



Supplement of

Satellite-based near-real-time global daily terrestrial evapotranspiration estimates

Lei Huang et al.

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Table S1. The 149 flux towers information

SITE_NAME	LOCATION_L AT	LOCATION_LO NG	LOCATIO N_ELEV	IGBP	MAT	MAP
San Luis	-33.4648	-66.4598		MF		400
Neustift	47.1167	11.3175	970	GRA	6.5	852
Alice Springs	-22.283	133.249		SAV		
Adelaide River	-13.0769	131.1178		WSA		
Calperum	-34.0021	140.5891		SAV		
Cumberland Plain	-33.6152	150.7236		EBF		
Daly River Savanna	-14.0633	131.3181		GRA	27.25	983.78
Daly River Cleared	-14.1593	131.3881		SAV	27.22	975.82
Dry River	-15.2588	132.3706		SAV		
Emerald	-23.8587	148.4746		GRA		
Fogg Dam	-12.5452	131.3072		WET	27.02	1323.6 9
Great Western Woodlands, Western Australia, Australia	-30.1913	120.6541		SAV		
Gingin	-31.3764	115.7138		WSA		
Howard Springs	-12.4943	131.1523		WSA	27.01	1449.3 5
Loxton	-34.4704	140.6551		DBF		
Red Dirt Melon Farm, Northern Territory	-14.5636	132.4776		WSA		
Riggs Creek	-36.6499	145.5759		GRA		
Robson Creek, Queensland, Australia	-17.1175	145.6301		EBF		
Sturt Plains	-17.1507	133.3502		GRA		
Ti Tree East	-22.287	133.64		GRA		

Tumbarumba	-35.6566	148.1517	1200	EBF	10.72	1159.0 1
Wallaby Creek	-37.4259	145.1878		EBF	12.76	1105.5 9
Whroo	-36.6732	145.0294		EBF		
Wombat	-37.4222	144.0944	705	EBF		
Jaxa	-34.9893	146.2907		GRA		
Brasschaat	51.3076	4.5198	16	MF	9.8	750
Lonzee	50.5516	4.7462	167	CRO	10	800
Vielsalm	50.3049	5.9981	493	MF	7.8	1062
Santarem-Km83- Logged Forest	-3.018	-54.9714	100	EBF	26.12	2043.7 7
Ontario - Groundhog River, Boreal Mixedwood Forest	48.2167	-82.1556	340	MF	1.3	831
Saskatchewan - Western Boreal, Mature Black Spruce	53.9872	-105.118	628.94	ENF	0.79	405.6
Quebec - Eastern Boreal, Mature Black Spruce	49.6925	-74.3421	382	ENF	-0.36	962.32
Saskatchewan - Western Boreal, forest burned in 1977	54.485	-105.818	536	ENF	0.4	470
Saskatchewan - Western Boreal, forest burned in 1989	54.2539	-105.878	520	ENF	0.4	470
Saskatchewan - Western Boreal, forest burned in 1998	54.0916	-106.005	540	OSH	0.4	470
Ontario - Turkey Point 2002 Plantation White Pine	42.6609	-80.5595	265	ENF	8	1036

Ontario - Turkey Point 1989 Plantation White Pine	42.7744	-80.4588	212	ENF	8	1036
Ontario - Turkey Point 1974 Plantation White Pine	42.7068	-80.3483	184	ENF	8	1036
Ontario - Turkey Point 1939 Plantation White Pine	42.7102	-80.3574	184	ENF	8	1036
Ontario - Turkey Point Mature Deciduous	42.6353	-80.5577	260	DBF	8	1036
Chamau	47.2102	8.4104	393	GRA	9.5	1136
Davos	46.8153	9.8559	1639	ENF	2.8	1062
Früebüel	47.1158	8.5378	982	GRA	7.2	1651
Changling	44.5934	123.5092		GRA		
Duolun_grassland (D01)	42.0467	116.2836		GRA	2.01	318.96
Duolun Degraded Meadow	42.0551	116.2809		GRA		
Haibei Alpine Tibet site	37.37	101.18		GRA		
Trebon (CZECHWET)	49.0247	14.7704	426	WET	7.7	604
Gebesee	51.0997	10.9146	161.5	CRO	8.5	470
Grillenburg	50.95	13.5126	385	GRA	7.8	901
Hainich	51.0792	10.4522	430	DBF	8.3	720
Klingenberg	50.8931	13.5224	478	CRO	7.6	842
Lackenberg	49.0996	13.3047	1308	ENF	4	1599
Leinefelde	51.3282	10.3678	451	DBF	6.96	894.6
Oberbärenburg	50.7867	13.7213	734	ENF	5.5	996
Rollesbroich	50.6219	6.3041	514.7	GRA	7.7	1033
Selhausen Juelich	50.8659	6.4471	102.755	CRO	10	700

