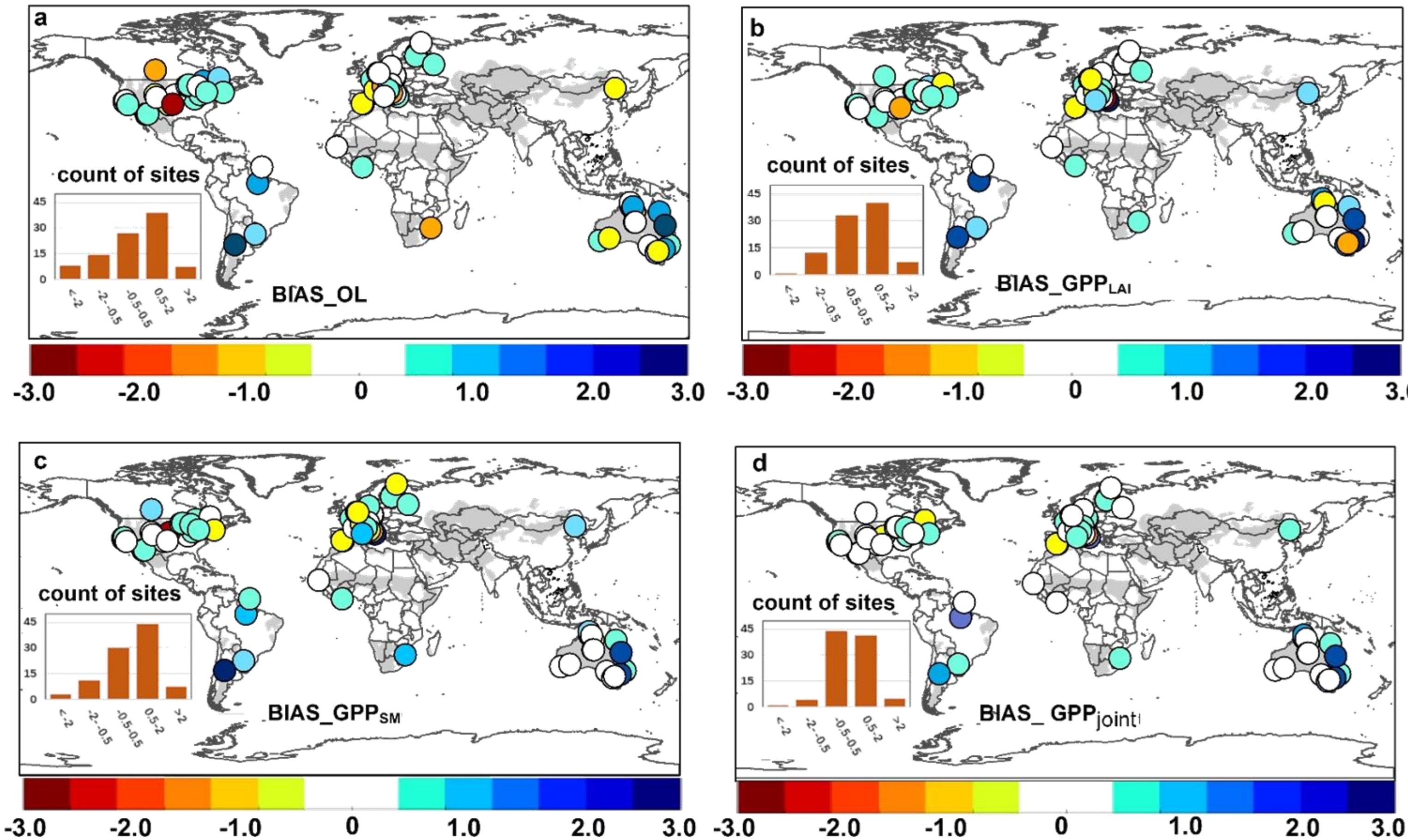

Fig. S5 **(a) The BIAS between the GPP_{LPJ} and the site observations; (b) BIAS（GPP_{LAI}）;(c) BIAS（GPP_{SM}）; (d) △ BIAS（GPP_{Joint}）, blue/red represent positive/negative value.**

