



Global Hydrological Cycle

Supporting Information for

Vapour pressure deficit is the main driver of tree canopy conductance across biomes

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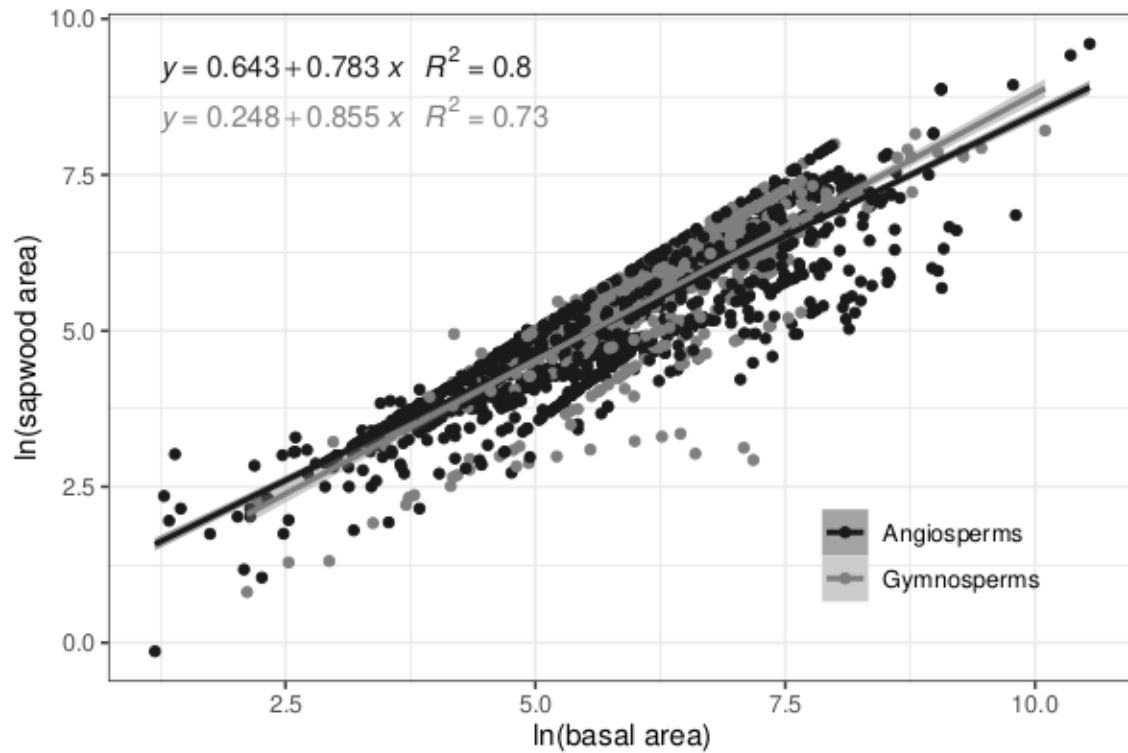


Figure S1: SAPFLUXNET global scaling relationship between basal area and sapwood area. Basal area and sapwood area are both in cm^2 . Shaded areas are 95% model confidence interval.

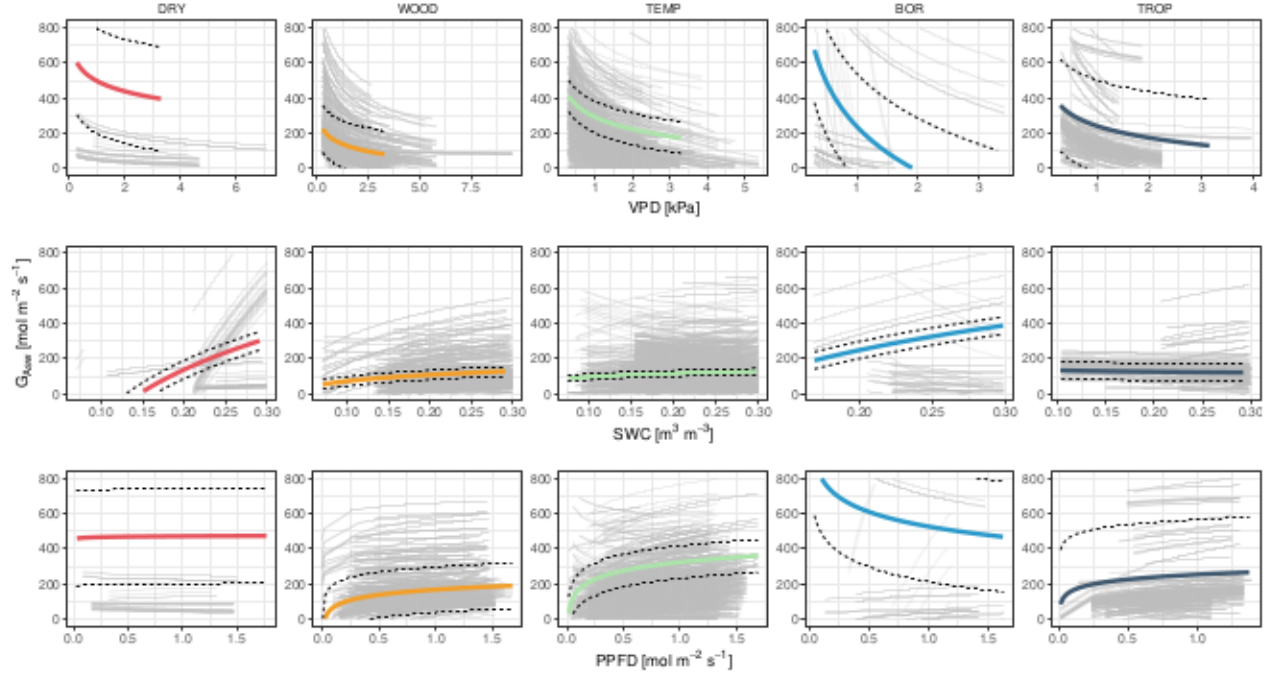


Figure S2: Log relationships of the three environmental variables estimated with the FULL model (VPD + SWC + PPFD) and grouped by biome. Coloured lines are biome-averaged models calculated from LMM predictions with $G_{A_{sw}}$ as response variable and the neperian logarithm of the environmental constrains as explanatory variables. Dashed line shows standard error of the average models calculated with bootstrap prediction using 100 simulations.