Selhausen	50.8706	6.4497	103	CRO	9.9	693
Schechenfilz Nord	47.8064	11.3275	590	WET	8.6	1127
Tharandt	50.9626	13.5651	385	ENF	8.2	843
Zarnekow	53.8759	12.889	0	WET	8.7	584
EngHAVE	55.6905	12.1918	10	GRA	8	613
Foulum	56.4842	9.5872	51	CRO	8	
Soroe	55.4859	11.6446	40	DBF	8.2	660
Amoladeras	36.8336	-2.2523	58	OSH		0
Llano de los Juanes	36.9266	-2.7521	1600	OSH	16	400
Laguna Seca	37.0979	-2.9658	2267	OSH		
Hyytiala	61.8474	24.2948	181	ENF	3.8	709
Jokioinen	60.8986	23.5134	109	CRO	4.6	627
Lettosuo	60.6418	23.9595	111	ENF	4.6	627
Lompolojankka	67.9972	24.2092	274	WET	-1.4	484
Sodankyla	67.3624	26.6386	180	ENF	-1	500
Grignon	48.8442	1.9519	125	CRO	12	650
Le Bray	44.7171	-0.7693	61	ENF	13.6	900
Puechabon	43.7413	3.5957	270	EBF	13.5	883
Ankasa	5.2685	-2.6942	124	EBF	26	1900
ZackenberG Fen	74.4814	-20.5545	38	WET	-9	211
Castel d'Asso1	42.3804	12.0266	200	DBF	14	766
Castel d'Asso2	42.3772	12.026	200	CRO	14	766
Castel d'Asso3	42.38	12.0222	197	DBF	14	766
Collelongo	41.8494	13.5881	1560	DBF	6.3	1180
Ispra ABC-IS	45.8126	8.6336	210	DBF	12.2	1300
Lavarone	45.9562	11.2813	1353	ENF	7.8	1291
Monte Bondone	46.0147	11.0458	1550	GRA	5.1	1214
Parco Ticino forest	45.2009	9.061	60	DBF	12.7	984
Renon	46.5869	11.4337	1730	ENF	4.7	809.3

Roccarespampa ni 2	42.3903	11.9209	160	DBF	15.15	876.2
Torgnon	45.8444	7.5781	2160	GRA	2.9	920
Pasoh Forest Reserve (PSO)	2.973	102.3062		EBF		
Horstermeer	52.2403	5.0713	2.2	GRA	10	800
Loobos	52.1666	5.7436	25	ENF	9.8	786
Chokurdakh	70.8291	147.4943	48	OSH	-14.3	232
Fyodorovskoye	56.4615	32.9221	265	ENF	3.9	711
Hakasia steppe	54.7252	90.0022	446	GRA	-0.07	591.87
Yakutsk Spasskaya Pad larch	62.255	129.168	246	DNF		
Tiksi	71.5943	128.8878	7	GRA	-12.7	323
Seida/Vorkuta	67.0547	62.9405	100	CSH	-5.6	501
Demokeya	13.2829	30.4783	500	SAV	26	320
Adventdalen	78.186	15.923	17	WET		
Dahra	15.4028	-15.4322	40	SAV	29	404
ARM USDA UNL OSU Woodward Switchgrass 1	36.4267	-99.42	611	GRA		
ARM USDA UNL OSU Woodward Switchgrass 2	36.6358	-99.5975	646	GRA		
ARM Southern Great Plains site- Lamont	36.6058	-97.4888	314	CRO	14.76	843
ARM Southern Great Plains burn site- Lamont	35.5497	-98.0402	424	GRA		
ARM Southern Great Plains control site- Lamont	35.5465	-98.04	424	GRA		
Atqasuk	70.4696	-157.409	15	WET	-9.7	93
Blodgett Forest	38.8953	-120.633	1315	ENF	11.09	1226

Curtice Walter-Berger cropland	41.6285	-83.3471	180	CRO	10.1	849
Corral Pocket	38.09	-109.39	1520	GRA		
GLEES Brooklyn Tower	41.3658	-106.24	3191	ENF	0.8	1200
GLEES	41.3665	-106.24	3197	ENF	0.8	1200
Goodwin Creek	34.2547	-89.8735	87	GRA	15.89	1425.77
Fermi National Accelerator Laboratory-Batavia (Prairie site)	41.8406	-88.241	226.5	GRA	9.04	930.25
Ivotuk	68.4865	-155.75	568	WET	-8.28	304
Kennedy Space Center (slash pine)	28.4583	-80.6709	1	ENF	21.9	1266
Lindcove Orange Orchard	36.3566	-119.092	131	CRO		
Lost Creek	46.0827	-89.9792	480	WET	4.08	828
Morgan Monroe State Forest	39.3232	-86.4131	275	DBF	10.85	1032
Metolius - Eyerly burn	44.5794	-121.5	896	ENF	7.88	704.61
Metolius-second young aged pine	44.3154	-121.608	1005	ENF	7.07	719
Metolius-first young aged pine	44.4372	-121.567	1188	ENF	6.47	590.81
Metolius Young Pine Burn	44.3233	-121.608	998	ENF	7.59	494
Niwot Ridge Forest (LTER NWT1)	40.0329	-105.546	3050	ENF	1.5	800
Mead - irrigated continuous maize site	41.1651	-96.4766	361	CRO	10.07	790.37
Mead - irrigated maize-soybean rotation site	41.1649	-96.4701	362	CRO	10.08	788.89