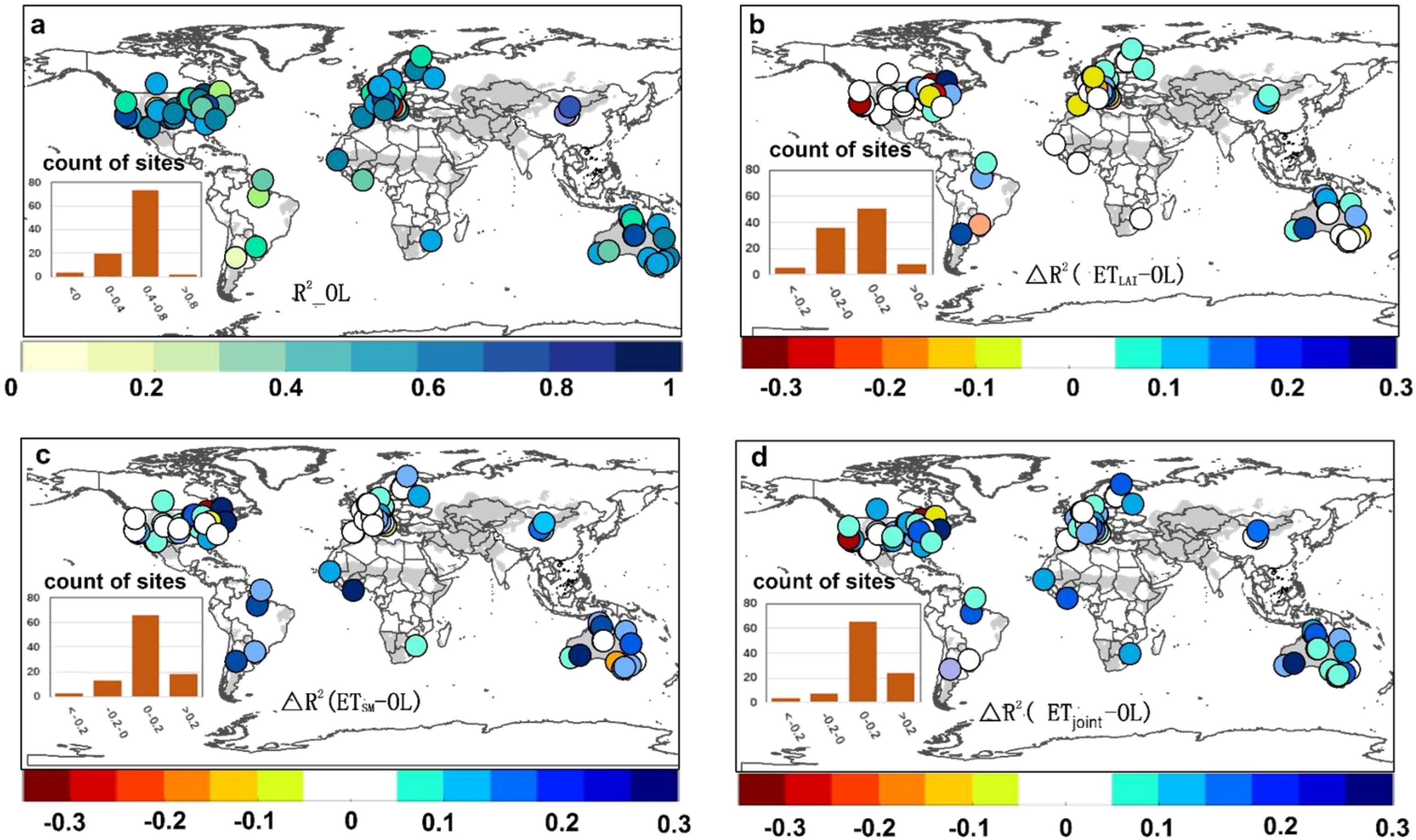

Figure S6 **(a) The squared correlation coefficient between the ET simulated by the LPJ-DGVM and the site observations, with yellow/blue indicating low/high correlation; (b) △R^2(difference between ET_{LAI} and ET_{LPJ});(c) △R^2（difference between ET_{SM} and ET_{LPJ}）; (d) △R^2（difference between ET_{Joint} and ET_{LPJ}）, blue/red represent positive/negative value.**

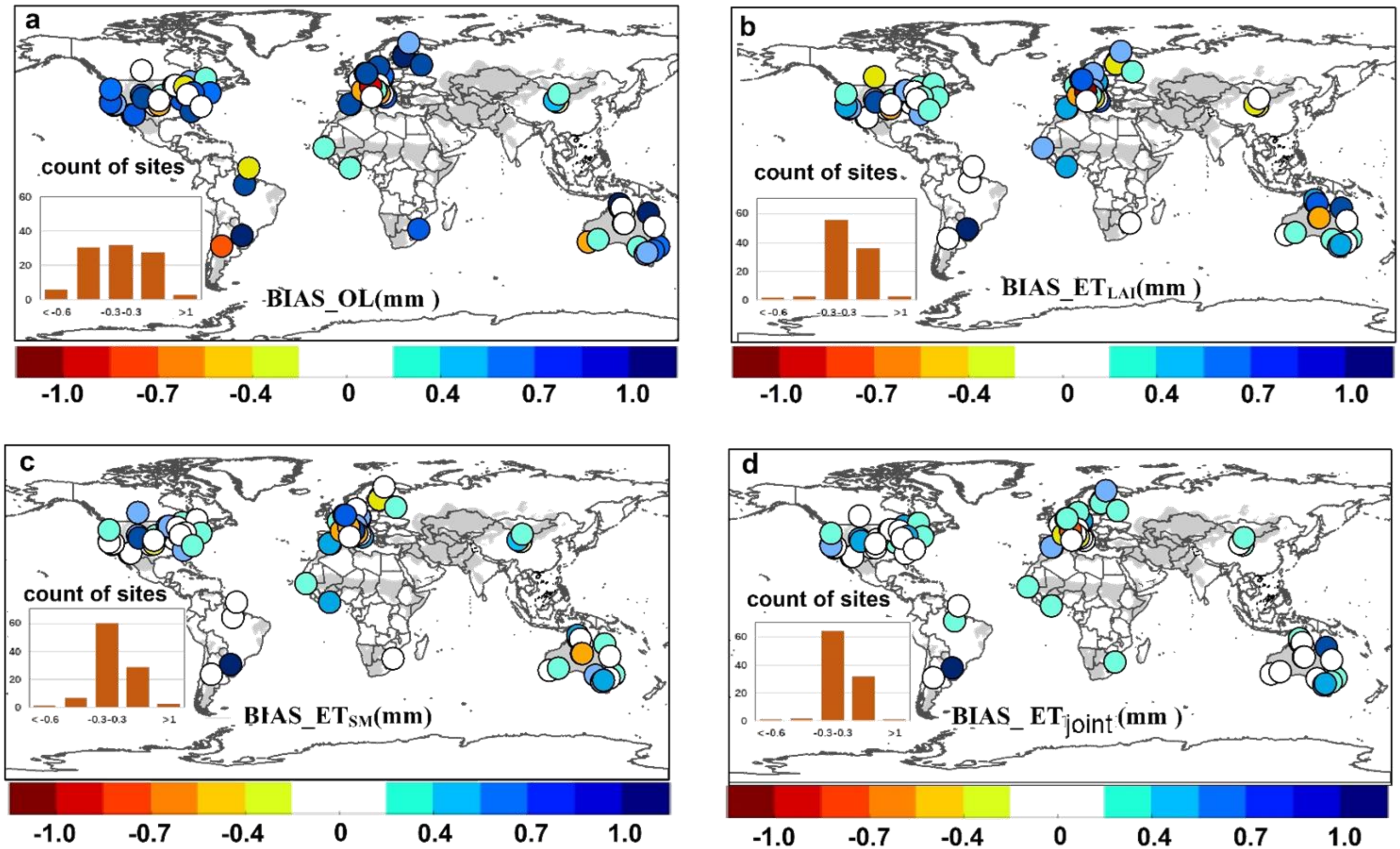

Figure S7 **(a) The BIAS between the ET simulated by the LPJ-DGVM and the site observations; (b) BIAS（ET_{LAI}）;(c) BIAS（ET_{SM}）; (d) △BIAS（ET_{Joint}）, blue/red represent positive/negative value.**

