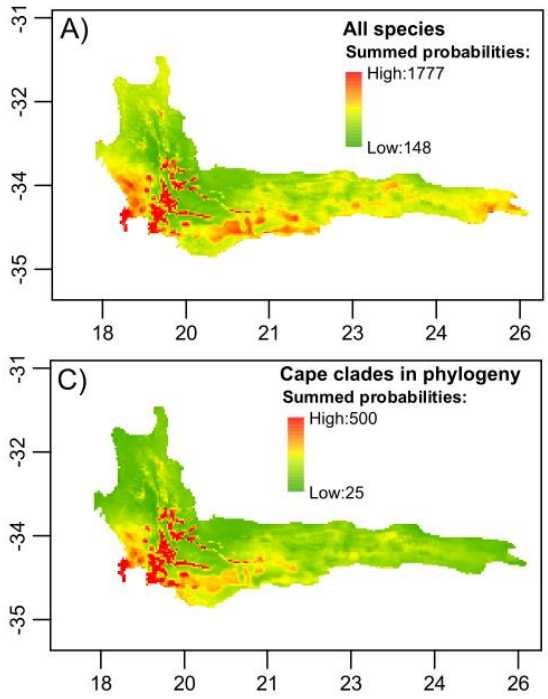
Supporting Information

Fig S1. (A) Total CFR plant species, (B) Cape clade species and (C) the Cape clade species included in our phylogeny show (D) strongly correlated spatial patterns of richness with each other (r~0.9).

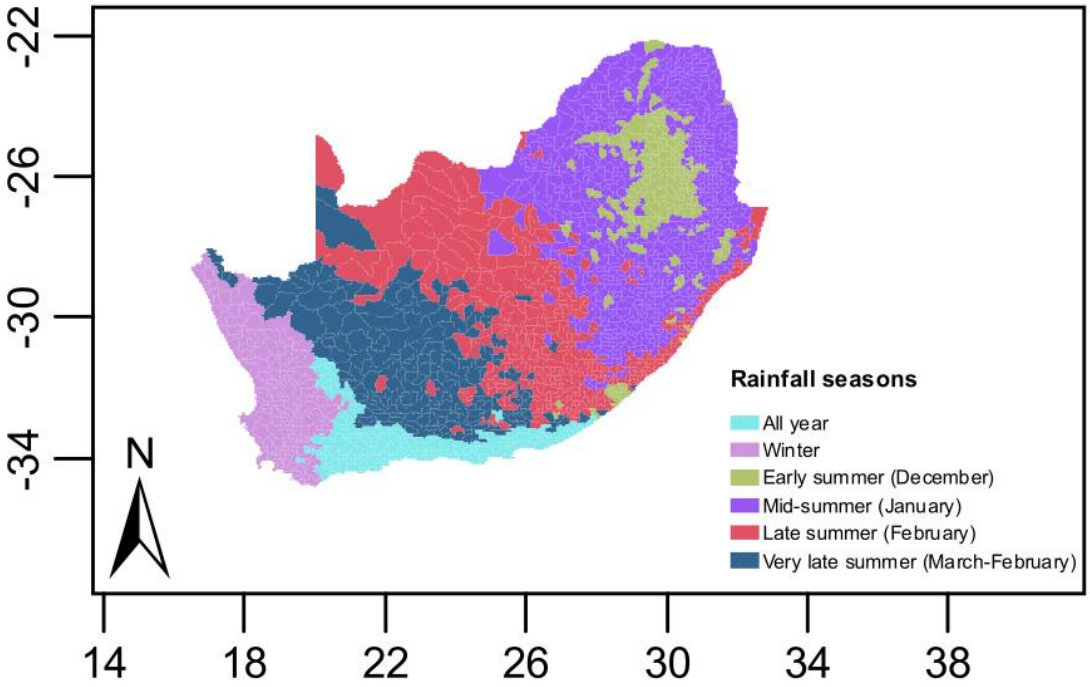


D)

Correlation matrix	All species	Cape clades	Cape clades in phylogeny
All species	1.000	0.895	0.876
Cape clades	0.895	1.000	0.982
Cape clades in phylogeny	0.876	0.982	1.000

www.pnas.org/cgi/doi/10.1073/pnas.1915646117

Fig. S2. Rainfall seasonality regions over South Africa following Schulze & Maharaj (2007).