Mead - rainfed maize-soybean rotation site	41.1797	-96.4397	363	CRO	10.11	783.68
Olentangy River Wetland Research Park	40.0201	-83.0183	221	WET	11.63	1499.1
Poker Flat Research Range Black Spruce Forest	65.1237	-147.488	210	ENF	-2	275
Santa Rita Creosote	31.9083	-110.84	950	OSH	22	330

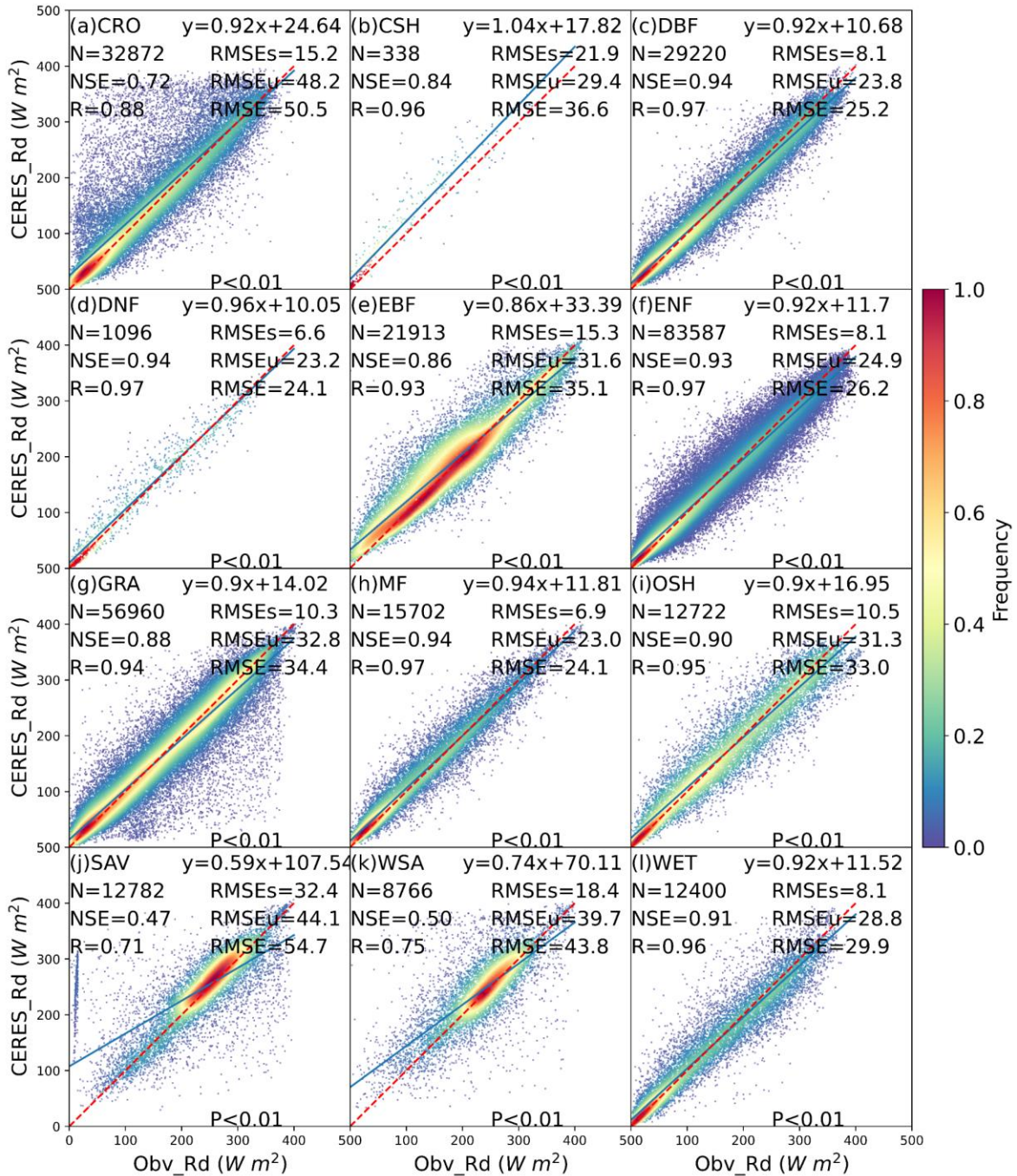


Figure S1. The scatter plot of daily downwards shortwave from Clouds and the Earth's Radiant Energy System (CERES) compared with local instruments measurements (Obv_Rd) under 12 IGBP land cover types: CRO (Croplands), CSH (Closed shrublands), DBF (Deciduous broadleaf forests), DNF (Deciduous needle leaf forests), EBF (Evergreen broadleaf forests), ENF (Evergreen needle leaf forests), GRA (Grasslands), MF (Mixed forests), OSH (Open shrublands), SAV (Savannas), WSA (Woody savannas), WET (Permanent wetlands). The red dotted line is the 1:1 line. N is the number of data points, NSE is Nash-Sutcliffe Efficiency, R is correlation coefficients, RMSE is Root Mean Square Error. The frequency denotes the probability density estimated through the Kernel Density Estimation, KDE method with a Gaussian kernel, and it is then scaled to ensure that the maximum value of the probability density function equals 1.

