Supplementary Information: Global patterns of forest autotrophic carbon fluxes

Rebecca Banbury Morgan
Valentine Herrmann
Norbert Kunert
Ben Bond-Lamberty
Helene C. Muller-Landau
Kristina J. Anderson-Teixeira

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In general, table + figure captions should be longer, to explain all elements + make figures + tables interpretable on own. Say what models tested. when lines drawn,

Table S1. Climate variable definitions, sources, and abbreviations

Abbreviation	Climate variable	Units	Definition	Source
MAT	Mean annual temperature	°C	Annual mean temperature	Primary literature; WorldClim[1]
MAP	Mean annual precipitation	mm yr^{-1}	Annual mean precipitation	Primary literature; WorldClim[1]
T Seas	Temperature seasonality	°C	Standard deviation of MAT *100	WorldClim[1]
P Seas	Precipitation seasonality	percent	Coefficient of variation of MAP	WorldClim[1]
ART	Annual temperature range	°C	Maximum temperature of warmest month - minimum temperature of coldest month	WorldClim[1]
Solar R	Solar radiation	kJ $m^{-2}yr^{-1}$	Solar radiation	WorldClim2[2]
Cloud	Cloud cover	percent	Cloud percentage cover	CRU time-series dataset v 4.03[3]
AFD	Annual frost days	days yr^{-1}	Number of freeze days annually	CRU time-series dataset v 4.03[3]
AWD	Annual wet days	days yr^{-1}	Number of days with precipitation >0.1 mm annually	CRU time-series dataset v 4.03[3]
PET	Potential evapotranspiration	mm yr^{-1}	Mean annual potential evapotranspiration	Global Aridity Index and Potential Evapotranspiration Climate Database[4]
AI	Aridity		MAP/Mean annual PET	Global Aridity Index and Potential Evapotranspiration Climate Database[4]
VPD	Vapour pressure deficit	kPa	Vapour pressure deficit	TerraClimate[5]
Max VPD	Maximum vapour pressure deficit	kPa	Maximum vapour pressure deficit	Derived
WSM	Water stress months	months yr^{-1}	Number of months annually with MAP < PET	Derived
LGS	Length of growing season	months yr^{-1}	Number of months annually with mean minimum temperature > 0.5°C	Derived

[1] Hijmans et al. (2005) [2] Fick et al. (2017) [3] Harris et al. (2017) [4] Trabucco and Zomer (2019) [5] Abatzoglou et al. (2018)

are these adjusted r^2 values? They should be (for fair comparison of polynomial & linear models)

These are all univariate models, right? Say so in caption.

Table S2. Model details and R2 values for all climate variables tested

	Latitude		MAT		MAP		T Seas		P Seas		ATR		Solar R		AI	
Carbon flux	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared
GPP	Linear	0.6387	Linear	0.6094	Linear	0.1764	Polynomial	0.7076	-	-	Polynomial	0.6879	Linear	0.1554	-	-
NPP	Linear	0.5108	Linear	0.4171	Polynomial	0.2138	Polynomial	0.4905	-	-	Polynomial	0.4798	Polynomial	0.1634	Linear	0.03795
ANPP	Linear	0.4351	Linear	0.4444	Polynomial	0.1625	Polynomial	0.4126	-	-	Polynomial	0.3740	Linear	0.1061	Linear	0.04851
ANPP woody stem	Linear	0.1773	Linear	0.2396	-	-	Linear	0.1416	Polynomial	0.0538	Linear	0.1157	Linear	0.05048	Linear	0.06607
ANPP foliage	Linear	0.4999	Linear	0.5826	Polynomial	0.2509	Linear	0.4823	-	-	Linear	0.5033	Linear	0.172	Linear	0.1084
BNPP root	Linear	0.3373	Linear	0.2833	Polynomial	0.1452	Linear	0.3300	-	-	Polynomial	0.3185	Polynomial	0.2886	-	-
BNPP fine root	Linear	0.1704	Linear	0.1477	Linear	0.08935	Linear	0.1721	-	-	Linear	0.1790	Linear	0.1393	-	-
Autotrophic respiration	Linear	0.6534	Linear	0.5909	Polynomial	0.604	Linear	0.4873	-	-	Linear	0.4900	Linear	0.26	Polynomial	0.4804
Root respiration	Linear	0.2612	Linear	0.2418	Linear	0.1493	Linear	0.1510	-	-	Polynomial	0.2371	-	-	Linear	0.1567

	Cloud		AFD		AWD		PET		VPD		Max VPD		WSM		LGS	
Carbon flux	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared	Model	R-squared
GPP	-	-	Linear	0.5498	Linear	0.11	Polynomial	0.3602	Polynomial	0.3076	-	-	-	-	Linear	0.5312
NPP	Linear	0.0634	Linear	0.4036	Linear	0.1118	Polynomial	0.3165	Polynomial	0.178	-	-	Linear	0.03561	Linear	0.3782
ANPP	Polynomial	0.0906	Linear	0.3668	Linear	0.1732	Polynomial	0.2672	Polynomial	0.2294	Polynomial	0.0632	Polynomial	0.06269	Linear	0.3425
ANPP woody stem	Polynomial	0.0904	Linear	0.1380	-	-	Polynomial	0.2024	Polynomial	0.2146	Linear	0.07403	-	-	Linear	0.1041
ANPP foliage	-	-	Linear	0.5306	Linear	0.1469	Linear	0.3076	Polynomial	0.3751	Polynomial	0.07489	Polynomial	0.1724	Linear	0.4552
BNPP root	-	-	Linear	0.2799	Polynomial	0.1113	Polynomial	0.3601	Polynomial	0.2584	-	-	-	-	Linear	0.2550
BNPP fine root	-	-	Linear	0.1631	Linear	0.08161	Linear	0.1376	-	-	-	-	-	-	Linear	0.1335
Autotrophic respiration	-	-	Linear	0.5502	Linear	0.226	Linear	0.3298	Linear	0.2807	-	-	Linear	0.2613	Linear	0.4664
Root respiration	Linear	0.1578	Linear	0.1647	Linear	0.1698	Polynomial	0.1905	Polynomial	0.272	-	-	Linear	0.1388	Linear	0.1889

referred to in main text as simply BNPP

Clarify in caption that "polynomial" means 2nd order polynomial.

too many significant digits (reduces readability). Limit to 2 or at most 3 decimal places throughout table.