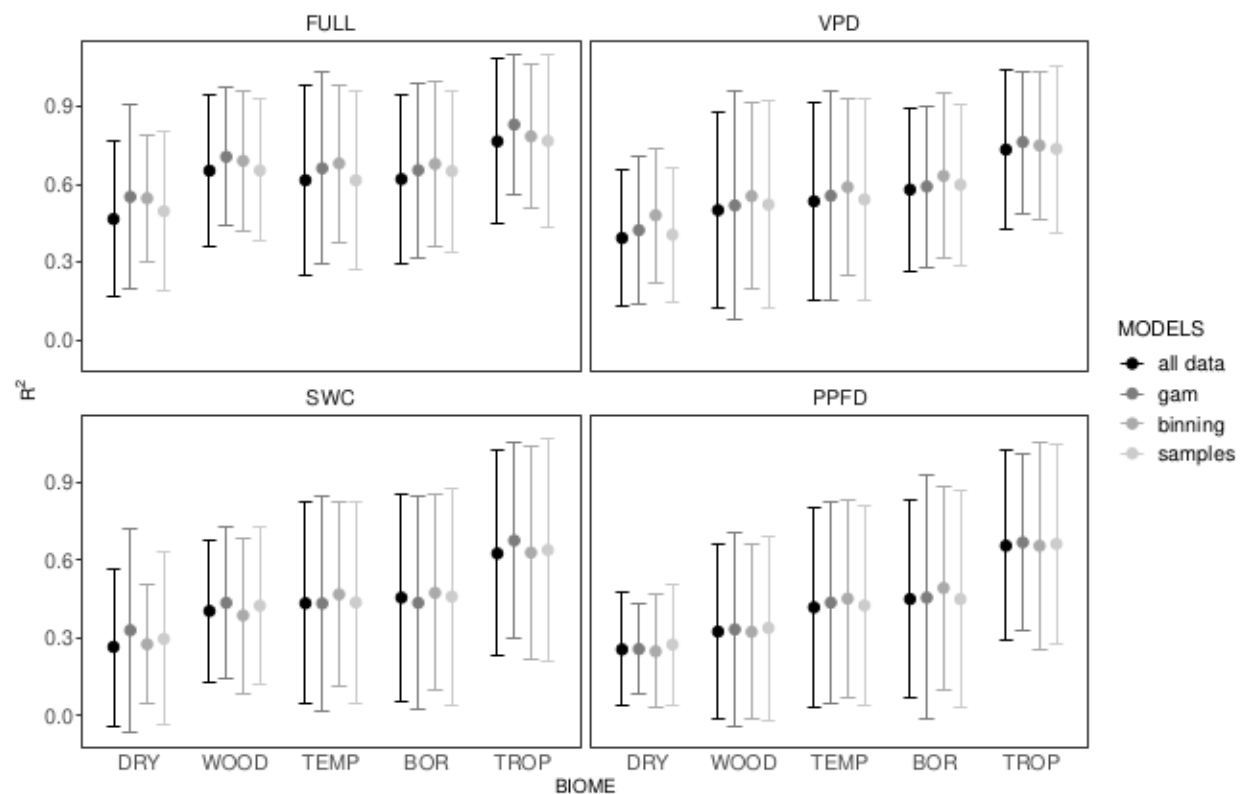


Figure S3: Comparison of biomes R^2_{FULL} (VPD + SWC + PPFD), R^2_{VPD} (VPD), R^2_{SWC} (SWC) and R^2_{PPFD} (PPFD) calculated with the four modelling approaches: using linear mixed models on all data, binned data and sampled data and, using GAM models on all data. Dots are mean values for each biome and error bars represent two standard deviations. There were no intra-biome significant differences among models.

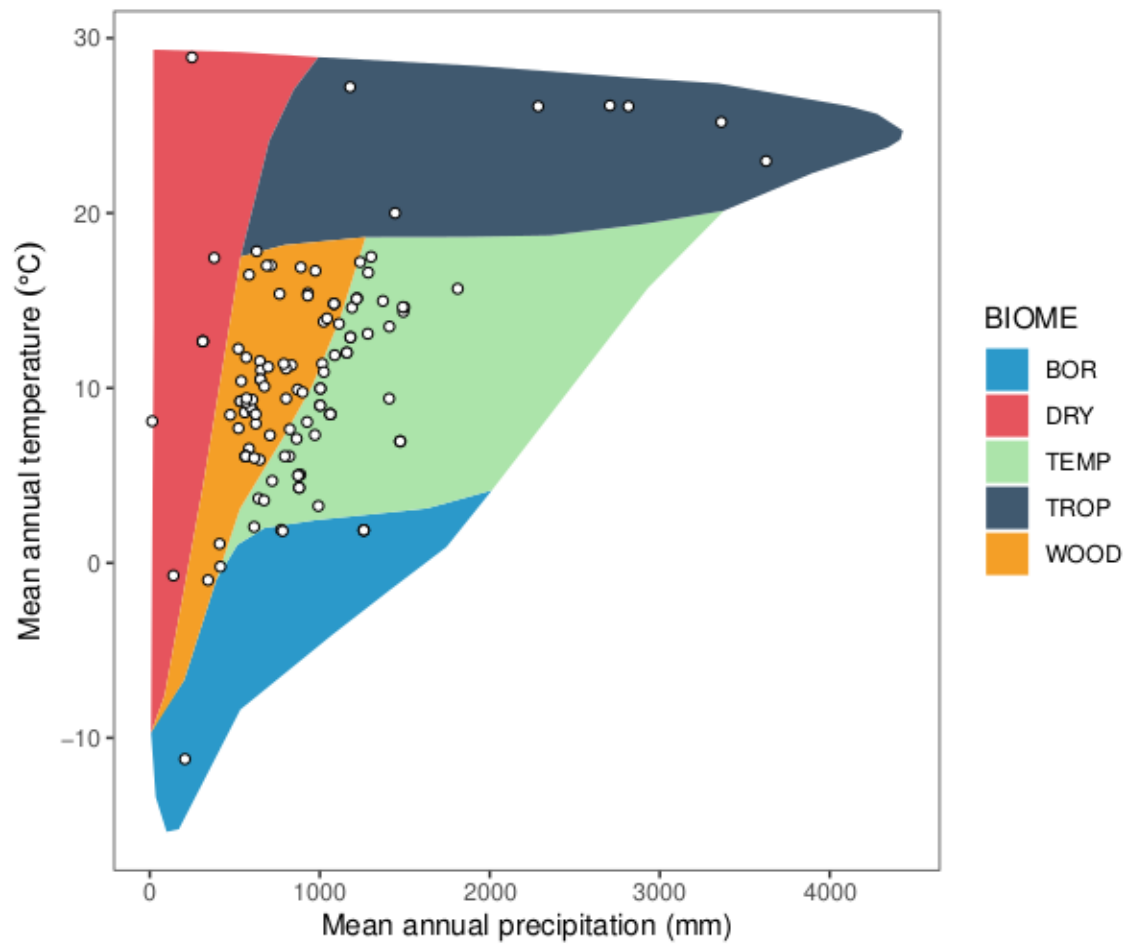


Figure S4: Bioclimatic distribution of the SAPFLUXNET datasets used in the study. Points show the different datasets in a Whittaker diagram showing the classification of the aggregated biomes used in the study.