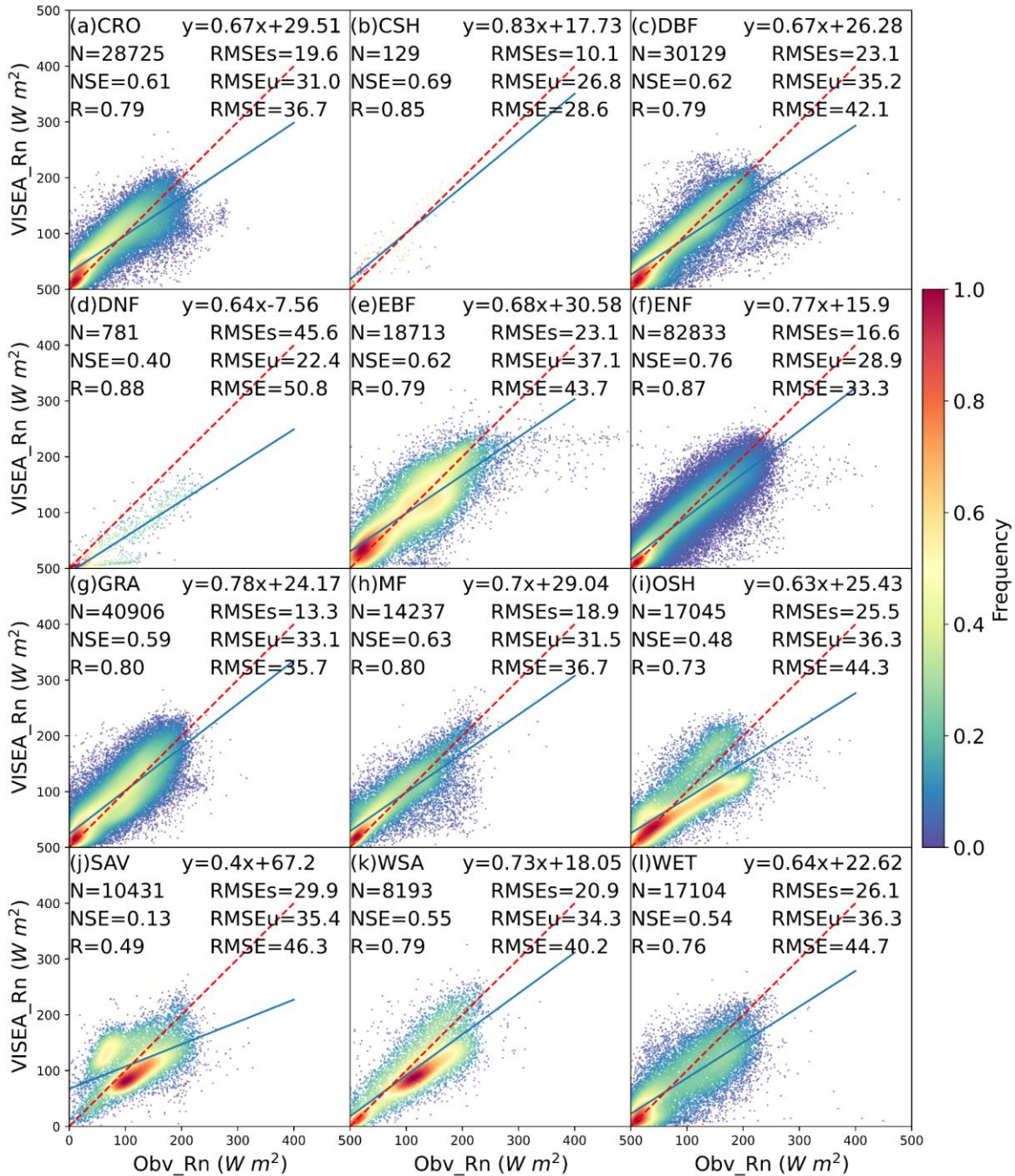


Figure S2. The scatter plot of daily net radiation with the Rd from CERES as inputs (CERES_Rn) compared with local instruments measurements (Obv_Rn) under 12 IGBP land cover types: CRO (Croplands), CSH (Closed shrublands), DBF (Deciduous broadleaf forests), DNF (Deciduous needle leaf forests), EBF (Evergreen broadleaf forests), ENF (Evergreen needle leaf forests), GRA (Grasslands), MF (Mixed forests), OSH (Open shrublands), SAV (Savannas), WSA (Woody savannas), WET (Permanent wetlands). The red dotted line is the 1:1 line. R is correlation coefficients, RMSE is Root Mean Square Error. The frequency denotes the probability density estimated through the Kernel Density Estimation, KDE method with a Gaussian kernel, and it is then scaled to ensure that the maximum value of the probability density function equals 1.