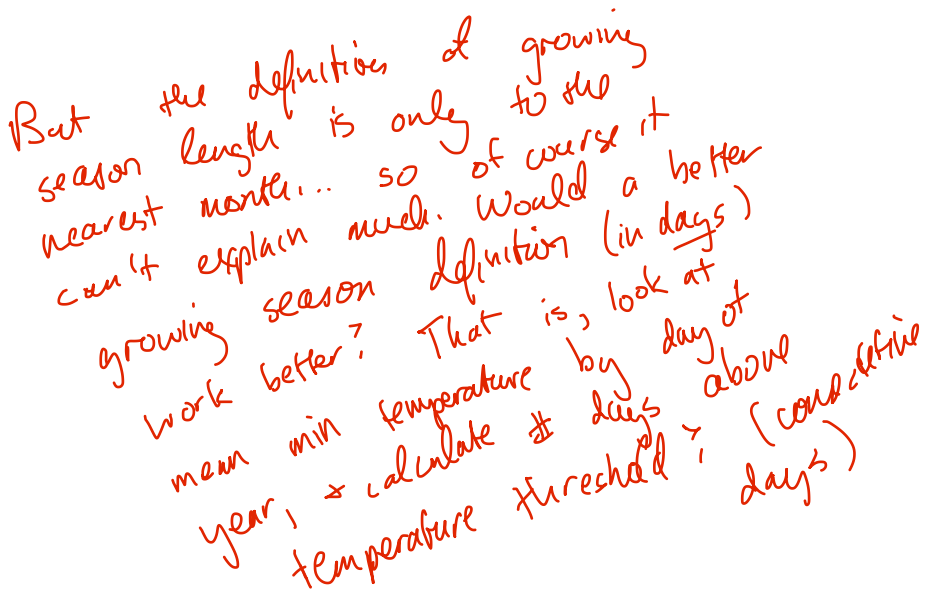
Highlight single best predictor for each response variable in BOLD.

Table S3. Results of analysis of interactions effects between MAT and MAP, for all FACF

Carbon flux	Significant interactive effect	Significant additive effect	Significant effect of MAT	p-value	R-squared value
GPP	FALSE	TRUE	TRUE	<0.0001	0.66
NPP	TRUE	TRUE	TRUE	0.018	0.48
ANPP	FALSE	TRUE	TRUE	0.0349	0.45
ANPP woody stem	TRUE	TRUE	TRUE	0.021	0.26
ANPP foliage	FALSE	FALSE	TRUE	<0.0001	0.59
BNPP root	FALSE	FALSE	TRUE	<0.0001	0.29
BNPP fine root	FALSE	FALSE	TRUE	0.002	0.15
Autotrophic respiration	FALSE	TRUE	TRUE	0.041	0.71
Root respiration	FALSE	FALSE	TRUE	0.001	0.25

Table S4. Comparison of growing season length and mean annual temperature as predictors of FACF

Fixed effect	AIC value	Delta AICc	Marginal R squared
GPP			
MAT	126.42617	0.000000	0.6196780
Growing season length	140.80589	14.379717	0.5411935
None	178.96179	52.535617	0.0000000
NPP			
MAT	174.88249	0.000000	0.5156614
Growing season length	191.53714	16.654650	0.4006999
None	216.16976	41.287265	0.0000000
ANPP			
MAT	249.50512	0.000000	0.2925950
Growing season length	254.20763	4.702509	0.2612187
None	268.94008	19.434966	0.0000000
ANPP woody stem			
MAT	235.95797	0.000000	0.1548800
Growing season length	237.28992	1.331943	0.1370243
None	243.13700	7.179027	0.0000000
ANPP foliage			
MAT	484.87610	0.000000	0.4462629
Growing season length	520.96482	36.088722	0.3497750
None	560.34915	75.473049	0.0000000
BNPP root			
MAT	184.54480	0.000000	0.5921282
Growing season length	204.92685	20.382054	0.4644116
None	237.46554	52.920743	0.0000000
BNPP fine root			
MAT	540.19217	0.000000	0.2429540
Growing season length	566.36955	26.177388	0.1060029
None	578.65529	38.463119	0.0000000
Autotrophic respiration			
MAT	45.25818	0.000000	0.6271133
Growing season length	50.35515	5.096972	0.5041004
None	56.16877	10.910597	0.0000000
Root respiration			
MAT	133.53500	0.000000	0.2507631
Growing season length	135.92632	2.391311	0.1990489
None	141.78719	8.252190	0.0000000