[Schulze, R.E. and Maharaj, M. 2007. Rainfall Seasonality. In: Schulze, R.E. (Ed). 2007. South African Atlas of Climatology and Agrohydrology. Water Research Commission, Pretoria, RSA, WRC Report 1489/1/06, Section 6.5.]

Fig S3. Spatial patterns of (A) species turnover and (B) nestedness plotted for the Cape Floristic Region. Taxonomic beta diversity was dominated by species turnover for the CFR, with nestedness making up only a small proportion of total taxonomic beta diversity.

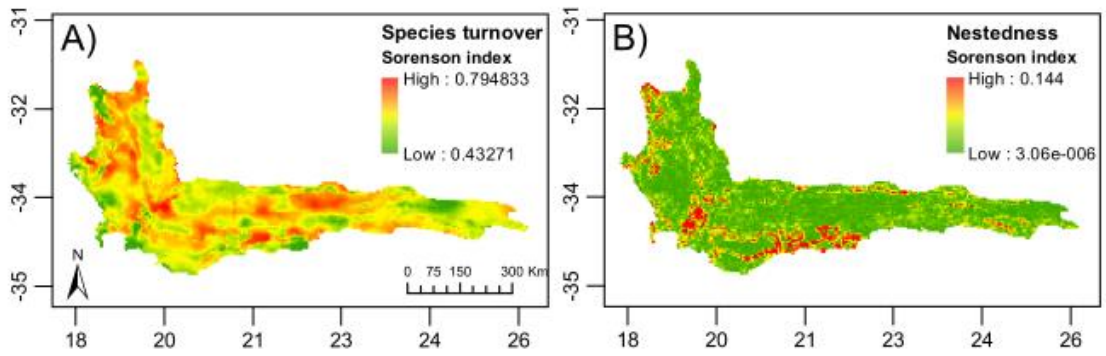
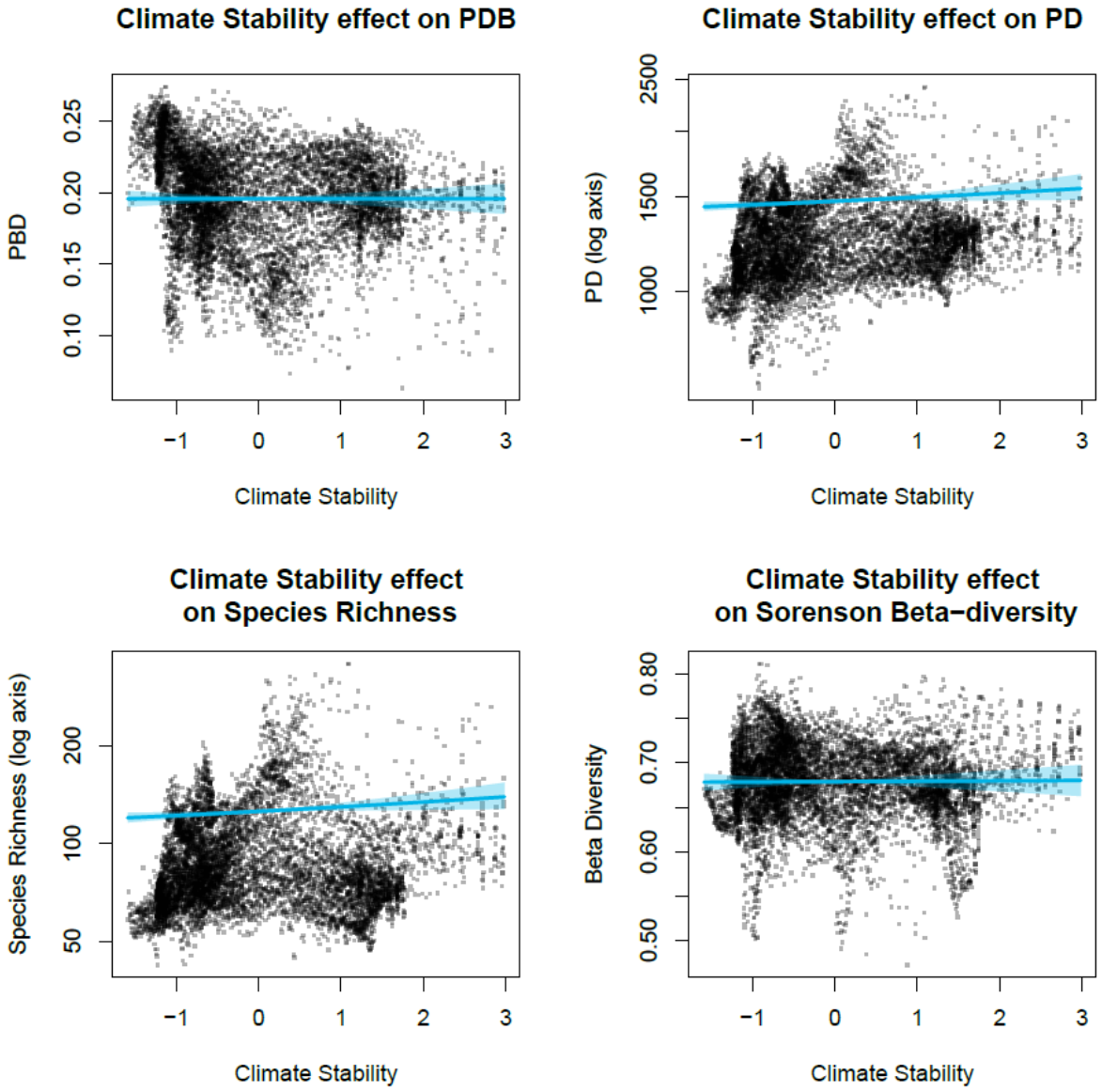
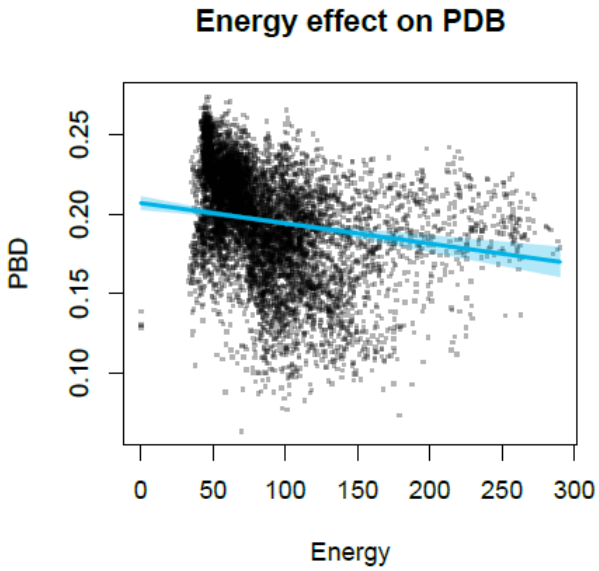