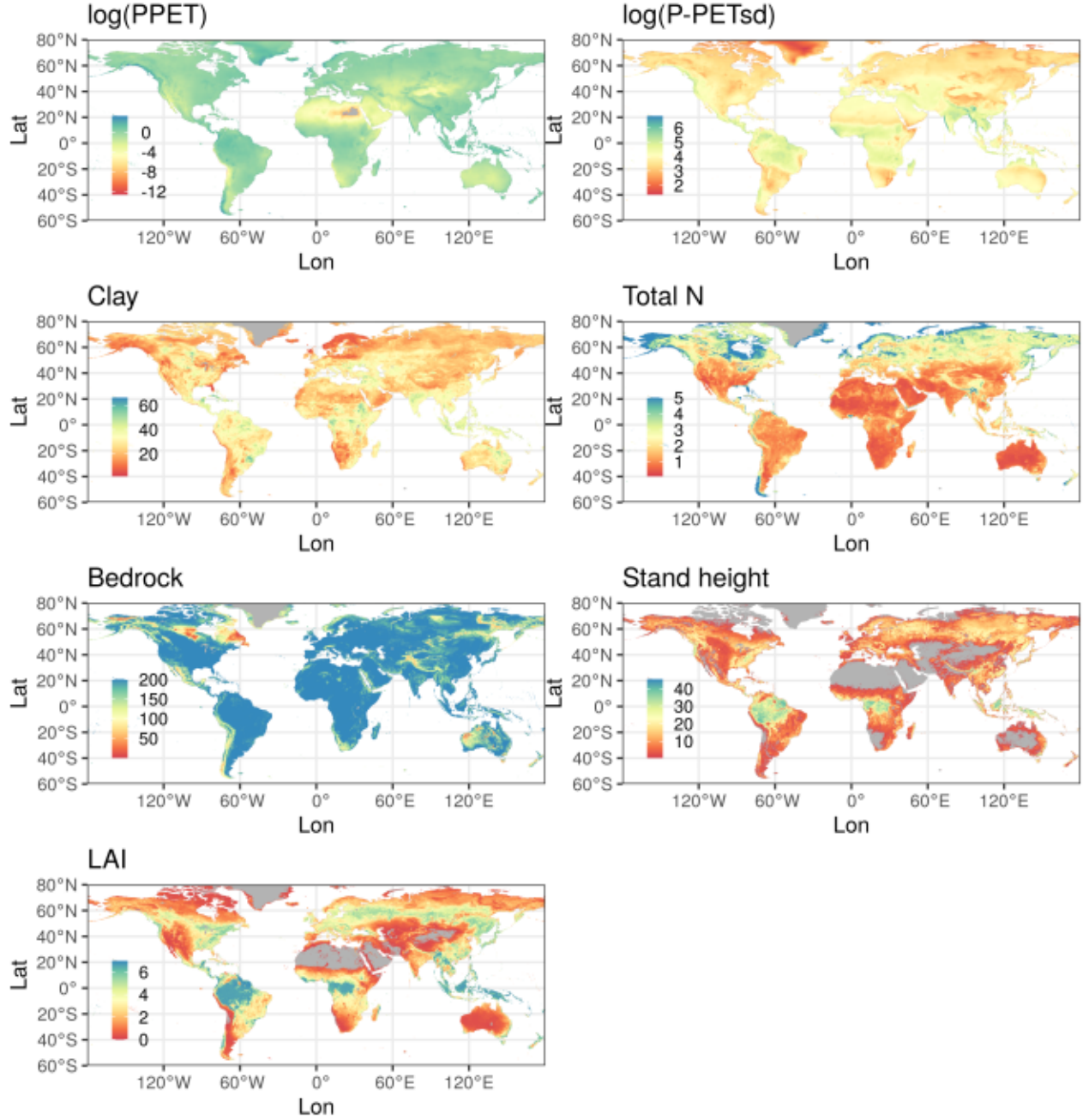


Figure S5: Global projection of climatic, soil and stand structure variables. $\log(\text{PPET})$: logarithm of precipitation over potential evapotranspiration [$\log(\text{mm mm}^{-1})$]; $\log(\text{P-PET}_{\text{sd}})$: logarithm of the standard deviation of the difference between precipitation and potential evapotranspiration [$\log(\text{mm})$]; Clay: percentage of clay in the soil; Total N: total nitrogen in the soil [g kg^{-1}]; Bedrock [cm]; Stand height [m]; LAI: leaf area index [$\text{m}^2 \text{m}^{-2}$]. Total N values above 5 g kg^{-1} were truncated.

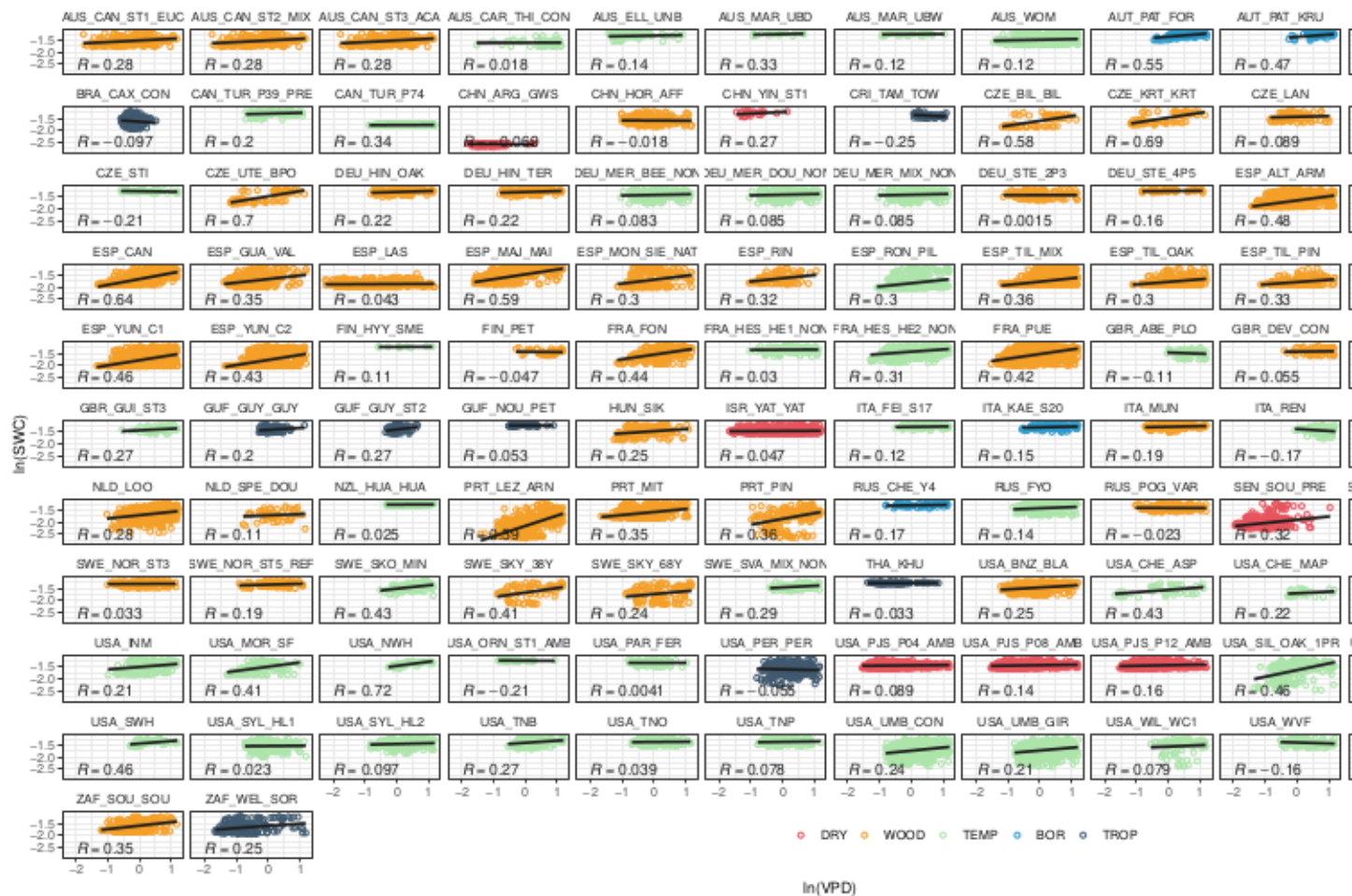


Figure S6: Correlations at the site level between VPD and SWC. R values are Pearson correlations. Different colors indicate different biomes; WOOD: woodlands and shrublands; TEMP: temperate biomes; BOR: boreal and tundra; TROP: tropical biomes.