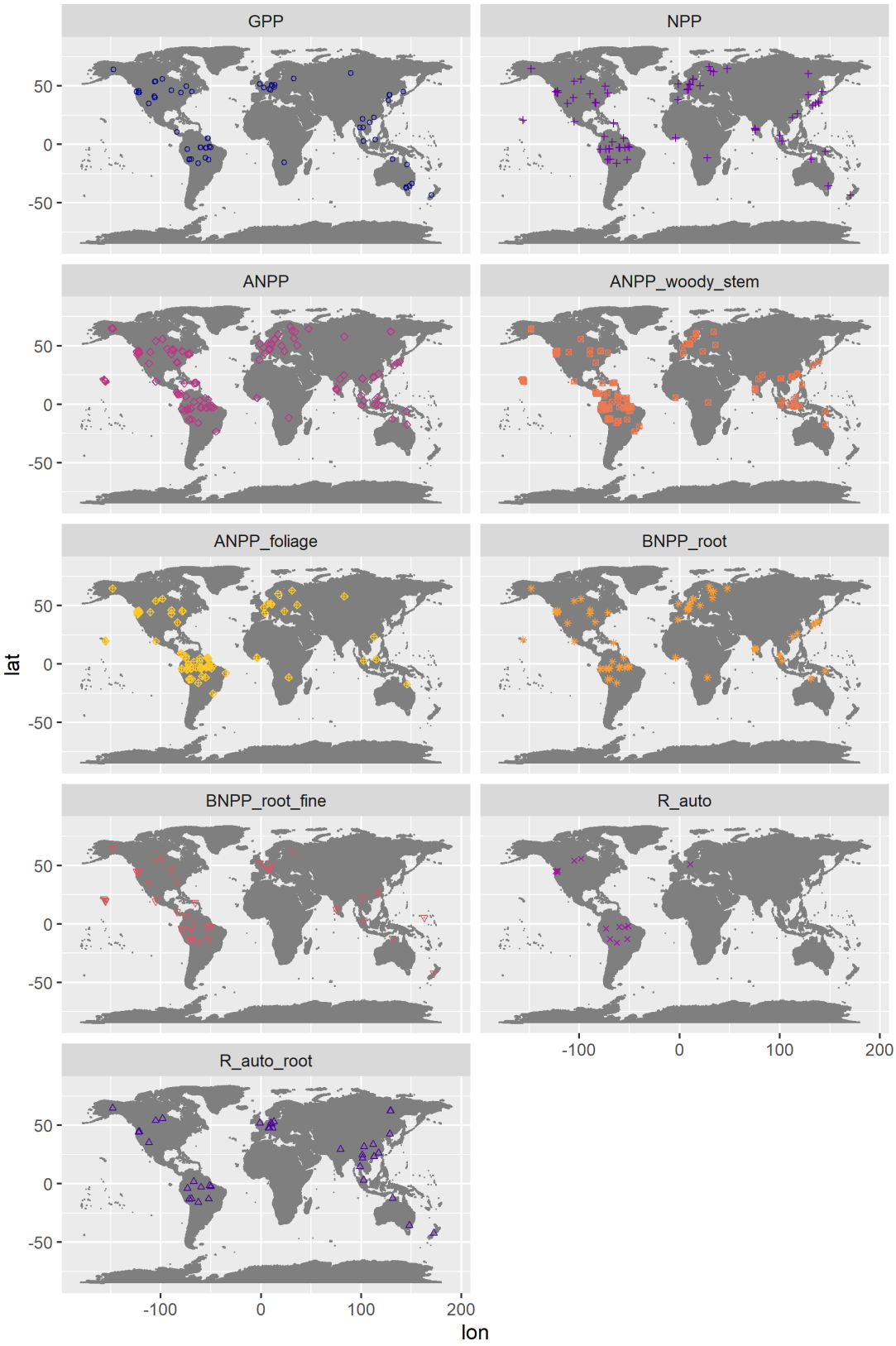


Figure S1: Maps showing distribution of samples for the nine FACF analyzed here.