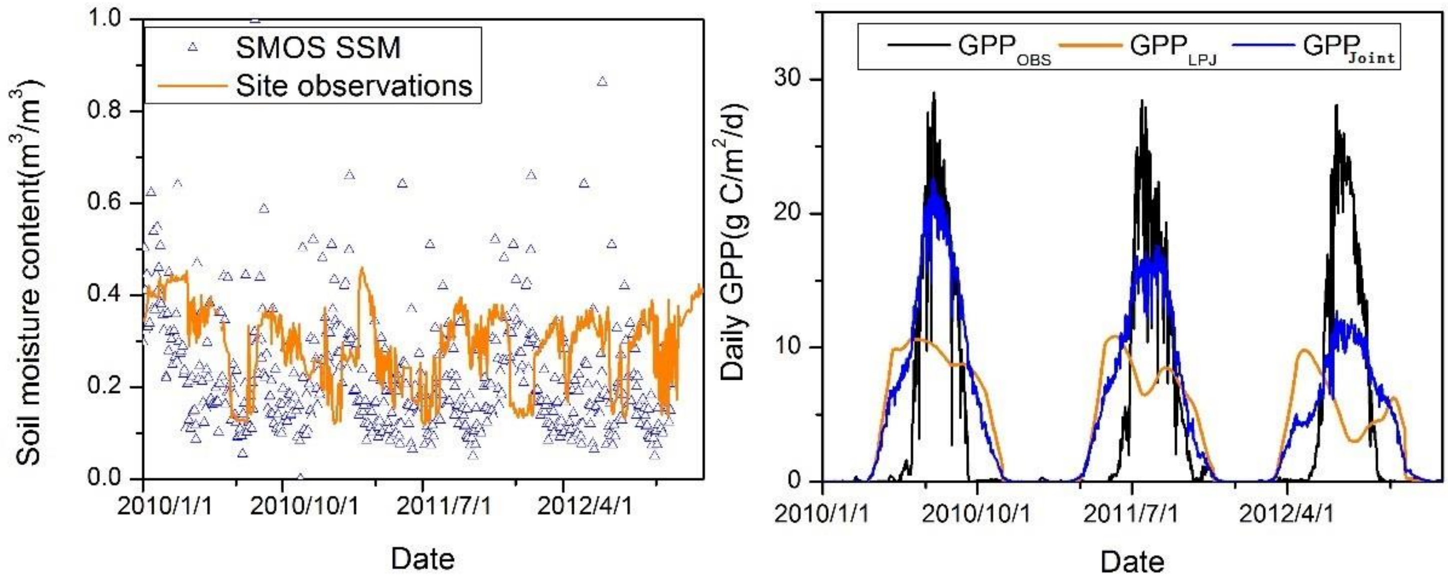

Figure S8 Soil moisture data and daily GPP during 2010-2012 at US-Ne1 site.