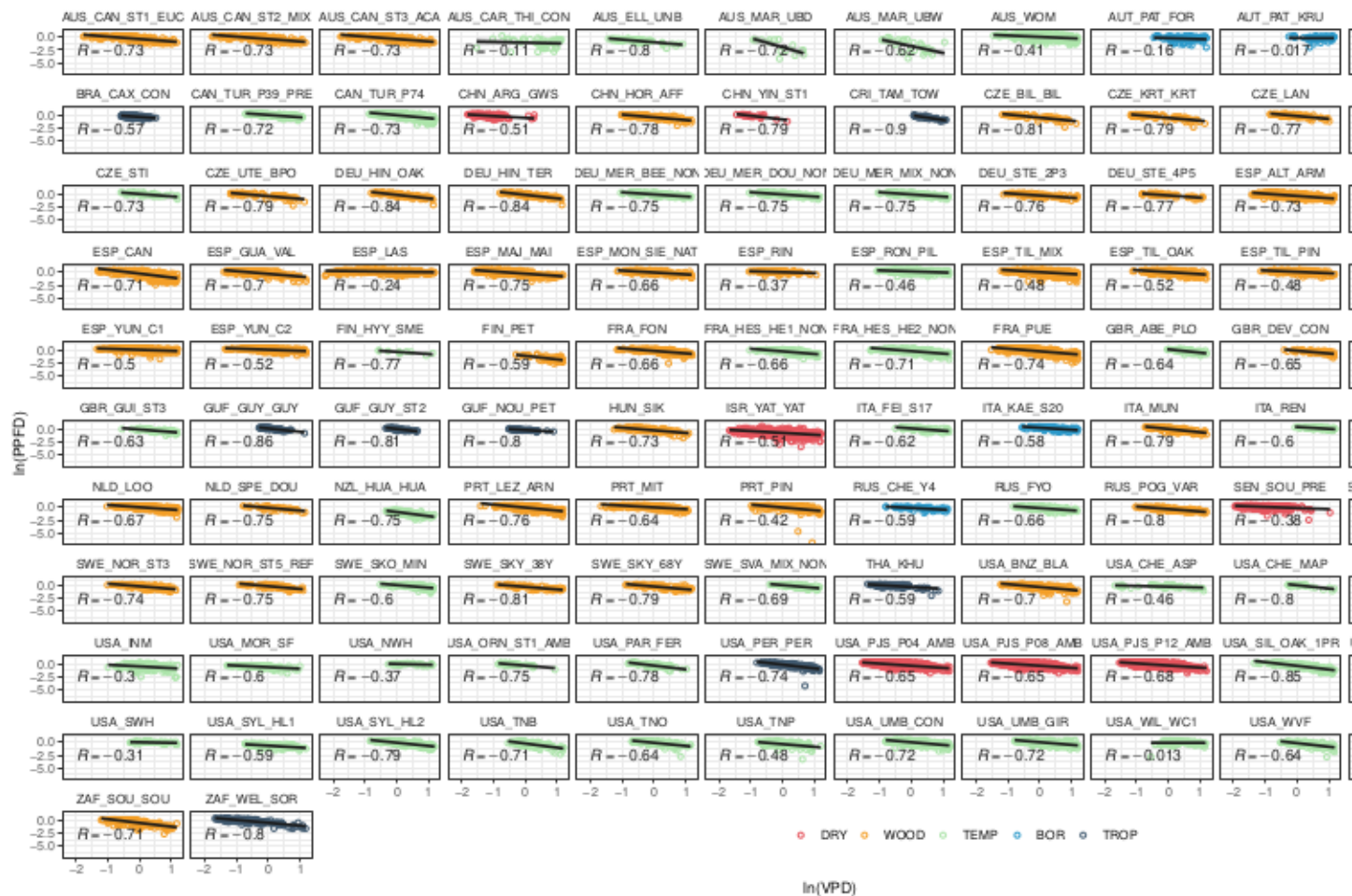


Figure S7: Correlations at the site level between VPD and PPFD. R values are Pearson correlations. Different colors indicate different biomes; WOOD: woodlands and shrublands; TEMP: temperate biomes; BOR: boreal and tundra; TROP: tropical biomes.

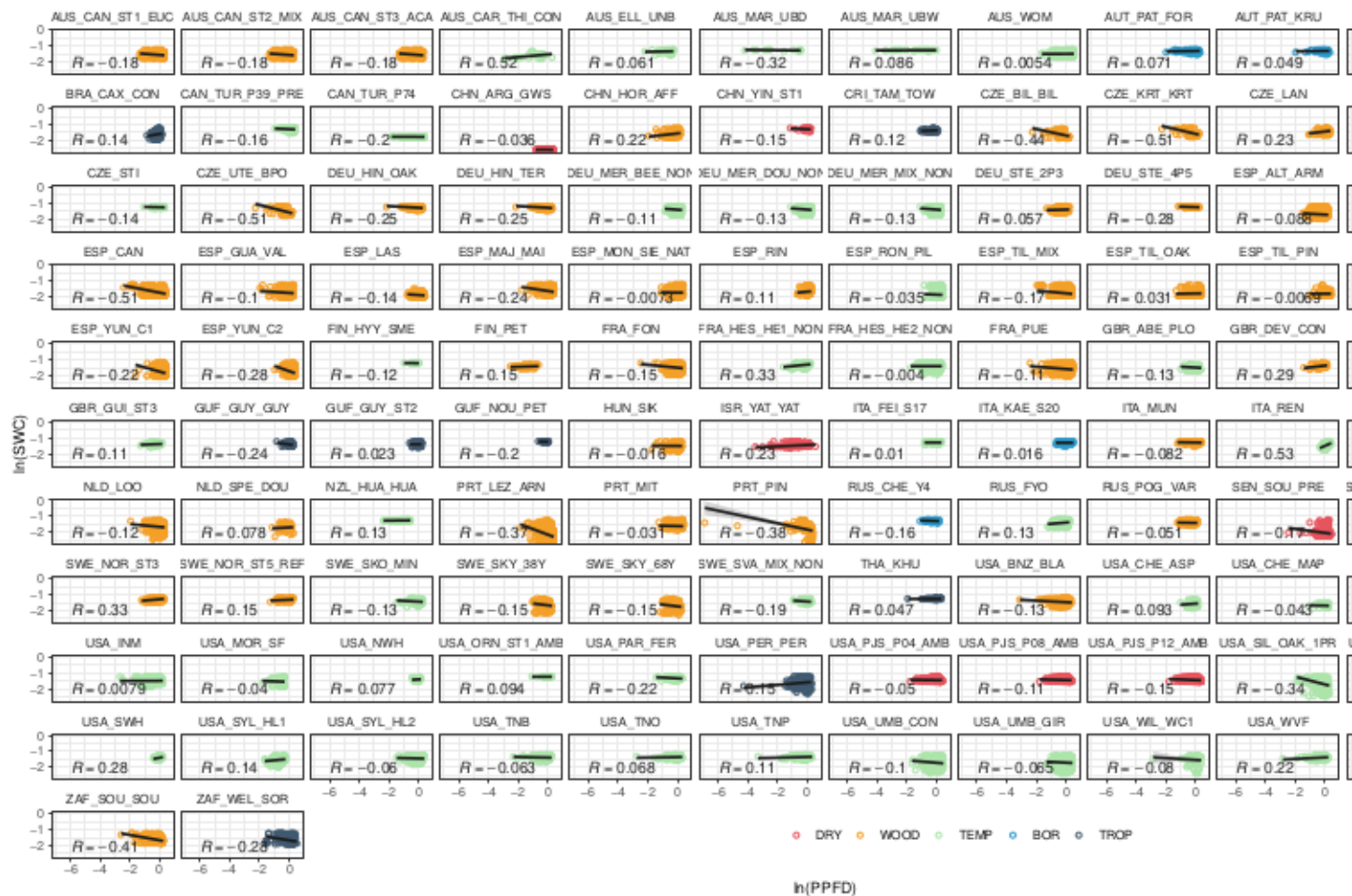


Figure S8: Correlations at the site level between PPFD and SWC. R values are Pearson correlations. Different colors indicate different biomes; WOOD: woodlands and shrublands; TEMP: temperate biomes; BOR: boreal and tundra; TROP: tropical biomes.

Table S1: SAPFLUXNET stand treatments included in the this study.

Plot treatment
NA
None
Control
control
Ambient Control
Control - Unthinned
natural conditions
Reference
1Premortality
2premortality
distructive sampling
Girdling early successional
Pre-thinning
Before thinning
Before Thinning
non thinned
none (periodict thinning every 5-6 years 20 to 25% of basal area)
Radiation Level
AMBIENT CO2 FACE rings
fertilization at plantation
AcaciaMonoculture
MixtureEucalyptusAndAcacia
EucalyptusMonoculture
Pre Irrigation

Table S2: SAPFLUXNET sites included in the study. Biome was estimated using a Whittaker diagram. *Indicates that the biome was manually adjusted and confirmed by SAPFLUXNET contributors.