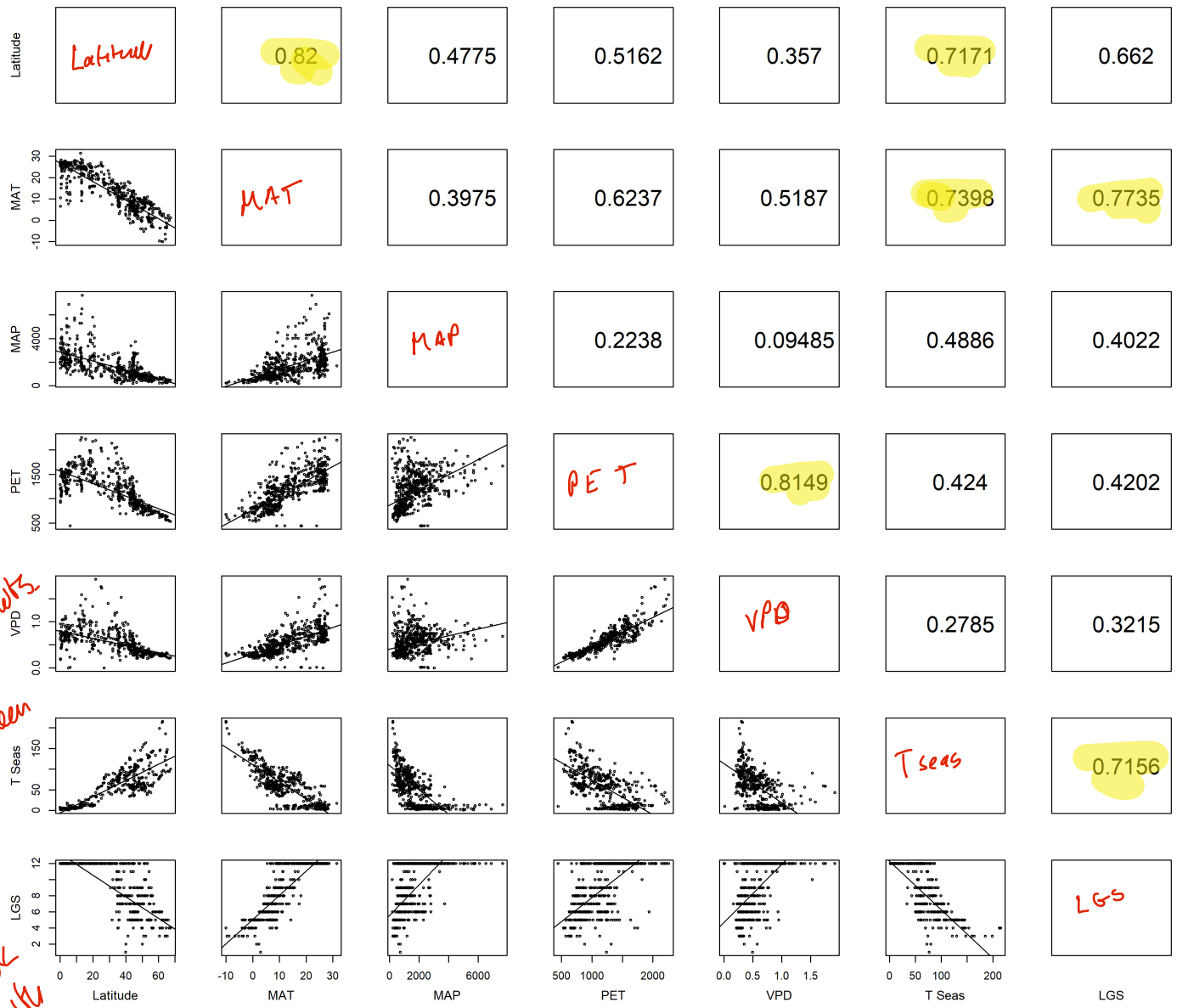


Figure S2: Correlations among latitude and climate variables. Variable ~~names~~ and units given in Table S1