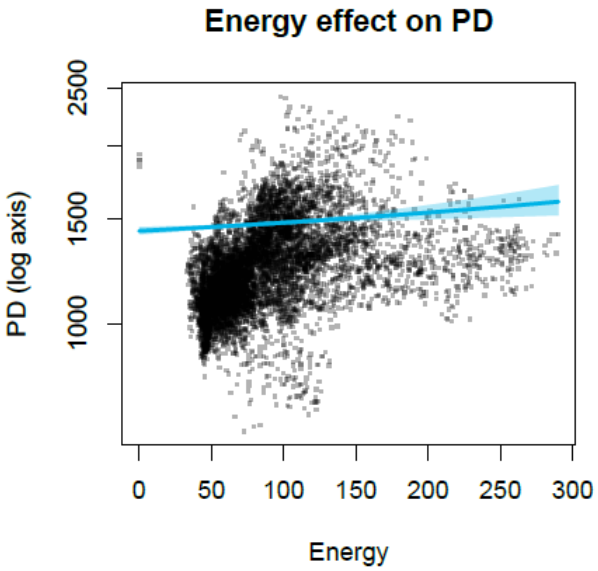
Table S1. wAIC values for the full model with all five covariates, and for models where a single covariate is removed. Grey shading indicates the importance of a covariate with an increase of ≥3 in the wAIC value when removed from the model with the lowest wAIC (shown in bold font)]. wAIC is a measure of model support equivalent to the well-known AIC score but appropriate to Bayesian models that can be used to compare relative support for different models of the same data. Deviance information criterion (dic) values, a Bayesian alternative to Akaike's information criterion (AIC), are also given. [Full model = climatic stability + biome stability + topographic heterogeneity + productivity + seasonality; SR = model controlling for the effects of species richness.]