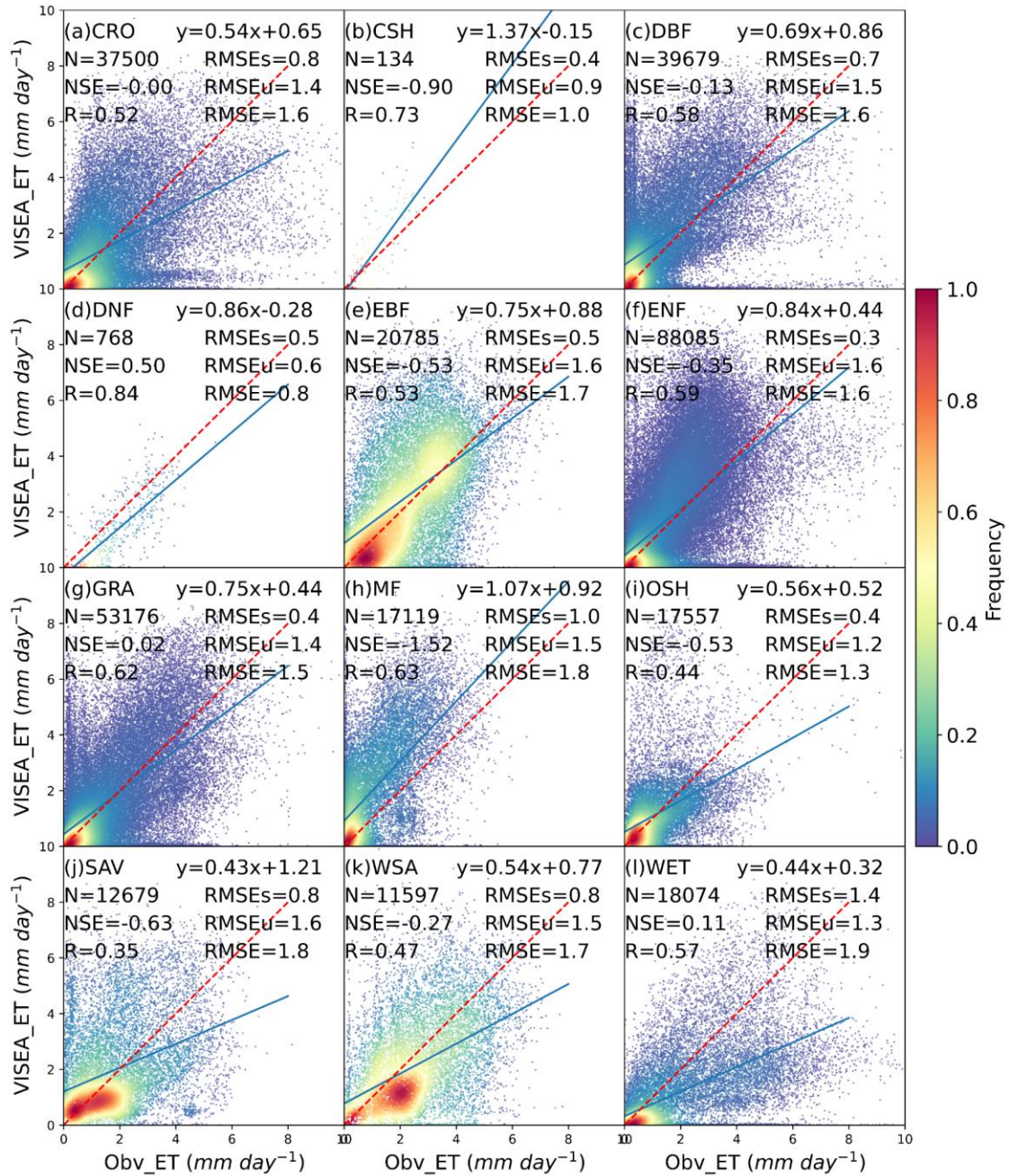


Figure S3. The scatter plot of daily ET simulated by VISEA with Rd from CERES as inputs compared with local instruments measurements (Obsv_Rn) under 12 IGBP land cover types: CRO (Croplands), CSH (Closed shrublands), DBF (Deciduous broadleaf forests), DNF (Deciduous needle leaf forests), EBF (Evergreen broadleaf forests), ENF (Evergreen needle leaf forests), GRA (Grasslands), MF (Mixed forests), OSH (Open shrublands), SAV (Savannas), WSA (Woody savannas), WET (Permanent wetlands). The red dotted line is the 1:1 line. N is the number of data points, NSE is Nash-Sutcliffe Efficiency, R is correlation coefficients, RMSE is Root Mean Square Error. The frequency denotes the probability density estimated through the Kernel Density Estimation, KDE method with a Gaussian kernel, and it is then scaled to ensure that the maximum value of the probability density function equals 1.