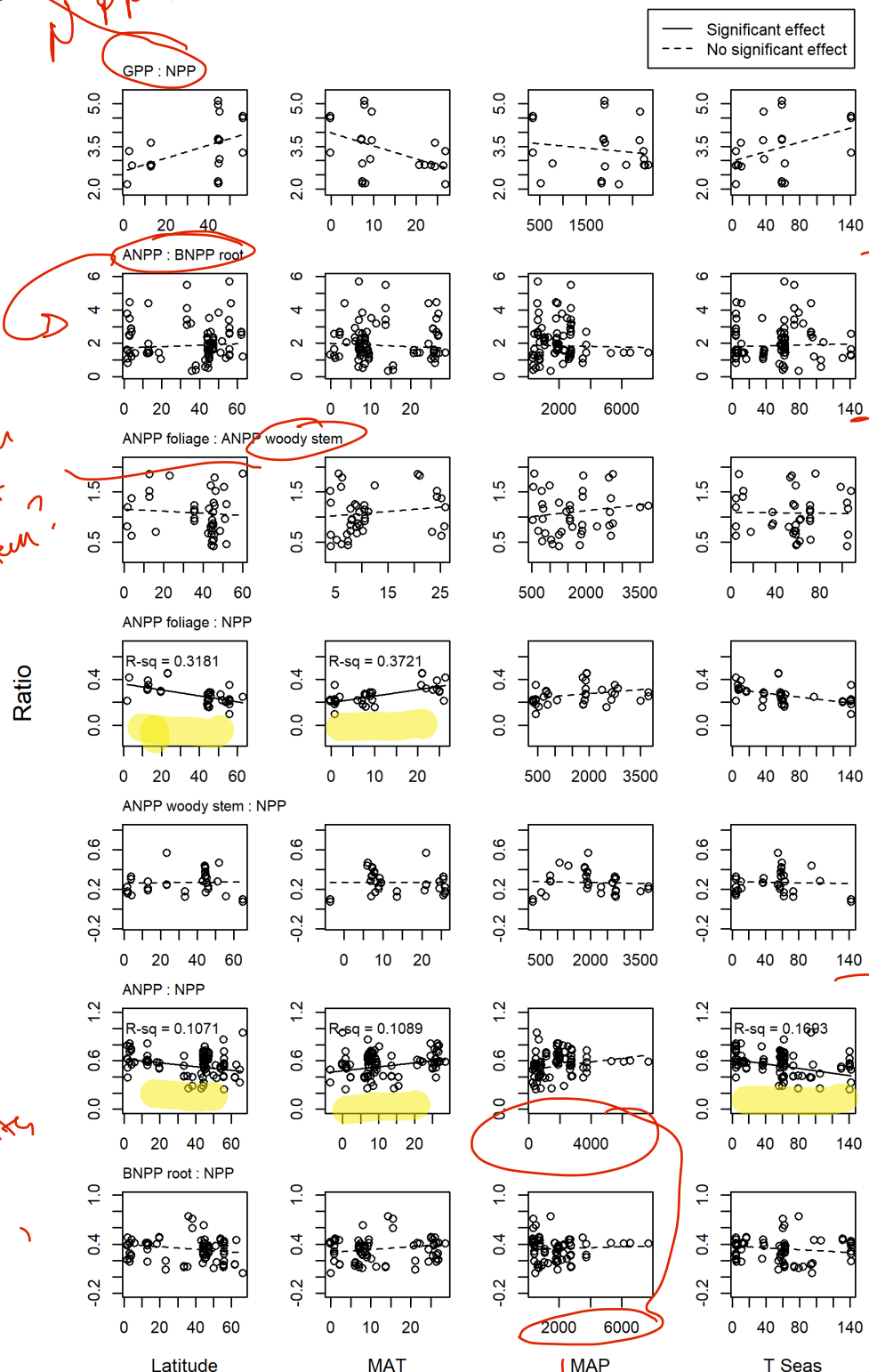


Figure S3: Ratios among FACF as a function of latitude and climate variables

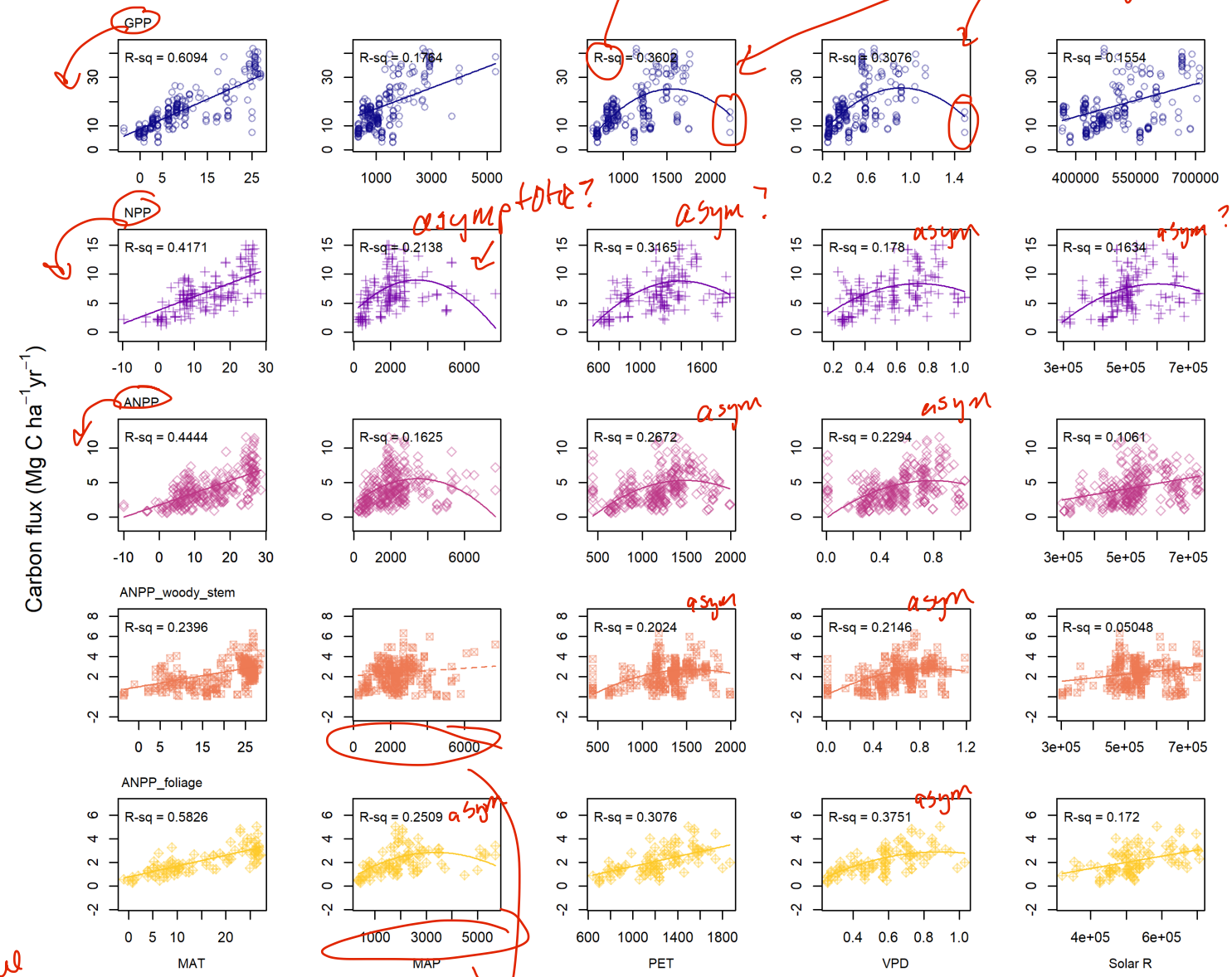


Figure S4: Individual plots of FACF in relation to mean annual climate, part 1.