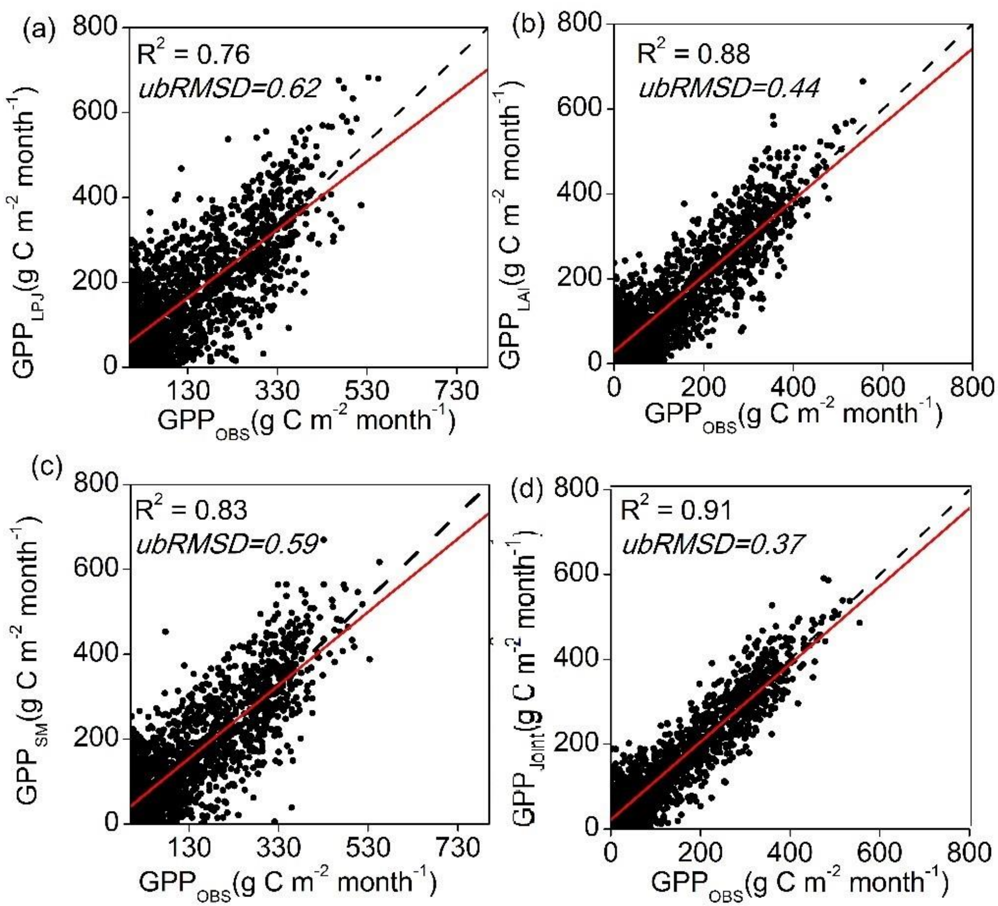

Fig. S9 Scatter plots of monthly observed vs. simulated GPP. GPP_{LPJ} (a), GPP_{LAI}(b), GPP_{SM} (c) GPP_{joint} (d) for the period of 2010-2014 at site level.

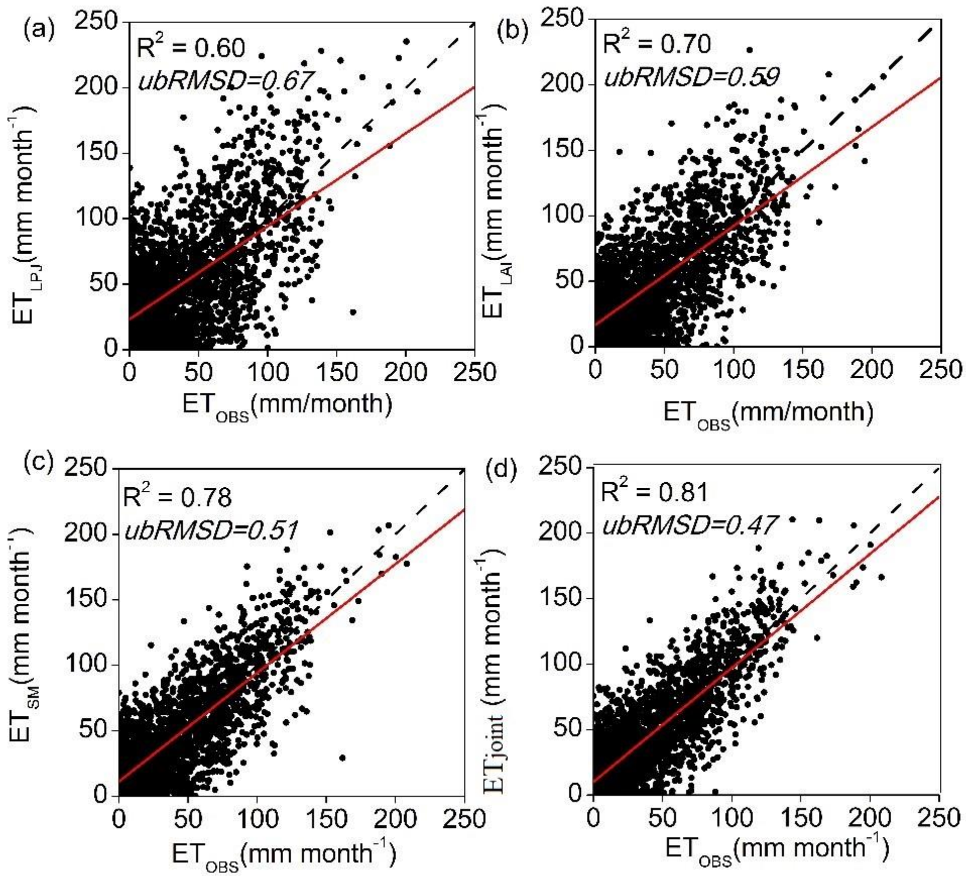

Fig.S10 Scatter plots of monthly observed vs. simulated ET. ET_{LPJ} (a), ET_{LAI}(b), ET_{SM} (c) ET_{joint} (d) for the period of 2010-2014 at site level.