Site code	Latitude	Longitude	Biome	# Tree-days	# Species	# Trees
AUS_CAN_ST1_EUC	-37.58	149.17	WOOD	500	1	12
AUS_CAN_ST2_MIX	-37.58	149.17	WOOD	1077	2	22
AUS_CAN_ST3_ACA	-37.58	149.17	WOOD	609	1	12
AUS_CAR_THI_CON	-38.38	146.68	TEMP	69	1	3
AUS_ELL_UNB	-36.78	146.58	TEMP	140	1	2
AUS_MAR_UBD	-37.69	145.56	TEMP	32	2	2
AUS_MAR_UBW	-37.89	145.57	TEMP	121	3	5
AUS_WOM	-37.42	144.09	TEMP	4454	2	11
AUT_PAT_FOR	47.21	11.45	BOR	286	1	3
AUT_PAT_KRU	47.21	11.45	BOR	105	1	2
AUT_PAT_TRE	47.21	11.45	BOR	133	1	3
BRA_CAM	-22.69	-45.52	TROP*	89	1	5
BRA_CAX_CON	-1.79	-51.43	TROP	2406	8	15
CAN_TUR_P39_PRE	42.71	-80.36	TEMP	2225	1	18
CAN_TUR_P74	42.71	-80.35	TEMP	10586	1	16
CHN_ARG_GWS	41.38	89.94	DRY	300	1	2
CHN_HOR_AFF	42.72	122.37	WOOD	2786	1	16
CHN_YIN_ST1	42.45	85.72	DRY	122	1	5
CRI_TAM_TOW	10.39	-84.63	TROP	1266	17	26
CZE_BIL_BIL	49.25	16.69	TEMP*	400	1	6
CZE_KRT_KRT	49.32	16.75	TEMP*	435	1	6
CZE_LAN	48.68	16.95	TEMP*	1775	3	17
CZE_RAJ_RAJ	49.44	16.70	TEMP*	360	1	6
CZE_SOB_SOB	49.25	16.69	TEMP*	1727	1	6
CZE_STI	49.04	17.97	TEMP	348	1	8
CZE_UTE_BPO	49.28	16.65	TEMP*	456	1	6
DEU_HIN_OAK	53.33	13.19	TEMP*	864	1	8
DEU_HIN_TER	53.33	13.19	TEMP*	1954	2	16
DEU_MER_BEE_NON	49.27	7.81	TEMP	841	1	8
DEU_MER_DOU_NON	49.27	7.81	TEMP	895	1	7
DEU_MER_MIX_NON	49.27	7.81	TEMP	1945	2	17
DEU_STE_2P3	53.10	13.00	TEMP*	1228	1	10
DEU_STE_4P5	53.10	13.00	TEMP*	402	1	10
ESP_ALT_ARM	40.78	-2.33	WOOD	8306	3	15
ESP_ALT_HUE	40.79	-2.29	WOOD	3698	2	8
ESP_ALT_TRI	40.80	-2.23	WOOD	5411	2	12
ESP_CAN	41.43	2.07	WOOD	6871	4	21
ESP_GUA_VAL	40.90	-4.03	WOOD	3424	1	24
ESP_LAS	28.31	-16.57	WOOD	4406	1	10
ESP_MAJ_MAI	39.94	-5.77	WOOD	2833	1	6
ESP_MON_SIE_NAT	41.12	-3.50	WOOD	2587	3	20
ESP_RIN	40.60	-6.02	WOOD	770	1	8
ESP_RON_PIL	36.69	-5.02	TEMP	4114	2	12
ESP_TIL_MIX	41.33	1.01	WOOD	15699	2	32
ESP_TIL_OAK	41.33	1.01	WOOD	2381	1	10
ESP_TIL_PIN	41.33	1.01	WOOD	1976	1	9
ESP_VAL_BAR	42.20	1.82	WOOD	1394	1	12
ESP_VAL_SOR	42.20	1.81	WOOD	1943	1	13
ESP_YUN_C1	36.72	-4.97	WOOD	2935	1	6
ESP_YUN_C2	36.72	-4.97	WOOD	830	1	6
FIN_HYY_SME	61.85	24.29	TEMP	10	1	1
FIN_PET	69.49	27.23	BOR*	216	1	7
FRA_FON	48.48	2.78	TEMP*	720	1	3
FRA_HES_HE1_NON	48.67	7.06	TEMP	1273	1	10
FRA_HES_HE2_NON	48.67	7.06	TEMP	4167	1	10
FRA_PUE	43.74	3.60	WOOD	23566	1	25
GBR_ABE_PLO	56.62	-3.80	TEMP	692	1	15
GBR_DEV_CON	56.03	-3.72	TEMP*	215	1	4
GBR_GUI_ST1	57.27	-4.82	TEMP	834	1	15

Table S2: SAPFLUXNET sites included in the study. Biome was estimated using a Whittaker diagram. *Indicates that the biome was manually adjusted and confirmed by SAPFLUXNET contributors. (continued)

Site code	Latitude	Longitude	Biome	# Tree-days	# Species	# Trees
GBR_GUI_ST2	57.27	-4.82	TEMP	621	1	9
GBR_GUI_ST3	57.27	-4.82	TEMP	444	1	8
GUF_GUY_GUY	5.28	-52.92	TROP	710	6	6
GUF_GUY_ST2	5.28	-52.91	TROP	885	7	11
GUF_NOU_PET	4.08	-52.68	TROP	923	10	22
HUN_SIK	47.93	20.44	WOOD	550	2	4
ISR_YAT_YAT	31.34	35.05	DRY	15766	1	24
ITA_FEI_S17	46.69	10.61	TEMP	378	1	6
ITA_KAE_S20	46.70	10.61	BOR	586	1	6
ITA_MUN	46.68	10.58	TEMP*	885	1	6
ITA_REN	46.59	11.43	TEMP	577	3	8
ITA_RUN_N20	46.70	10.64	BOR	766	2	8
MEX_COR_YP	19.49	-97.04	TEMP	113	1	7
NLD_LOO	52.17	5.74	TEMP*	3033	1	6
NLD_SPE_DOU	52.25	5.69	TEMP*	150	1	3
NZL_HUA_HUA	-36.80	174.49	TEMP	1107	1	6
PRT_LEZ_ARN	38.83	-8.82	WOOD	1764	1	4
PRT_MIT	38.54	-8.00	WOOD	1510	1	4
PRT_PIN	38.25	-8.76	WOOD	2991	2	20
RUS_CHE_Y4	68.74	161.41	BOR	587	1	11
RUS_FYO	56.46	32.92	TEMP	2338	3	17
RUS_POG_VAR	56.36	92.95	TEMP*	1290	3	9
SEN_SOU_PRE	16.34	-15.43	DRY	1706	1	3
SWE_NOR_ST1_BEF	60.09	17.48	TEMP*	843	2	22
SWE_NOR_ST2	60.09	17.48	TEMP*	194	2	6
SWE_NOR_ST3	60.09	17.48	TEMP*	1195	2	37
SWE_NOR_ST5_REF	60.08	17.48	TEMP*	1255	3	25
SWE_SKO_MIN	58.36	12.15	TEMP	1072	1	11
SWE_SKY_38Y	60.13	17.84	TEMP*	455	1	12
SWE_SKY_68Y	60.10	17.83	TEMP*	1046	2	12
SWE_SVA_MIX_NON	64.26	19.77	TEMP	1549	2	20
THA_KHU	15.27	103.08	TROP	1278	1	6
USA_BNZ_BLA	64.70	-148.32	BOR*	1705	1	6
USA_CHE_ASP	45.94	-90.27	TEMP	3995	6	142
USA_CHE_MAP	45.95	-90.26	TEMP	3378	2	145
USA_DUK_HAR	36.98	-79.09	TEMP	621	6	33
USA_HIL_HF2	36.22	-78.86	TEMP	263	5	22
USA_INM	39.32	-86.41	TEMP	1648	6	9
USA_MOR_SF	39.32	-86.41	TEMP	680	4	6
USA_NWH	34.58	-91.26	TEMP	525	2	10
USA_ORN_ST1_AMB	35.90	-84.33	TEMP	310	1	8
USA_PAR_FER	35.80	-76.67	TEMP	736	1	8
USA_PER_PER	30.21	-83.87	TROP	18180	1	80
USA_PJS_P04_AMB	34.39	-106.53	DRY	12129	2	10
USA_PJS_P08_AMB	34.39	-106.53	DRY	10754	2	10
USA_PJS_P12_AMB	34.39	-106.53	DRY	12528	2	10
USA_SIL_OAK_1PR	39.92	-74.60	TEMP	2304	4	18
USA_SIL_OAK_2PR	39.92	-74.60	TEMP	6790	4	22
USA_SMI_SER	38.89	-76.56	TEMP*	1733	5	30
USA_SWH	34.11	-91.13	TEMP	956	2	16
USA_SYL_HL1	46.24	-89.35	TEMP	8620	3	48
USA_SYL_HL2	46.24	-89.35	TEMP	3678	4	20
USA_TNB	36.47	-84.70	TEMP	1240	4	8
USA_TNO	35.97	-84.28	TEMP	1271	5	9
USA_TNP	35.96	-84.29	TEMP	1342	5	9
USA_UMB_CON	45.56	-84.71	TEMP	17923	5	57
USA_UMB_GIR	45.56	-84.70	TEMP	19175	4	57
USA_WIL_WC1	45.81	-90.09	TEMP	1306	5	16
USA_WVF	39.06	-79.69	TEMP	989	5	8