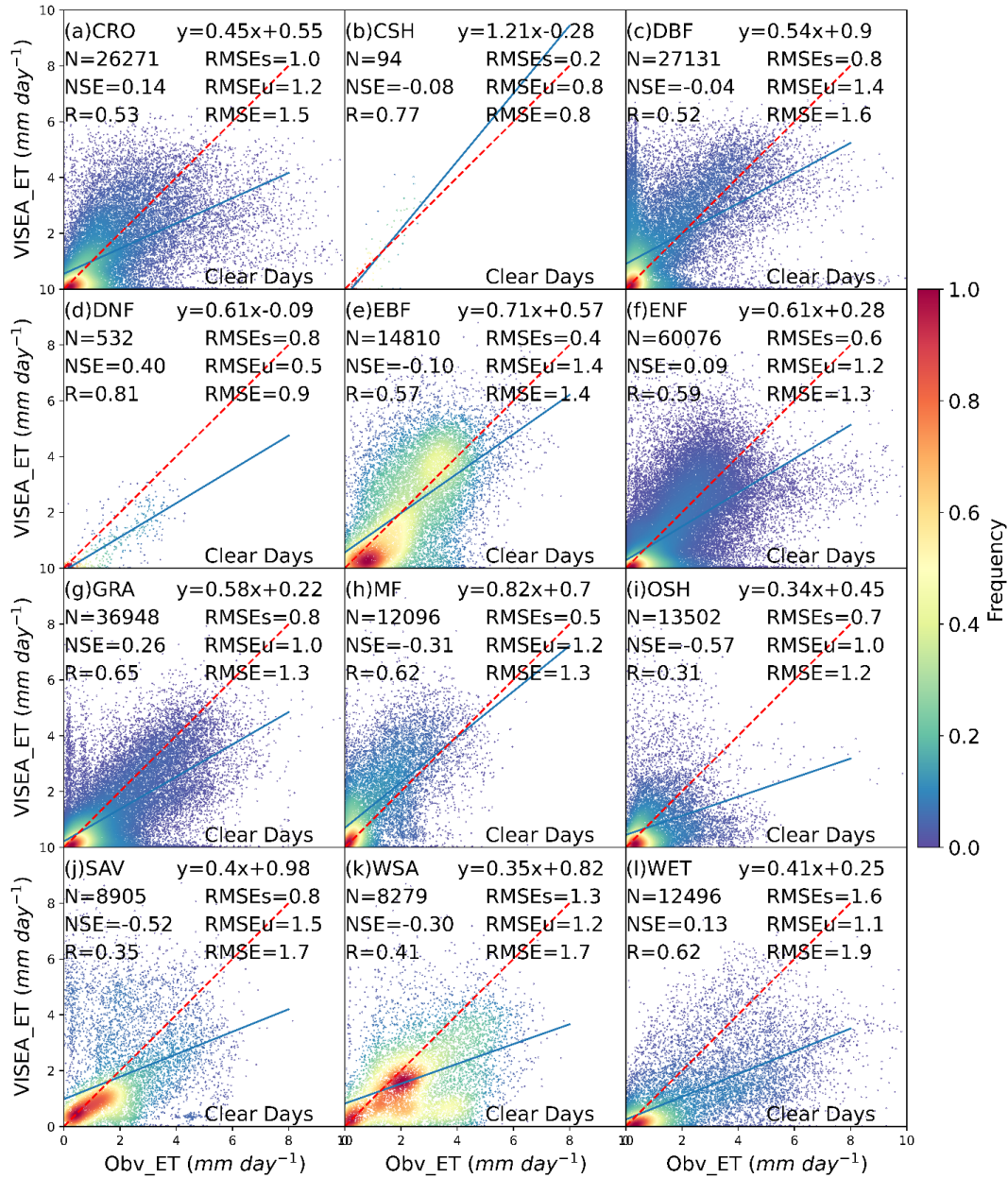


Figure S4. The scatter plot of daily simulated ET by VISEA (VISEA_ET) compared with local instruments measurements (Obv_ET) when MODIS land surface temperature is available (defined as clear days) under 12 IGBP land cover types: CRO (Croplands), CSH (Closed shrublands), DBF (Deciduous broadleaf forests), DNF (Deciduous needle leaf forests), EBF (Evergreen broadleaf forests), ENF (Evergreen needle leaf forests), GRA (Grasslands), MF (Mixed forests), OSH (Open shrublands), SAV (Savannas), WSA (Woody savannas), WET (Permanent wetlands). The red dotted line is the 1:1 line. N is the number of data points, NSE is Nash-Sutcliffe Efficiency, R is correlation coefficients, RMSE is Root Mean Square Error, RMSEs is systematic RMSE, and RMSEu is unsystematic RMSE. The frequency denotes the probability density estimated through the Kernel Density Estimation, KDE method with a Gaussian kernel, and it is then scaled to ensure that the maximum value of the probability density function equals 1.