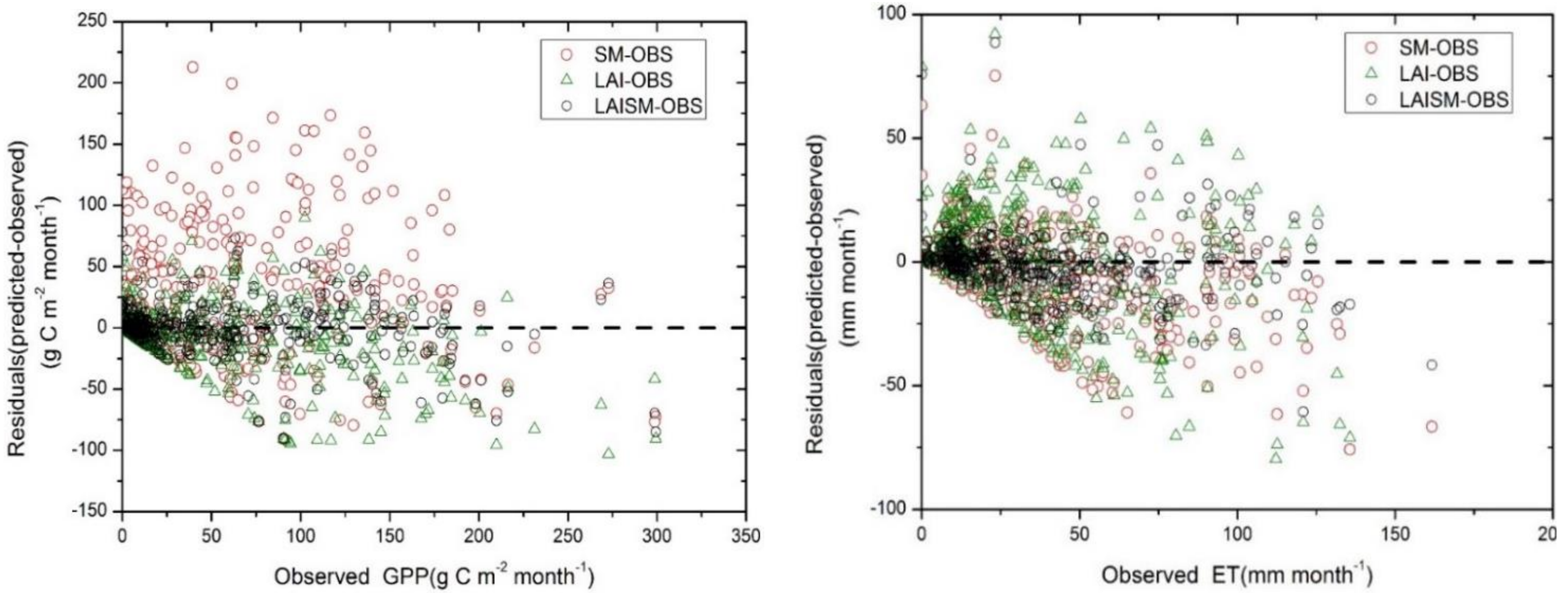

Fig. S11 Scatterplot of the monthly observed GPP (left graph) and ET values (right graph) vs. the difference of their simulations and observations. In the map, GPP_{LAI}-GPP_{OBS} and ET_{LAI}-ET_{OBS} (green triangle), GPP_{SM} -GPP_{OBS} and ET_{SM} -ET_{OBS} (red hollow circle), and GPP_{joint} -GPP_{OBS} and ET_{joint} -ET_{OBS} (black hollow circle)

Table S1 Flux tower information for global FLUXNET2015, Ameriflux and Heihe dataset sites used in this study.

Source	ID	SITE	LAT	LON	IGBP	Validation
FLUXNET2015	1	CA-TPD	42.63533	-80.5577	DBF	GPP, ET
FLUXNET2015	2	DE-Lnf	51.32822	10.3678	DBF	GPP, ET
FLUXNET2015	3	FR-Fon	48.47636	2.7801	DBF	GPP, ET
FLUXNET2015	4	CA-Oas	53.62889	-106.198	DBF	GPP, ET
FLUXNET2015	5	IT-CA1	42.38041	12.02656	DBF	GPP, ET
FLUXNET2015	6	IT-Col	41.84936	13.58814	DBF	GPP, ET
FLUXNET2015	7	IT-Isp	45.81264	8.63358	DBF	GPP, ET
FLUXNET2015	8	IT-Ro2	42.39026	11.92093	DBF	GPP, ET
FLUXNET2015	9	US-Ha1	42.5378	-72.1715	DBF	GPP, ET
FLUXNET2015	10	US-MMS	39.3232	-86.4131	DBF	GPP, ET
FLUXNET2015	11	DK-Sor	55.48587	11.64464	DBF	GPP, ET
FLUXNET2015	12	US-Oho	41.5545	-83.8438	DBF	GPP, ET
FLUXNET2015	13	US-UMB	45.5598	-84.7138	DBF	GPP, ET
FLUXNET2015	14	DE-Hai	51.07921	10.45217	DBF	GPP

FLUXNET2015	15	AU-Whr	-36.6732	145.0294	EBF	GPP, ET
FLUXNET2015	16	AU-Cum	-33.6152	150.7236	EBF	GPP, ET
FLUXNET2015	17	AU-Rob	-17.1175	145.6301	EBF	GPP, ET
FLUXNET2015	18	AU-Tum	-35.6566	148.1517	EBF	GPP, ET
FLUXNET2015	19	AU-Wom	-37.4222	144.0944	EBF	GPP, ET
FLUXNET2015	20	BR-Sa1	-2.85667	-54.9589	EBF	GPP, ET
FLUXNET2015	21	FR-Pue	43.7413	3.5957	EBF	GPP, ET
FLUXNET2015	22	GF-Guy	5.27877	-52.9249	EBF	GPP, ET
FLUXNET2015	23	GH-Ank	5.26854	-2.69421	EBF	GPP, ET
FLUXNET2015	24	CH-Dav	46.81533	9.85591	ENF	GPP, ET
FLUXNET2015	25	IT-SRo	43.72786	10.28444	ENF	GPP, ET
FLUXNET2015	26	DE-Lkb	49.09962	13.30467	ENF	GPP, ET
FLUXNET2015	27	DE-Obe	50.78666	13.72129	ENF	GPP, ET
FLUXNET2015	28	DE-Tha	50.96256	13.56515	ENF	GPP, ET
FLUXNET2015	29	IT-SR2	43.73202	10.29091	ENF	GPP, ET
FLUXNET2015	30	FI-Hyy	61.84741	24.29477	ENF	GPP, ET
FLUXNET2015	31	FI-Let	60.64183	23.95952	ENF	GPP, ET
FLUXNET2015	32	NL-Loo	52.16658	5.74356	ENF	GPP, ET
FLUXNET2015	33	RU-Fyo	56.46153	32.92208	ENF	GPP, ET