Table S2: SAPFLUXNET sites included in the study. Biome was estimated using a Whittaker diagram. *Indicates that the biome was manually adjusted and confirmed by SAPFLUXNET contributors. *(continued)*

Site code	Latitude	Longitude	Biome	# Tree-days	# Species	# Trees
ZAF_FRA_FRA	-33.88	19.06	WOOD	563	1	3
ZAF_RAD	-34.08	19.11	WOOD	660	1	3
ZAF_SOU_SOU	-34.09	19.09	WOOD	424	1	2
ZAF_WEL_SOR	-33.48	18.96	WOOD*	538	1	3

Table S3: Table of equivalence between Whittaker biomes and the groups of biomes used in the study.

Original biome name	Study biome group
Desert	DRY
Temperate grassland desert	DRY
Subtropical desert	DRY
Woodland/shrubland	WOOD
Temperate forest	TEMP
Boreal forest	BOR
Tundra	BOR
Tropical rainforest	TROP
Tropical seasonal forest/savanna	TROP

Table S4: Summary table of site level R_{VPD}^2 , R_{SWC}^2 , R_{PPFD}^2 , climate, soil properties and vegetation structure data. PPET is in $[mm\ mm^{-1}]$, P-PET_{sd} is in $[mm]$, Clay and Sand are in $[\%]$, Total N is in $[g\ kg^{-1}]$, Stand height is in $[m]$, LAI is in $[m_{leaves}^2\ m_{soil}^{-2}]$. Letters show data source: a = SAPFLUXNET, b = Global rasters, c = SAPFLUXNET plant height.

Site code	R_{VPD}^2	R_{SWC}^2	R_{PPFD}^2	Relimp VPD	Relimp SWC	Relimp PPFD	PPET	P - PET _{sd}	Clay	Sand	Total N	Bedrock
AUS_CAN_ST1_EUC	0.77	0.49	0.60	0.66	0.34	0.00	1.23	47.52	26.30 b	45.10 b	1.02	184
AUS_CAN_ST2_MIX	0.83	0.62	0.72	0.83	0.17	0.00	1.23	47.52	26.30 b	45.10 b	1.02	184
AUS_CAN_ST3_ACA	0.83	0.69	0.75	0.84	0.15	0.02	1.23	47.52	26.30 b	45.10 b	1.02	184
AUS_CAR_THI_CON	0.41	0.00	0.07	0.81	0.05	0.14	1.36	49.01	27.20 b	44.30 b	2.34	111
AUS_ELL_UNB	0.86	0.46	0.76	0.98	0.00	0.02	1.08	67.16	26.70 b	48.50 b	1.95	63
AUS_MAR_UBD	0.81	0.23	0.37	0.82	0.15	0.04	1.35	70.37	26.60 b	44.60 b	1.90	89
AUS_MAR_UBW	0.90	0.78	0.81	0.89	0.00	0.11	1.21	65.38	27.90 b	43.90 b	2.00	173
AUS_WOM	0.79	0.52	0.51	0.79	0.00	0.20	1.09	69.35	25.90 b	52.90 b	1.97	172
AUT_PAT_FOR	0.77	0.69	0.64	0.94	0.00	0.06	2.17	16.78	5.00 a	60.00 a	3.94	180
AUT_PAT_KRU	0.43	0.27	0.28	0.84	0.07	0.09	2.17	16.78	5.00 a	60.00 a	3.94	180
AUT_PAT_TRE	0.56	0.27	0.20	0.70	0.30	0.00	2.17	16.78	5.00 a	60.00 a	3.94	180
BRA_CAM	0.84	0.70	0.70	0.65	0.27	0.07	1.66	88.82	27.60 b	52.00 b	2.26	200
BRA_CAX_CON	0.75	0.68	0.68	0.73	0.00	0.27	1.90	122.90	8.00 a	79.00 a	1.45	197
CAN_TUR_P39_PRE	0.49	0.33	0.31	0.72	0.09	0.19	1.39	42.08	1.00 a	98.00 a	1.58	200
CAN_TUR_P74	0.21	0.32	0.16	0.31	0.33	0.35	1.39	41.87	1.00 a	98.00 a	1.60	200
CHN_ARG_GWS	0.45	0.34	0.35	0.52	0.45	0.03	0.01	63.51	17.70 b	46.00 b	0.70	172
CHN_HOR_AFF	0.37	0.33	0.32	0.51	0.47	0.01	0.59	31.24	8.00 a	83.00 a	1.00	200
CHN_YIN_ST1	0.46	0.46	0.44	0.48	0.41	0.11	0.19	35.09	20.80 b	32.90 b	2.41	148
CRI_TAM_TOW	0.68	0.68	0.67	0.47	0.15	0.37	3.57	159.99	36.10 b	34.70 b	2.75	200
CZE_BIL_BIL	0.53	0.53	0.41	0.52	0.20	0.29	0.71	28.98	29.60 b	27.40 b	1.91	200
CZE_KRT_KRT	0.61	0.50	0.30	0.62	0.04	0.34	0.85	27.00	26.00 b	27.40 b	2.10	200
CZE_LAN	0.74	0.73	0.69	0.67	0.07	0.26	0.66	37.49	17.80 a	71.80 a	2.46	200
CZE_RAJ_RAJ	0.35	0.36	0.39	0.37	0.03	0.60	0.99	26.14	21.80 b	33.90 b	1.96	200
CZE_SOB_SOB	0.40	0.43	0.13	0.49	0.30	0.21	0.71	28.98	29.60 b	27.40 b	1.91	200
CZE_ST1	0.52	0.36	0.43	0.69	0.23	0.09	1.13	27.10	34.20 a	47.60 a	1.65	200
CZE_UTE_BPO	0.64	0.67	0.53	0.41	0.17	0.42	0.75	29.86	26.70 b	23.80 b	2.71	200
DEU_HIN_OAK	0.36	0.18	0.29	0.93	0.06	0.01	0.95	35.10	17.90 b	49.90 b	2.42	200
DEU_HIN_TER	0.22	0.17	0.18	0.74	0.02	0.24	0.95	35.10	18.00 b	50.50 b	2.05	200
DEU_MER_BEE_NON	0.38	0.25	0.27	0.80	0.05	0.15	1.48	47.33	4.00 a	71.00 a	2.56	200
DEU_MER_DOU_NON	0.38	0.25	0.18	0.58	0.29	0.14	1.48	47.33	4.00 a	71.00 a	2.56	200
DEU_MER_MIX_NON	0.35	0.21	0.25	0.85	0.01	0.14	1.48	47.33	4.00 a	71.00 a	2.56	200
DEU_STE_2P3	0.48	0.14	0.25	0.84	0.08	0.08	0.90	37.45	2.50 a	92.50 a	3.28	200
DEU_STE_4P5	0.45	0.28	0.33	0.64	0.32	0.04	0.90	37.45	2.50 a	92.50 a	3.28	200
ESP_ALT_ARM	0.44	0.39	0.29	0.77	0.19	0.04	0.66	65.80	21.90 b	41.50 b	1.27	187
ESP_ALT_HUE	0.42	0.27	0.22	0.77	0.00	0.23	0.51	63.08	21.60 b	35.90 b	1.46	200
ESP_ALT_TRI	0.48	0.42	0.26	0.67	0.21	0.13	0.57	63.48	21.00 b	40.00 b	1.31	196
ESP_CAN	0.51	0.44	0.35	0.62	0.09	0.28	0.94	46.91	32.90 b	28.30 b	1.76	179
ESP_GUA_VAL	0.50	0.30	0.25	0.71	0.00	0.29	0.68	69.09	24.80 b	40.90 b	1.27	200
ESP_LAS	0.24	0.26	0.07	0.43	0.45	0.13	1.63	37.89	1.00 a	70.00 a	1.65	197
ESP_MAJ_MAI	0.53	0.47	0.28	0.69	0.15	0.16	0.76	97.45	9.00 a	80.00 a	1.18	200
ESP_MON_SIE_NAT	0.38	0.33	0.40	0.49	0.05	0.45	0.62	63.05	20.80 b	41.90 b	1.45	200
ESP_RIN	0.82	0.61	0.60	0.96	0.00	0.04	0.85	76.30	15.00 a	9.00 a	2.17	200
ESP_RON_PIL	0.34	0.26	0.16	0.59	0.11	0.31	1.05	93.66	18.00 a	30.00 a	1.86	200
ESP_TIL_MIX	0.40	0.42	0.30	0.43	0.17	0.40	0.77	48.10	20.00 a	60.00 a	1.44	162
ESP_TIL_OAK	0.16	0.37	0.18	0.29	0.35	0.37	0.77	48.10	20.00 a	60.00 a	1.44	162
ESP_TIL_PIN	0.20	0.39	0.06	0.28	0.55	0.17	0.79	48.10	20.00 a	60.00 a	1.78	188