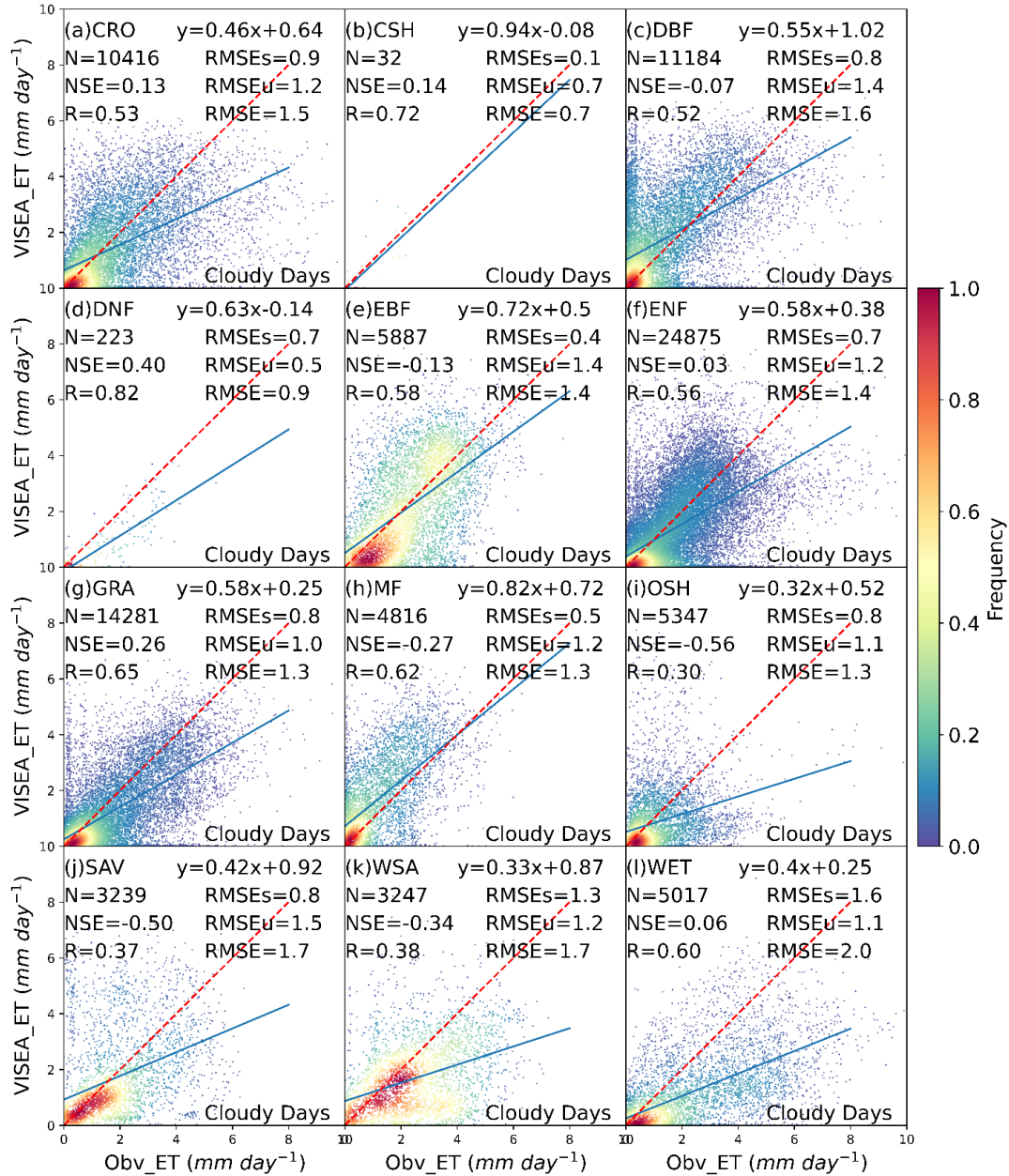


Figure S5. The scatter plot of daily ET simulated by VISEA (VISEA_ET) compared with local instruments measurements (Obsv_ET) when the MODIS land surface temperature is not available (we define as cloudy days) under 12 IGBP land cover types: CRO (Croplands), CSH (Closed shrublands), DBF (Deciduous broadleaf forests), DNF (Deciduous needle leaf forests), EBF (Evergreen broadleaf forests), ENF (Evergreen needle leaf forests), GRA (Grasslands), MF (Mixed forests), OSH (Open shrublands), SAV (Savannas), WSA (Woody savannas), WET (Permanent wetlands). The red dotted line is the 1:1 line. N is the number of data points, NSE is Nash-Sutcliffe Efficiency, R is correlation coefficients, RMSE is Root Mean Square Error, RMSEs is systematic RMSE, and RMSEu is unsystematic RMSE. The frequency denotes the probability density estimated through the Kernel Density Estimation, KDE method with a Gaussian kernel, and it is then scaled to ensure that the maximum value of the probability density function equals 1.