FLUXNET2015	34	US-NR1	40.0329	-105.546	ENF	GPP, ET
FLUXNET2015	35	US-GLE	41.36653	-106.24	ENF	GPP, ET
FLUXNET2015	36	US-Me6	44.32328	-121.608	ENF	GPP, ET
FLUXNET2015	37	US-NC3	35.799	-76.656	ENF	GPP, ET
FLUXNET2015	38	FI-Sod	67.36239	26.63859	ENF	GPP, ET
FLUXNET2015	39	IT-Lav	45.9562	11.28132	ENF	GPP, ET
FLUXNET2015	40	IT-Ren	46.58686	11.43369	ENF	GPP, ET
FLUXNET2015	41	AR-Vir	-28.2395	-56.1886	ENF	GPP, ET
FLUXNET2015	42	CA-Qfo	49.6925	-74.3421	ENF	GPP, ET
FLUXNET2015	43	US-CZ2	37.03106	-119.257	ENF	GPP, ET
FLUXNET2015	44	CA-TP1	42.66094	-80.5595	ENF	GPP, ET
FLUXNET2015	45	BE-Bra	51.30761	4.51984	MF	GPP, ET
FLUXNET2015	46	AR-Slu	-33.4648	-66.4598	MF	GPP, ET
FLUXNET2015	47	BE-Vie	50.30493	5.99812	MF	GPP, ET
FLUXNET2015	48	CA-Gro	48.2167	-82.1556	MF	GPP, ET
FLUXNET2015	49	CH-Lae	47.47833	8.36439	MF	GPP, ET
FLUXNET2015	50	US-PFa	45.9459	-90.2723	MF	GPP, ET
FLUXNET2015	51	US-Syv	46.242	-89.3477	MF	GPP, ET
FLUXNET2015	52	US-Akn	33.3833	-81.5656	MF	ET

FLUXNET2015	53	AU-Emr	-23.8587	148.4746	GRA	GPP, ET
FLUXNET2015	54	US-AR1	36.4267	-99.42	GRA	GPP, ET
FLUXNET2015	55	US-Wkg	31.7365	-109.942	GRA	GPP, ET
FLUXNET2015	56	US-Dia	37.6773	-121.53	GRA	ET
FLUXNET2015	57	AT-Neu	47.11667	11.3175	GRA	GPP, ET
FLUXNET2015	58	AU-Rig	-36.6499	145.5759	GRA	GPP, ET
FLUXNET2015	59	CH-Fru	47.11583	8.53778	GRA	GPP, ET
FLUXNET2015	60	DE-Gri	50.95004	13.51259	GRA	GPP, ET
FLUXNET2015	61	DE-RuR	50.62191	6.30413	GRA	GPP, ET
FLUXNET2015	62	IT-MBo	46.01468	11.04583	GRA	GPP, ET
FLUXNET2015	63	IT-Tor	45.84444	7.57806	GRA	GPP, ET
FLUXNET2015	64	NL-Hor	52.24035	5.0713	GRA	GPP, ET
FLUXNET2015	65	US-IB2	41.84062	-88.241	GRA	GPP, ET
FLUXNET2015	66	US-Var	38.4133	-120.951	GRA	GPP, ET
FLUXNET2015	67	US-KLS	38.7745	-97.5684	GRA	GPP, ET
FLUXNET2015	68	AU-Stp	-17.1507	133.3502	GRA	GPP, ET
FLUXNET2015	69	AU-TTE	-22.287	133.64	GRA	GPP, ET
FLUXNET2015	70	US-SRG	31.78938	-110.828	GRA	GPP, ET
FLUXNET2015	71	CN-Cng	44.5934	123.5092	GRA	GPP

FLUXNET2015	72	IT-Noe	40.60618	8.15169	CSH	GPP, ET
FLUXNET2015	73	ES-Amo	36.83361	-2.25232	OSH	GPP, ET
FLUXNET2015	74	ES-LJu	36.92659	-2.75212	OSH	GPP, ET
FLUXNET2015	75	US-Whs	31.7438	-110.052	OSH	GPP, ET
FLUXNET2015	76	ZA-Kru	-25.0197	31.4969	SAV	GPP, ET
FLUXNET2015	77	AU-Cpr	-34.0021	140.5891	SAV	GPP, ET
FLUXNET2015	78	AU-DaS	-14.1593	131.3881	SAV	GPP, ET
FLUXNET2015	79	AU-Dry	-15.2588	132.3706	SAV	GPP, ET
FLUXNET2015	80	AU-ASM	-22.283	133.249	SAV	GPP, ET
FLUXNET2015	81	AU-GWW	-30.1913	120.6541	SAV	GPP, ET
FLUXNET2015	82	SN-Dhr	15.40278	-15.4322	SAV	GPP, ET
FLUXNET2015	83	AU-Gin	-31.3764	115.7138	WSA	GPP, ET
FLUXNET2015	84	AU-RDF	-14.5636	132.4776	WSA	GPP, ET
FLUXNET2015	85	AU-How	-12.4943	131.1523	WSA	GPP, ET
FLUXNET2015	86	US-Ton	38.4316	-120.966	WSA	GPP, ET
FLUXNET2015	87	US-CRT	41.6285	-83.3471	CRO	GPP, ET
FLUXNET2015	88	CH-Oe2	47.28642	7.73375	CRO	GPP, ET
FLUXNET2015	89	IT-BCi	40.52375	14.95744	CRO	GPP, ET
FLUXNET2015	90	US-Twt	38.10872	-121.653	CRO	GPP, ET

FLUXNET2015	91	US-Lin	36.3566	-119.842	CRO	GPP, ET
FLUXNET2015	92	US-ARM	36.6058	-97.4888	CRO	GPP, ET
FLUXNET2015	93	IT-CA2	42.37722	12.02604	CRO	GPP, ET
FLUXNET2015	94	US-CRT	41.6285	-83.3471	CRO	ET
FLUXNET2015	95	DE-Geb	51.09973	10.91463	CRO	GPP, ET
FLUXNET2015	96	BE-Lon	50.55162	4.74623	CRO	GPP, ET
FLUXNET2015	97	DE-Kli	50.89306	13.52238	CRO	GPP, ET
FLUXNET2015	98	US-Ne1	41.16506	-96.4766	CRO	GPP, ET
FLUXNET2015	99	FR-Gri	48.84422	1.95191	CRO	GPP, ET
Ameriflux	100	US-CF1	46.7815	-117.082	CRO	ET_{SMOS} vs ET_{SMAP}
Ameriflux	101	US-IB1	41.8593	-88.2227	CRO	ET_{SMOS} vs ET_{SMAP}
Ameriflux	102	US-Ne2	41.16487	-96.4701	CRO	ET_{SMOS} vs ET_{SMAP}
Ameriflux	103	US-UiA	40.06463	-88.1961	CRO	ET_{SMOS} vs ET_{SMAP}
HeiHe	104	Daman	38.855	100.3717	CRO	ET_{SMOS} vs ET_{SMAP}
Ameriflux	105	US-Rls	43.1439	-116.736	CSH	ET_{SMOS} vs ET_{SMAP}
Ameriflux	106	US-Bar	44.0646	-71.2881	DBF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	107	US-MOz	38.7441	-92.2	DBF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	108	US-Rpf	65.1198	-147.429	DBF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	109	US-WCr	45.8059	-90.0799	DBF	ET_{SMOS} vs ET_{SMAP}