Table S4: Summary table of site level R^2_{VPD} , R^2_{SWC} , R^2_{PPFD} , climate, soil properties and vegetation structure data. PPET is in $[mm\ mm^{-1}]$, P-PET_{sd} is in $[mm]$, Clay and Sand are in $[\%]$, Total N is in $[g\ kg^{-1}]$, Stand height is in $[m]$, LAI is in $[m^2_{leaves}\ m^{-2}_{soil}]$. Letters show data source: a = SAPFLUXNET, b = Global rasters, c = SAPFLUXNET plant height. (continued)

Site code	R^2_{VPD}	R^2_{SWC}	R^2_{PPFD}	Relimp VPD	Relimp SWC	Relimp PPFD	PPET	P - PET _{sd}	Clay	Sand	Total N	Bedrock
ESP_VAL_BAR	0.56	0.24	0.27	0.87	0.00	0.13	0.70	34.07	32.63 a	9.81 a	1.94	200
ESP_VAL_SOR	0.50	0.32	0.26	0.66	0.10	0.24	0.78	32.15	20.00 a	60.00 a	2.04	200
ESP_YUN_C1	0.29	0.44	0.17	0.17	0.67	0.16	0.83	93.65	29.00 a	22.00 a	1.37	197
ESP_YUN_C2	0.27	0.61	0.24	0.22	0.43	0.35	0.78	91.33	29.00 a	22.00 a	1.37	188
FIN_HYY_SME	0.51	0.01	0.10	0.61	0.10	0.29	1.20	38.32	6.50 a	37.00 a	1.67	200
FIN_PET	0.63	0.63	0.58	0.40	0.60	0.01	1.13	26.34	7.30 b	60.80 b	5.08	200
FRA_FON	0.68	0.62	0.64	0.72	0.22	0.06	0.89	45.10	19.00 a	37.00 a	1.26	200
FRA_HES_HE1_NON	0.42	0.53	0.43	0.41	0.26	0.33	1.31	47.72	25.00 a	8.00 a	1.41	200
FRA_HES_HE2_NON	0.25	0.35	0.12	0.45	0.27	0.28	1.31	47.72	25.00 a	8.00 a	1.41	200
FRA_PUE	0.40	0.47	0.27	0.46	0.27	0.27	1.27	70.16	39.00 a	26.00 a	1.69	195
GBR_ABE_PLO	0.28	0.26	0.21	0.51	0.23	0.25	1.92	47.48	10.00 a	60.00 a	3.70	179
GBR_DEV_CON	0.88	0.48	0.62	0.93	0.04	0.04	1.43	44.38	14.80 b	56.90 b	3.44	200
GBR_GUI_ST1	0.80	0.78	0.77	0.58	0.01	0.41	3.19	68.11	3.70 b	80.40 b	14.26	197
GBR_GUI_ST2	0.59	0.55	0.47	0.59	0.06	0.35	3.19	68.11	3.70 b	80.40 b	14.26	197
GBR_GUI_ST3	0.82	0.81	0.77	0.66	0.03	0.31	3.19	68.11	3.70 b	80.40 b	14.26	197
GUF_GUY_GUY	0.96	0.90	0.93	0.82	0.07	0.11	2.88	135.18	43.00 a	48.00 a	1.53	200
GUF_GUY_ST2	0.79	0.78	0.75	0.46	0.49	0.04	3.02	141.34	43.20 a	47.80 a	1.66	200
GUF_NOU_PET	0.81	0.55	0.71	1.00	0.00	0.00	2.69	158.16	59.20 a	33.20 a	2.22	200
HUN_SIK	0.79	0.36	0.48	0.93	0.01	0.06	0.70	39.64	30.40 b	44.00 b	1.64	200
ISR_YAT_YAT	0.28	0.32	0.14	0.43	0.57	0.00	0.28	83.43	28.00 a	31.00 a	0.71	178
ITA_FEI_S17	0.54	0.39	0.30	0.68	0.13	0.19	1.08	22.97	8.00 a	76.00 a	3.11	117
ITA_KAE_S20	0.62	0.47	0.47	0.72	0.06	0.22	1.24	22.97	17.00 a	50.00 a	3.64	121
ITA_MUN	0.56	0.39	0.42	0.74	0.22	0.04	0.80	29.87	7.00 a	55.00 a	1.93	188
ITA_REN	0.79	0.73	0.74	0.99	0.00	0.01	1.61	12.59	17.70 b	47.90 b	2.73	143
ITA_RUN_N20	0.78	0.71	0.71	0.88	0.00	0.12	1.39	15.28	14.00 a	54.00 a	3.33	123
MEX_COR_YP	0.68	0.23	0.31	0.79	0.05	0.16	1.42	81.77	22.20 b	46.40 b	2.94	200
NLD_LOO	0.18	0.12	0.12	0.79	0.00	0.21	1.33	41.67	1.00 a	99.00 a	2.61	200
NLD_SPE_DOU	0.75	0.59	0.63	0.85	0.03	0.12	1.42	39.80	4.80 b	80.70 b	1.62	200
NZL_HUA_HUA	0.65	0.61	0.59	0.70	0.15	0.15	2.62	42.52	71.20 a	13.20 a	1.73	200
PRT_LEZ_ARN	0.59	0.28	0.27	0.78	0.01	0.21	0.72	77.42	5.04 a	90.38 a	1.52	200
PRT_MIT	0.66	0.55	0.32	0.61	0.33	0.06	0.51	80.80	16.10 b	64.50 b	1.33	200
PRT_PIN	0.65	0.55	0.38	0.65	0.32	0.02	0.76	74.76	16.60 b	61.20 b	1.26	200
RUS_CHE_Y4	0.32	0.22	0.24	0.94	0.00	0.06	0.62	34.23	21.10 b	23.20 b	4.96	200
RUS_FYO	0.61	0.56	0.54	0.81	0.02	0.17	1.24	30.87	18.20 b	48.80 b	3.77	198
RUS_POG_VAR	0.70	0.50	0.58	0.81	0.00	0.19	0.70	33.02	28.60 b	37.50 b	2.64	200
SEN_SOU_PRE	0.64	0.40	0.22	0.66	0.34	0.01	0.13	43.94	6.00 a	90.00 a	0.23	200
SWE_NOR_ST1_BEf	0.74	0.65	0.64	0.61	0.28	0.10	1.07	36.70	5.80 a	58.60 a	2.63	185
SWE_NOR_ST2	0.32	0.29	0.23	0.55	0.02	0.44	1.07	36.70	5.80 a	58.60 a	2.63	185
SWE_NOR_ST3	0.55	0.59	0.56	0.48	0.22	0.30	1.07	36.70	5.80 a	58.60 a	2.63	185
SWE_NOR_ST5_REF	0.53	0.56	0.53	0.48	0.20	0.32	1.07	36.55	19.20 b	43.50 b	2.83	190
SWE_SKO_MIN	0.71	0.70	0.67	0.52	0.04	0.44	1.60	45.86	17.30 b	52.00 b	2.48	133
SWE_SKY_38Y	0.34	0.43	0.37	0.05	0.94	0.00	1.39	33.61	21.70 b	43.80 b	3.93	184
SWE_SKY_68Y	0.35	0.53	0.34	0.05	0.83	0.11	1.30	33.80	18.90 b	46.50 b	4.15	184
SWE_SVA_MIX_NON	0.65	0.54	0.57	0.78	0.22	0.00	1.33	34.34	0.50 a	92.50 a	1.67	200
THA_KHU	0.50	0.41	0.41	0.78	0.21	0.01	0.83	84.24	10.00 a	65.00 a	0.75	200
USA_BNZ_BLA	0.52	0.37	0.46	0.68	0.21	0.10	0.69	33.86	10.30 b	36.80 b	2.57	200
USA_CHE_ASP	0.67	0.32	0.30	0.91	0.03	0.06	1.23	20.06	12.00 a	74.00 a	1.52	200