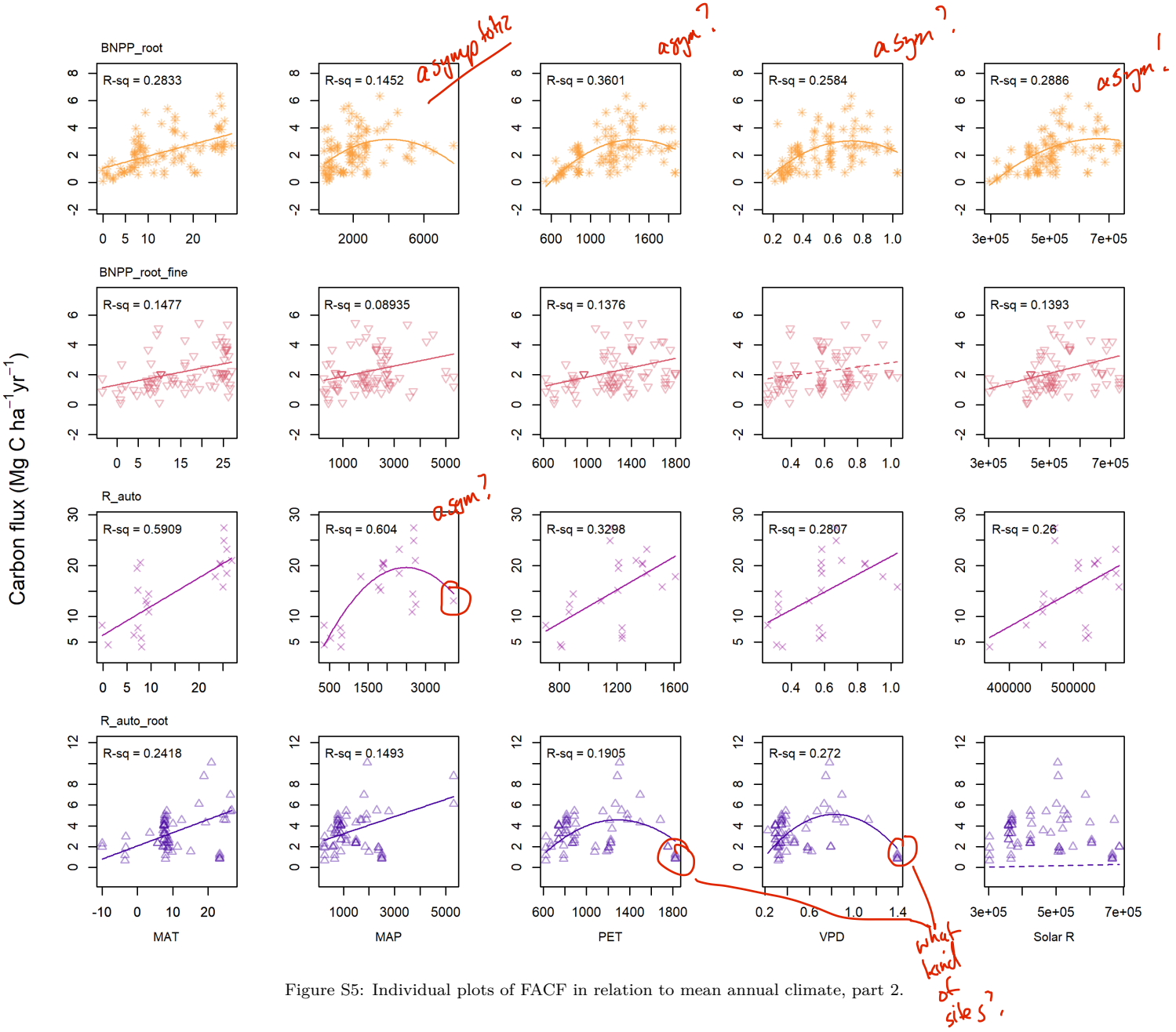


Figure S5: Individual plots of FACF in relation to mean annual climate, part 2.

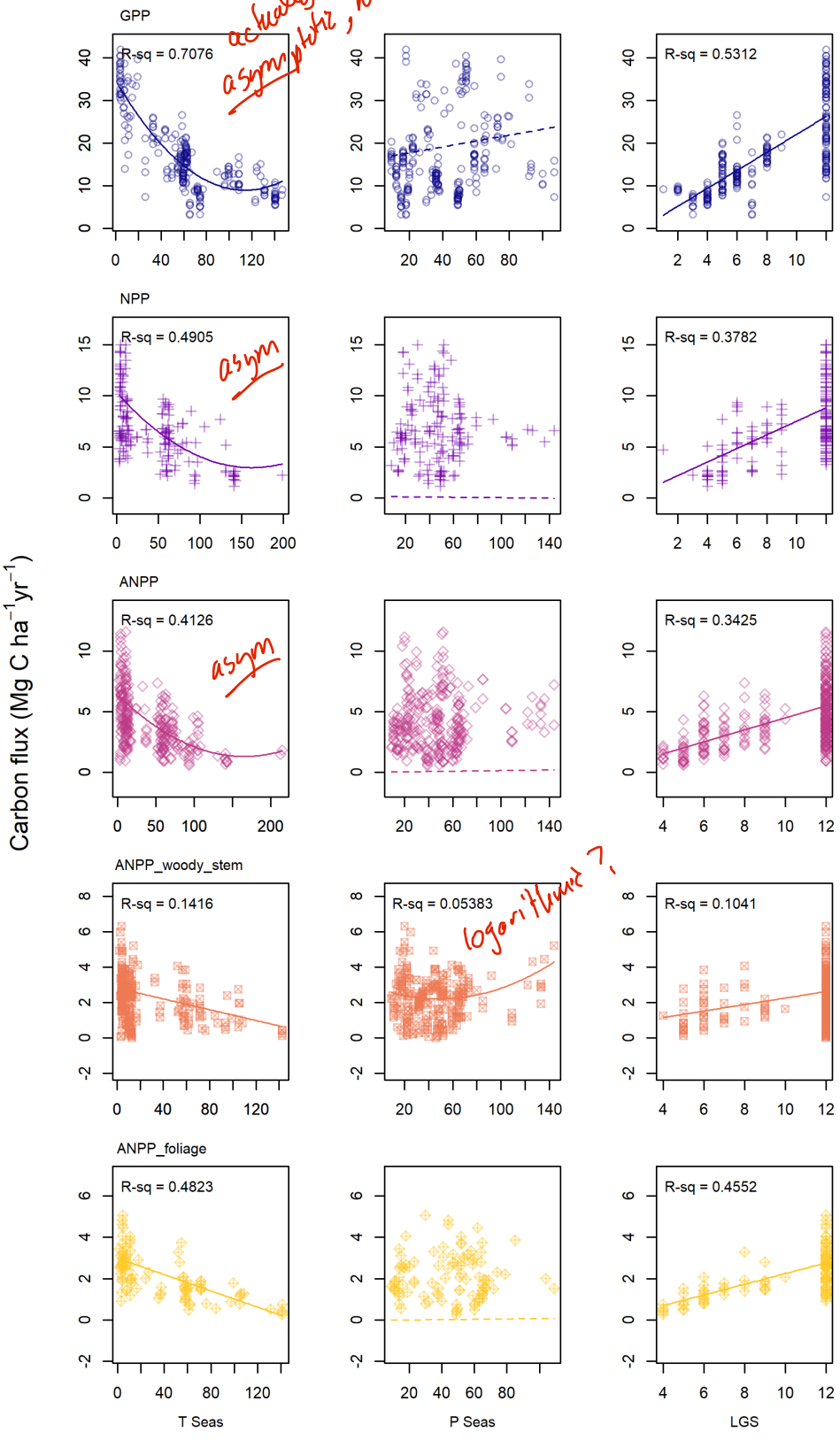


Figure S6: Individual plots of FACF in relation to mean climate seasonality, part 1.