Ameriflux	110	US-CZ2	37.03106	-119.257	ENF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	111	US-Ho1	45.2041	-68.7402	ENF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	112	US-Me6	44.32328	-121.608	ENF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	113	US-MtB	32.41667	-110.726	ENF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	114	US-NC3	35.799	-76.656	ENF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	115	US-Prr	65.12367	-147.488	ENF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	116	US-Uaf	64.86627	-147.856	ENF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	117	US-Vcm	35.88845	-106.532	ENF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	118	US-Wrc	45.8205	-121.952	ENF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	119	US-A32	36.81927	-97.8198	GRA	ET_{SMOS} vs ET_{SMAP}
Ameriflux	120	US-Hn2	46.68886	-119.464	GRA	ET_{SMOS} vs ET_{SMAP}
Ameriflux	121	US-JRn	39.67886	-80.1646	GRA	ET_{SMOS} vs ET_{SMAP}
Ameriflux	122	US-KLS	38.7745	-97.5684	GRA	ET_{SMOS} vs ET_{SMAP}
Ameriflux	123	US-Seg	34.3623	-106.702	GRA	ET_{SMOS} vs ET_{SMAP}
Ameriflux	124	US-Sne	38.0369	-121.755	GRA	ET_{SMOS} vs ET_{SMAP}
HeiHe	125	Arou	38.05	100.45	GRA	ET_{SMOS} vs ET_{SMAP}
HeiHe	126	Dashalong	38.8399	98.94	GRA	ET_{SMOS} vs ET_{SMAP}
HeiHe	127	Hunhelin	41.99	101.1335	MF	ET_{SMOS} vs ET_{SMAP}
Ameriflux	128	US-EML	63.8784	-149.254	OSH	ET_{SMOS} vs ET_{SMAP}

Ameriflux	129	US-Jo2	32.58494	-106.603	OSH	ET_{SMOS} vs ET_{SMAP}
Ameriflux	130	US-Rws	43.16755	-116.713	OSH	ET_{SMOS} vs ET_{SMAP}
Ameriflux	131	US-SCs	33.73433	-117.696	OSH	ET_{SMOS} vs ET_{SMAP}
Ameriflux	132	US-Wjs	34.42549	-105.862	SAV	ET_{SMOS} vs ET_{SMAP}
Ameriflux	133	US-Mpj	34.4385	-106.238	WSA	ET_{SMOS} vs ET_{SMAP}

Table S2 Statistics for daily GPP between observations and simulations by LPJ-DGVM and that of three assimilation schemes for different vegetation types in different regions.

Humid and dry-sub humid	**R^2**				**bias (mm/daily)**				**ubRMSE (mm/daily)**			
	GPP_{LPJ}	GPP_{LAI}	GPP_{SM}	GPP_{CO}	GPP_{LPJ}	GPP_{LAI}	GPP_{SM}	GPP_{CO}	GPP_{LPJ}	GPP_{LAI}	GPP_{SM}	GPP_{CO}
Forest	0.38	0.48	0.46	0.55	0.56	0.46	0.47	0.51	2.14	2.10	1.91	1.56
Grassland	0.46	0.57	0.51	0.61	0.24	0.40	0.48	0.65	1.75	1.55	1.33	0.81
Savanna	0.34	0.50	0.52	0.56	0.13	0.65	0.66	0.63	2.15	1.40	1.17	1.14
Shrubland	0.47	0.54	0.58	0.66	-0.37	1.46	1.99	0.66	1.21	1.48	0.81	0.93
Cropland	0.38	0.53	0.53	0.65	-0.18	0.64	0.47	0.72	2.48	2.29	1.80	1.69
Average	**0.41**	**0.53**	**0.52**	**0.61**	**0.08**	**0.72**	**0.81**	**0.63**	**1.95**	**1.76**	**1.40**	**1.23**
Semi-arid and Arid	**R^2**				**bias (mm/daily)**				**ubRMSE (mm/daily)**			
	GPP_{LPJ}	GPP_{LAI}	GPP_{SM}	GPP_{CO}	GPP_{LPJ}	GPP_{LAI}	GPP_{SM}	GPP_{CO}	GPP_{LPJ}	GPP_{LAI}	GPP_{SM}	GPP_{CO}
Forest	0.56	0.62	0.57	0.73	-1.72	0.34	0.98	0.30	2.67	1.72	1.79	1.32
Grassland	0.64	0.77	0.72	0.87	-0.54	0.10	0.41	0.35	1.83	1.42	1.41	1.12
Savanna	0.58	0.69	0.64	0.75	-0.22	0.84	0.48	0.59	1.15	1.02	1.15	0.83
Shrubland	0.38	0.43	0.51	0.59	-1.03	-0.67	-0.53	-0.19	1.47	1.46	1.06	0.87
Cropland	0.59	0.75	0.57	0.72	1.72	0.81	0.65	0.63	2.24	2.01	1.73	1.10
Average	**0.55**	**0.65**	**0.59**	**0.73**	**-0.36**	**0.28**	**0.40**	**0.34**	**1.88**	**1.53**	**1.43**	**1.05**

TableS3 Statistics for daily ET between observations and simulations by LPJ-DGVM and that of three assimilation schemes for different vegetation types in different regions.