Table S4: Summary table of site level R^2_{VPD} , R^2_{SWC} , R^2_{PPFD} , climate, soil properties and vegetation structure data. PPET is in $[mm\ mm^{-1}]$, P-PET_{sd} is in $[mm]$, Clay and Sand are in $[\%]$, Total N is in $[g\ kg^{-1}]$, Stand height is in $[m]$, LAI is in $[m^2_{leaves}\ m^2_{soil}]$. Letters show data source: a = SAPFLUXNET, b = Global rasters, c = SAPFLUXNET plant height. (continued)

Site code	R^2_{VPD}	R^2_{SWC}	R^2_{PPFD}	Relimp VPD	Relimp SWC	Relimp PPFD	PPET	P - PET _{sd}	Clay	Sand	Total N	Bedrock
USA_CHE_MAP	0.57	0.52	0.52	0.76	0.06	0.18	1.22	19.85	6.63 a	59.31 a	2.54	200
USA_DUK_HAR	0.72	0.62	0.67	0.91	0.02	0.07	1.12	41.33	33.90 b	31.00 b	0.76	200
USA_HIL_HP2	0.75	0.71	0.74	0.61	0.00	0.39	1.14	37.46	26.00 a	43.00 a	0.71	200
USA_INM	0.40	0.35	0.38	0.56	0.00	0.44	1.18	39.20	26.70 b	8.00 b	1.05	200
USA_MOR_SF	0.65	0.58	0.49	0.90	0.09	0.01	1.18	39.20	30.00 a	10.00 a	1.05	200
USA_NWH	0.88	0.85	0.73	0.80	0.04	0.15	1.05	59.56	36.70 b	4.90 b	0.80	200
USA_ORN_ST1_AMB	0.63	0.62	0.53	0.51	0.10	0.39	1.14	61.36	24.00 a	21.00 a	0.85	200
USA_PAR_FER	0.43	0.17	0.22	0.69	0.04	0.27	1.32	25.96	10.00 a	60.00 a	1.75	200
USA_PER_PER	0.55	0.30	0.37	0.85	0.01	0.14	1.32	34.41	3.40 b	89.20 b	6.13	200
USA_PJS_P04_AMB	0.31	0.09	0.26	0.74	0.03	0.23	0.25	49.32	6.00 a	52.00 a	0.82	186
USA_PJS_P08_AMB	0.33	0.10	0.22	0.94	0.03	0.03	0.25	49.32	3.00 a	49.00 a	0.82	186
USA_PJS_P12_AMB	0.28	0.14	0.15	0.63	0.37	0.00	0.25	49.32	6.00 a	54.00 a	0.82	186
USA_SIL_OAK_1PR	0.38	0.40	0.36	0.29	0.58	0.13	1.36	38.70	1.00 a	98.00 a	0.74	200
USA_SIL_OAK_2PR	0.39	0.32	0.36	0.92	0.06	0.01	1.36	38.70	1.00 a	98.00 a	0.74	200
USA_SMI_SER	0.51	0.37	0.37	0.67	0.32	0.01	1.03	40.05	28.70 b	30.90 b	0.82	200
USA_SWH	0.86	0.63	0.50	0.94	0.01	0.05	1.09	62.29	43.10 b	6.30 b	0.69	200
USA_SYL_HL1	0.46	0.36	0.38	0.97	0.03	0.00	1.27	25.01	8.90 b	51.00 b	1.41	200
USA_SYL_HL2	0.47	0.46	0.46	0.55	0.01	0.44	1.27	25.01	8.90 b	51.00 b	1.41	200
USA_TNB	0.25	0.27	0.24	0.41	0.12	0.46	1.39	48.33	21.60 b	34.90 b	0.84	200
USA_TNO	0.40	0.40	0.38	0.50	0.22	0.28	1.41	60.02	29.60 b	30.20 b	0.83	200
USA_TNP	0.33	0.36	0.31	0.40	0.37	0.23	1.41	61.60	31.60 b	26.60 b	0.81	200
USA_UMB_CON	0.51	0.39	0.38	0.79	0.03	0.18	1.30	30.60	1.00 a	92.00 a	2.02	200
USA_UMB_GIR	0.43	0.35	0.34	0.78	0.05	0.17	1.25	30.69	1.00 a	92.00 a	2.49	200
USA_WIL_WC1	0.33	0.18	0.16	0.82	0.16	0.02	1.19	20.23	6.90 b	53.20 b	1.01	200
USA_WVF	0.28	0.26	0.25	0.59	0.06	0.36	1.63	30.35	24.90 b	29.90 b	1.37	200
ZAF_FRA_FRA	0.43	0.08	0.14	0.92	0.00	0.08	0.90	99.17	20.00 b	69.90 b	0.95	200
ZAF_RAD	0.46	0.42	0.40	0.57	0.10	0.33	0.95	82.73	21.30 b	61.40 b	1.18	200
ZAF_SOU_SOU	0.39	0.22	0.21	0.59	0.06	0.35	0.97	86.39	23.00 b	61.90 b	1.13	200
ZAF_WEL_SOR	0.62	0.33	0.34	0.63	0.08	0.29	0.50	79.71	20.00 a	60.00 a	0.81	179