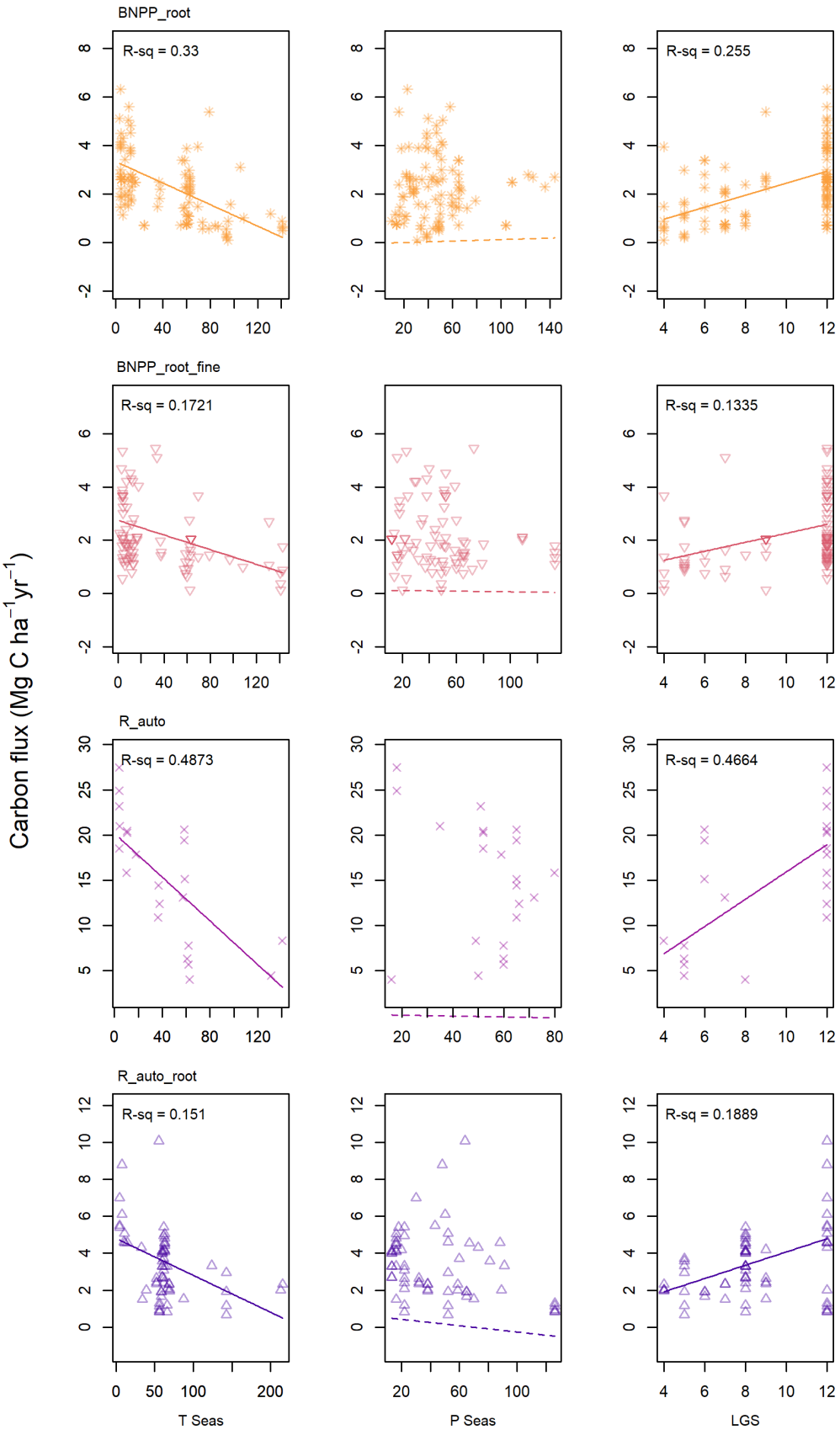


Figure S7: Individual plots of FACF in relation to mean climate seasonality, part 2.