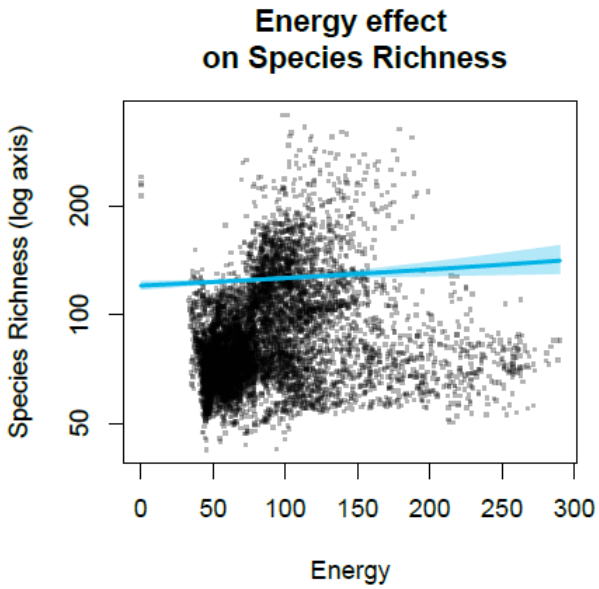
	Model	wAIC	dic	Difference between model with lowest wAIC
Species richness	Full model	16020.02074	16396.06631	1.048
	Full model – climatic stability	16020.79628	16399.70405	1.823
	Full model – biome stability	16023.5865	16407.49952	4.614
	Full model – productivity	**16018.9728**	16400.69428	--
	Full model – seasonality	16029.73992	16410.44291	10.767
	Full model – topographic heterogeneity	16050.12553	16425.61027	31.153
Taxonomic beta diversity	Full model	17041.62868	17798.26508	0.980
	Full model – climatic stability	17041.21901	17797.33856	0.570
	Full model – biome stability	17041.24787	17798.5425	0.599
	Full model – productivity	**17040.64871**	17800.2544	--
	Full model – seasonality	17049.17655	17803.02755	8.528
	Full model – topographic heterogeneity	17064.87193	17841.74798	24.223
	Full modelSR	16013.46376	16612.4569	3.035
	Full model – climatic stabilitySR	**16010.42889**	16615.04852	--
	Full model – biome stabilitySR	16017.56591	16628.92278	7.137
	Full model – productivitySR	16013.43766	16611.79949	3.009
	Full model – seasonalitySR	16010.51185	16612.3853	0.083
	Full model – topographic heterogeneitySR	16013.54935	16618.77517	3.120
Phylogenetic diversity	Full model	**15926.48838**	16353.83571	--
	Full model – climatic stability	15926.86926	16356.74216	0.381
	Full model – biome stability	15933.324	16373.34072	6.836
	Full model – productivity	15927.00528	16361.82408	0.517
	Full model – seasonality	15943.04467	16379.95724	16.556
	Full model – topographic heterogeneity	15956.00152	16386.46558	29.513
	Full modelSR	14651.41871	14770.87755	1.283
	Full model – climatic stabilitySR	**14650.1358**	14769.8164	--
	Full model – biome stabilitySR	14654.26908	14776.59751	4.133
	Full model – productivitySR	14652.53905	14771.2953	2.403
	Full model – seasonalitySR	14652.8451	14778.6903	2.709
	Full model – topographic heterogeneitySR	14651.16078	14770.83809	1.025
Phylogenetic-beta diversity	Full model	16448.12959	16926.18894	0.358
	Full model – climatic stability	**16447.7712**	16925.16497	--
	Full model – biome stability	16450.84972	16945.98474	3.079
	Full model – productivity	16459.3285	16948.50771	11.557
	Full model – seasonality	16452.88221	16929.73907	5.111
	Full model – topographic heterogeneity	16478.44714	16959.88247	30.676
	Full modelSR	15567.37618	15766.48978	0.414
	Full model – climatic stabilitySR	**15566.96256**	15774.92335	--
	Full model – biome stabilitySR	15571.87702	15779.6292	4.914
	Full model – productivitySR	15579.72643	15779.45668	12.764
	Full model – seasonalitySR	15567.0543	15769.84668	0.092
	Full model – topographic heterogeneitySR	15569.18265	15766.63675	2.220