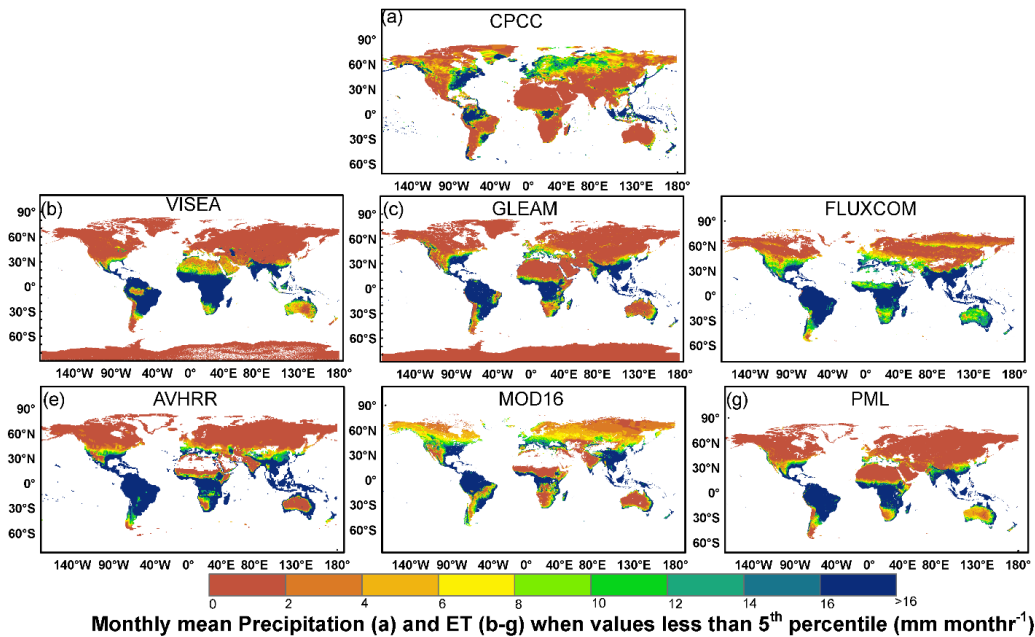


Figure S6. Monthly mean precipitation (a) and ET (b-g) when values less than 5th percentile (mm month^{-1}) (a) GPCC (2001-2019), (b) VISEA (2001-2020), (c) GLEAM (2001-2020), (d) FLUXCOM (2001-2016), (e) AVHRR (2001-2006), (f) MOD16 (2001-2014) and (g) PML (2003-2018).

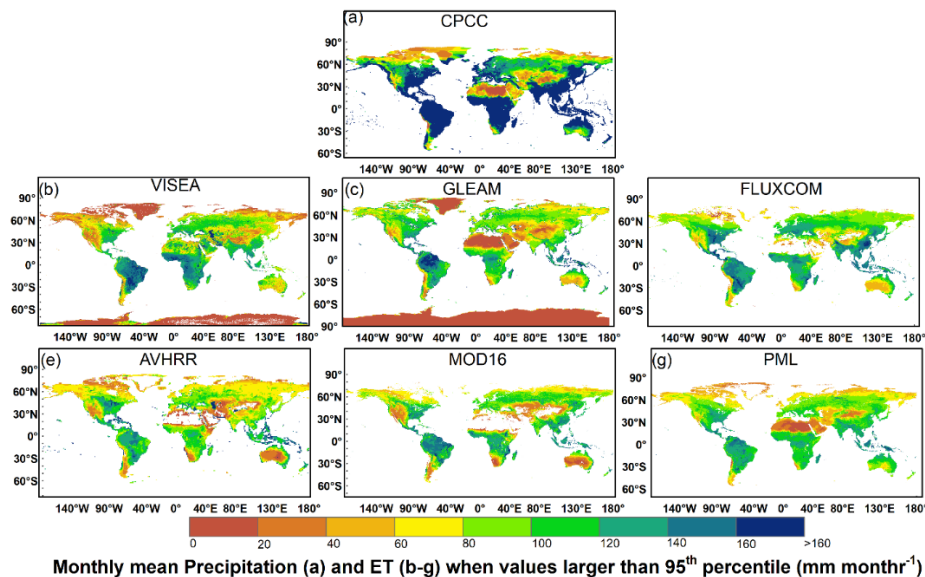


Figure S7. Monthly mean precipitation (a) and ET (b-g) when values large than 95th percentile (mm month^{-1}) (a) GPCC (2001-2019), (b) VISEA (2001-2020), (c) GLEAM (2001-2020), (d) FLUXCOM (2001-2016), (e) AVHRR (2001-2006), (f) MOD16 (2001-2014) and (g) PML (2003-2018).