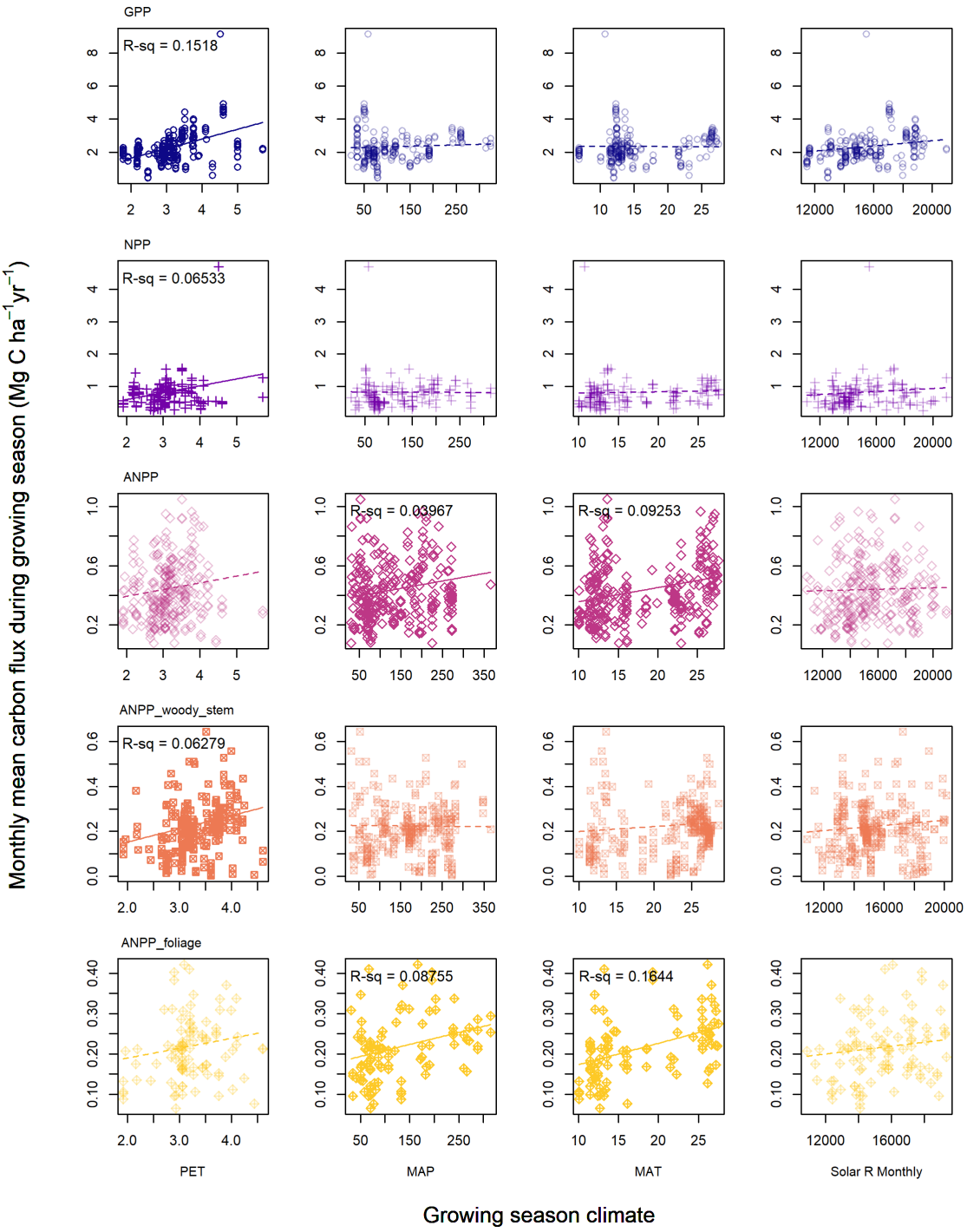


Figure S8: Growing season length-standardized FACF in relation to mean growing season climate, part 1.

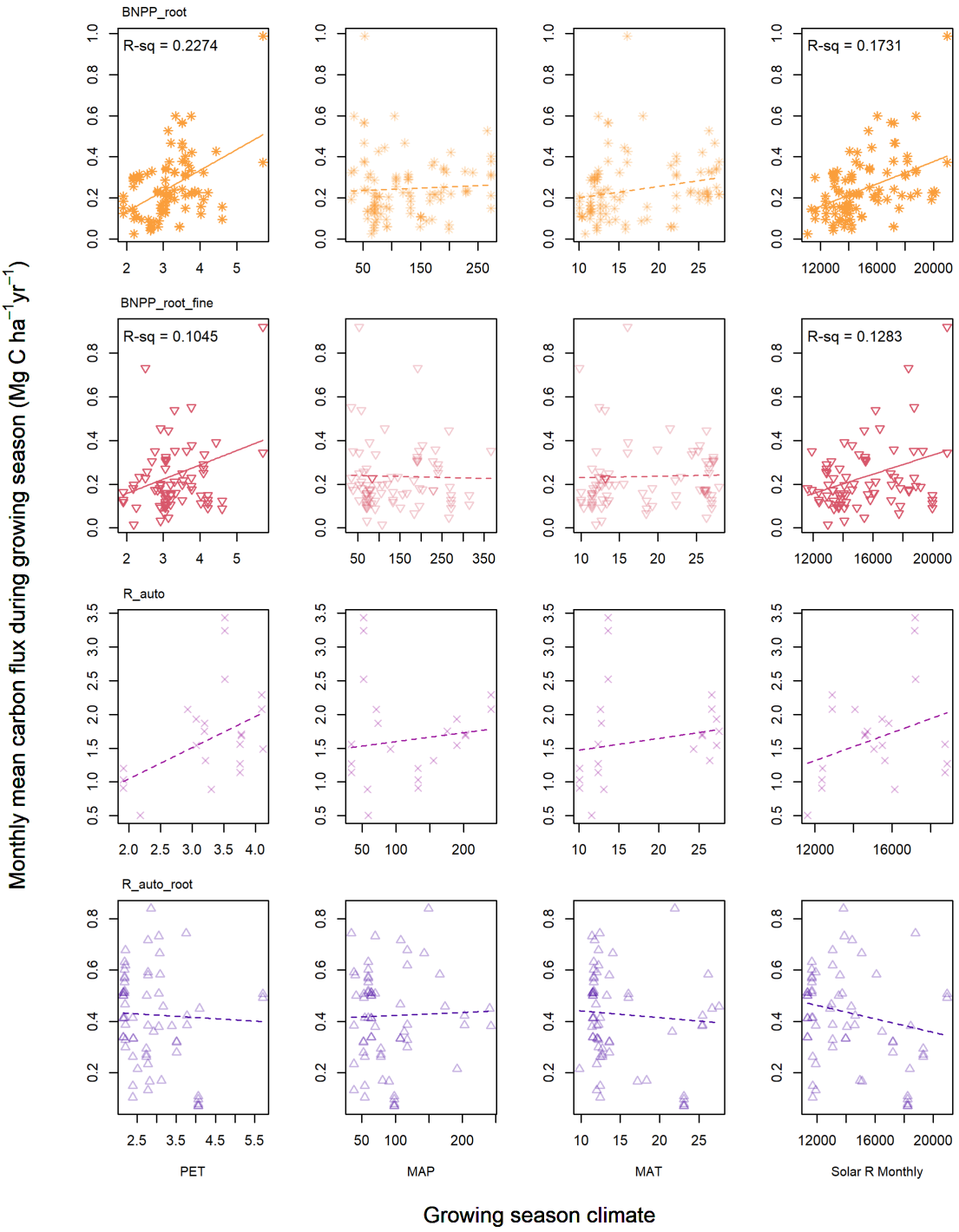


Figure S9: Growing season length-standardized FACF in relation to mean growing season climate, part 2.