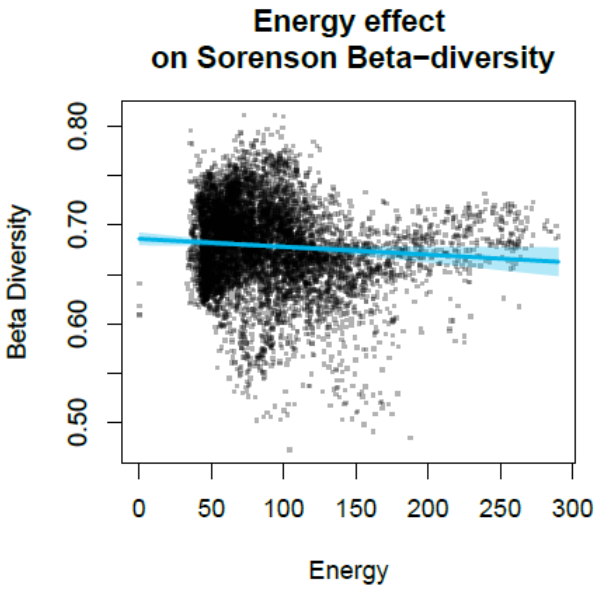
Fig. S4. The relationships between plant diversity variables predicted from models with climate stability, biome stability, topographic heterogeneity, productivity, and seasonality. Within each plot, the results are shown with median estimate and 95% confidence intervals (shaded). Confidence intervals are computed from models that include all fixed and spatially explicit random effects: the presence of strong spatial effects generates wider scatter in the points than may be expected from plotted confidence intervals. [PD = phylogenetic diversity; PBD = phylogenetic beta diversity; Sorenson Beta-diversity = beta diversity]. These plots should be read in conjunction with Table S1.