Humid and dry-subhumid	**R^2**				**bias (mm/daily)**				**ubRMSE (mm/daily)**			
	ET_{LPJ}	ET_{LAI}	ET_{SM}	ET_{CO}	ET_{LPJ}	ET_{LAI}	ET_{SM}	ET_{CO}	ET_{LPJ}	ET_{LAI}	ET_{SM}	ET_{CO}
Forest	0.39	0.45	0.53	0.52	0.38	0.22	0.29	0.29	0.88	0.95	0.87	0.68
Grassland	0.60	0.58	0.66	0.63	0.13	0.17	0.24	0.26	0.78	0.97	0.83	0.64
Savanna	0.54	0.62	0.68	0.68	0.56	0.21	0.34	0.30	0.96	1.03	0.82	0.59
Shurbland	0.65	0.65	0.68	0.80	0.10	-0.06	-0.06	0.11	1.22	1.42	0.78	0.65
Cropland	0.51	0.53	0.59	0.65	0.29	0.29	0.37	0.21	1.00	0.90	0.82	0.77
Average	0.54	0.56	0.63	0.66	0.29	0.17	0.24	0.23	0.97	1.05	0.83	0.67
Semi-arid and Arid	**R^2**				**bias (mm/daily)**				**ubRMSE (mm/daily)**			
	ET_{LPJ}	ET_{LAI}	ET_{SM}	ET_{CO}	ET_{LPJ}	ET_{LAI}	ET_{SM}	ET_{CO}	ET_{LPJ}	ET_{LAI}	ET_{SM}	ET_{CO}
Forest	0.45	0.47	0.56	0.59	0.33	0.35	0.27	0.31	0.77	1.05	0.80	0.71
Grassland	0.72	0.64	0.75	0.79	0.11	-0.03	-0.03	-0.02	0.94	0.85	0.71	0.50
Savanna	0.65	0.70	0.65	0.77	0.34	0.28	0.24	0.18	0.85	0.91	0.77	0.56
Shurbland	0.56	0.58	0.66	0.62	0.13	0.17	0.10	0.17	0.81	0.94	0.65	0.69
Cropland	0.65	0.64	0.73	0.77	0.23	-0.06	-0.01	0.19	1.30	1.20	0.70	0.64
Average	0.60	0.62	0.67	0.71	0.23	0.14	0.11	0.14	0.93	0.99	0.72	0.61

Table S4 Normal distribution parameters and interval estimation of error for GPP products simulated from our study and other cited.

Dataset	Estimator of μ (g C/m^2/month)	confidence interval of μ (α=0.05)	Estimator of σ	confidence interval of σ(α=0.05)
LPJ-VSJA	4.7	[4.65,4.88]	1.73	[1.22-1.97]
LPJ-DGVM	19.7	[17.6,22.3]	5.23	[1.22-1.97]
MODIS	25.4	[23.9,29.6]	8.98	[8.34-9.22]
GOSIF	8.3	[8.1-8.5]	4.23	[4.11-4.56]
GLASS	3.6	[3.44-3.78]	3.17	[2.77-3.45]

Table S5 Normal distribution parameter and interval estimation of error for ET products simulated from our study and other cited.

Dataset	Estimator of μ (mm/month)	confidence interval of μ (α=0.05)	Estimator of σ	confidence interval of σ(α=0.05)
LPJ-VSJA	3.4	[3.15,3.74]	1.91	[1.55-2.05]
LPJ-DGVM	14.3	[11.8,17.1]	7.1	[6.6-7.85]
MODIS	32.2	[31.9,33.6]	10.28	[9.34-11.22]
GLDAS	4.3	[4.06-4.55]	2.23	[2.11-2.56]
GLASS	10.2	[9.44-10.78]	5.3	[4.57-5.65]

GLEAM	4.13	[3.96-4.35]	3.75	[3.35-3.88]

Table S6 Global annual gross primary productivity (GPP) and evaporation (ET) from different products and their estimation accuracy.

Dataset	GPP (Pg C/yr)	ET (km^3 /yr)	Period	Accuracy derived from reference (site evaluation)	Reference
Fluxcom	~125	86.0× 10^3	2010-2015	GPP:2.83 g C/m^2/d, R^2=0.60	Jung et al.,2020
PML-V2	145.8	72.8 × 10^3	2003-2017	ET:0.69 mm/d, R^2=0.69 GPP:1.99 g C/m^2/d, R^2=0.79	Zhang et al.,2019
GLEAM	----	68 × 10^3	2010-2017	ET:0.72 mm/d, R^2=0.64	Martens et al.,2017
MOD17A2H	~110	58.9× 10^3	2001-2014	ET:1.0 mm/d, R^2=0.49 GPP:2.82 g C/m^2/d, R^2=0.59	Zhang et al.,2019
GOSIF	135.5	-------	2000-2017	GPP:1.92 g C/m^2/d, R^2=0.74	Li et al.,2019
GLDAS-2	-----	72.4 × 10^3	2010-2017	ET:0.70 mm/d, R^2=0.71	Jung et al.,2020
GLASS	~108	72 × 10^3	2010-2018	ET:1.0 mm/d, R^2=0.49 GPP:1.74 g C/m^2/d, R^2=0.81	Yao et al.,2014
LPJ-VSJA	130.2	69.2× 10^3	2010-2018	ET:0.74 mm/d, R^2=0.70 GPP:1.32 g C/m^2/d, R^2=0.70	Our study
LPJ-DGVM	123	82× 10^3	2010-2018	ET:1.10 mm/d, R^2=0.58 GPP:2.23 g C/m^2/d, R^2=0.60	Our study