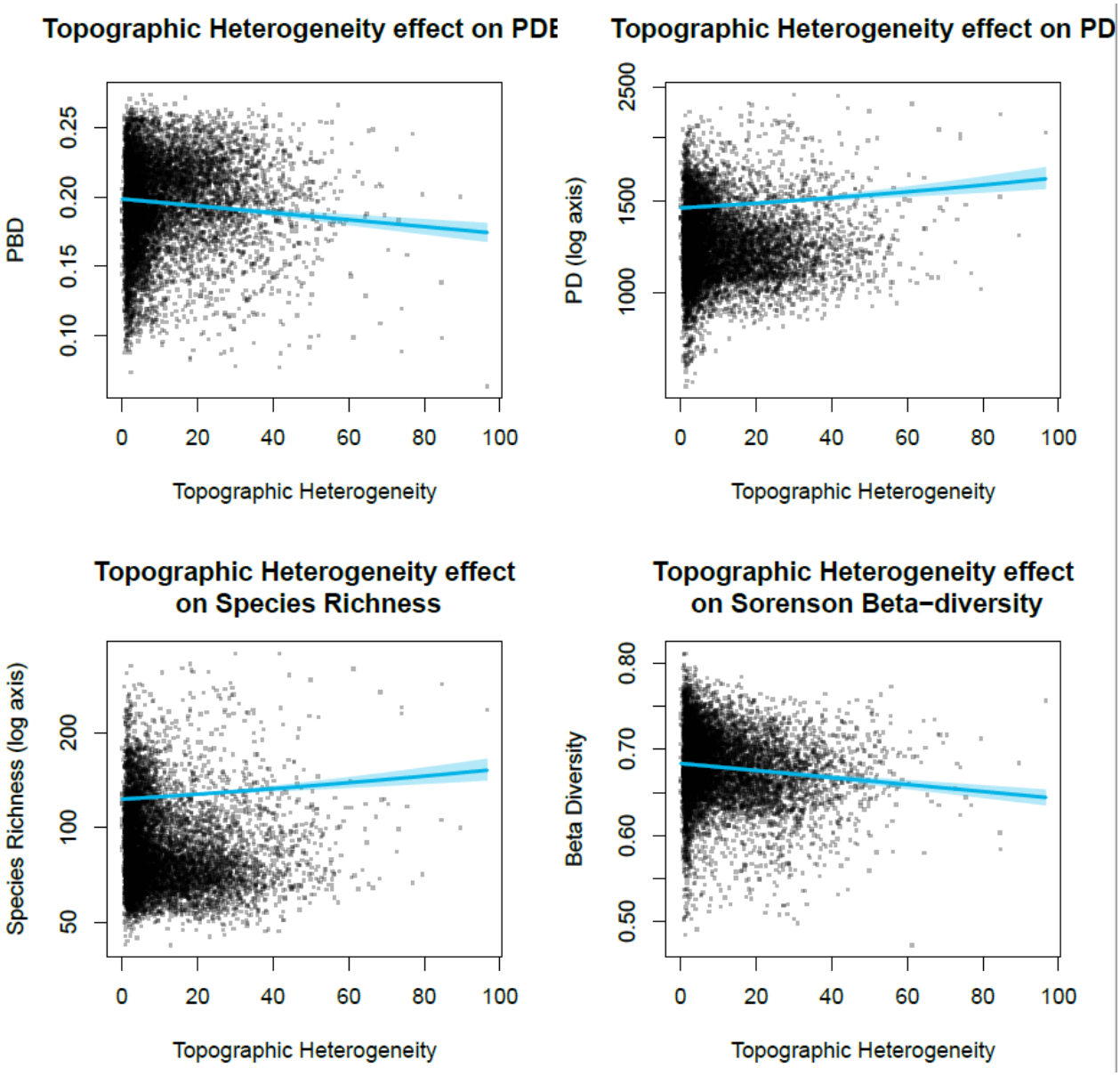

Energy effect on PDB
PBD
0.10
0.15
0.20
0.25
0
50
100
150
200
250
300
Energy


Energy effect on PD
PD (log axis)
1000
1500
2500
0
50
100
150
200
250
300
Energy

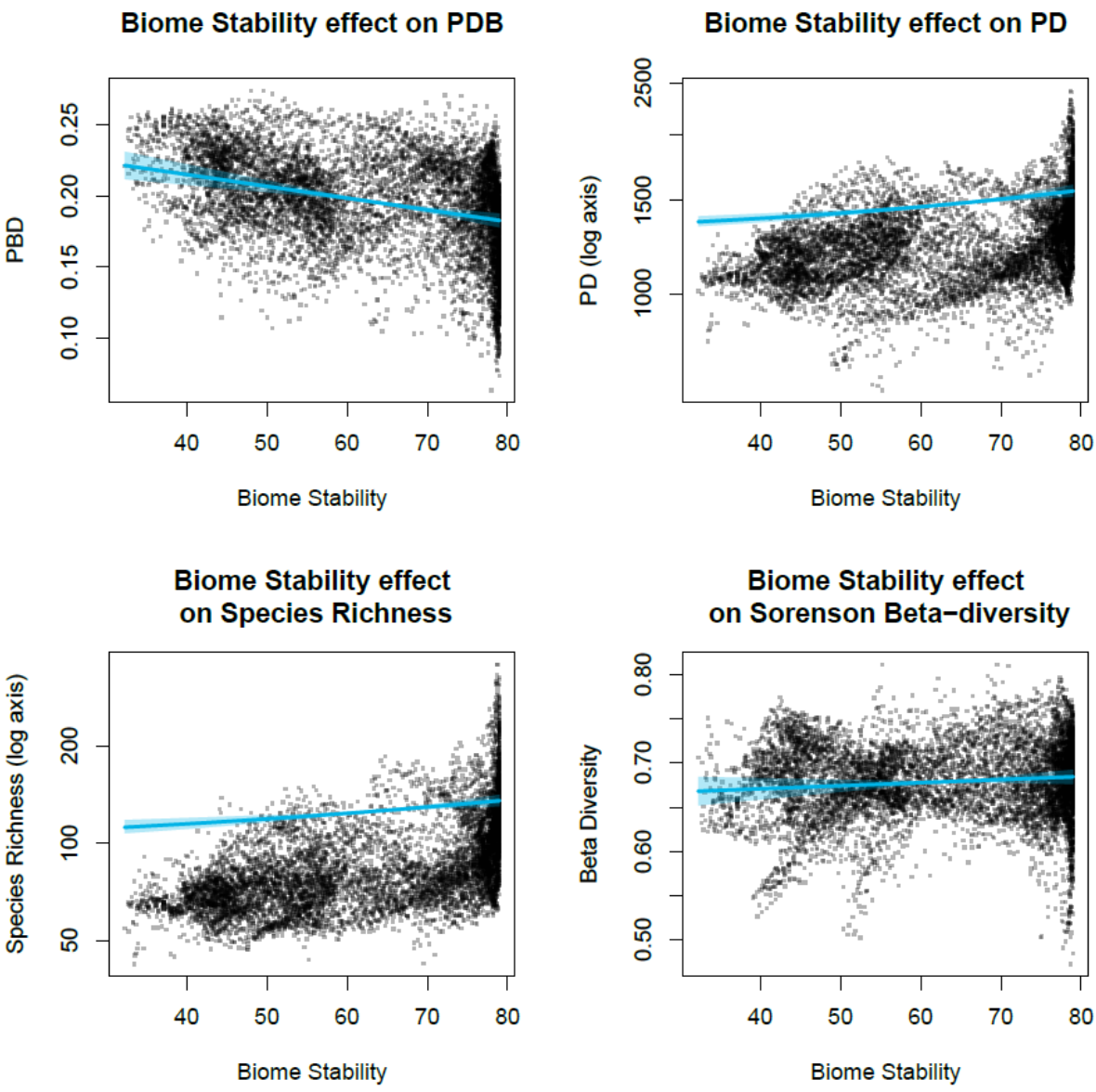

Energy effect
on Species Richness
Species Richness (log axis)
50
100
200
0
50
100
150
200
250
300
Energy


Energy effect
on Sorenson Beta−diversity
Beta Diversity
0.50
0.60
0.70
0.80
0
50
100
150
200
250
300
Energy

34


Topographic Heterogeneity effect on PDE
PBD
0.10
0.15
0.20
0.25
0
20
40
60
80
100
Topographic Heterogeneity
Topographic Heterogeneity effect on PD
PD (log axis)
1000
1500
2500
0
20
40
60
80
100
Topographic Heterogeneity
Topographic Heterogeneity effect on Species Richness
Species Richness (log axis)
50
100
200
0
20
40
60
80
100
Topographic Heterogeneity
Topographic Heterogeneity effect on Sorenson Beta−diversity
Beta Diversity
0.50
0.60
0.70
0.80
0
20
40
60
80
100
Topographic Heterogeneity

35


Biome Stability effect on PDB
PBD
0.10
0.15
0.20
0.25
40
50
60
70
80
Biome Stability
Biome Stability effect on PD
PD (log axis)
1000
1500
2500
40
50
60
70
80
Biome Stability
Biome Stability effect
on Species Richness
Species Richness (log axis)
50
100
200
40
50
60
70
80
Biome Stability
Biome Stability effect
on Sorenson Beta-diversity
Beta Diversity
0.50
0.60
0.70
0.80
40
50
60
70
80
Biome Stability

36

37

Table S2. INLA model fixed effects summaries for each diversity model run, and for models controlling for species richness (SR). Pseudo-R^2 values are given for each of the full models incorporating all five covariates. Joint estimation of the spatial error term and fixed effects enables accurate computation of fixed effects but the relatively strong spatial effects modelled mean comparison of the raw data with the confidence intervals of the parameters may be misleading: to the naïve eye, confidence intervals may be more precisely estimated than raw data seems to imply possible.

Species richness: Full model (pseudo-R^2 = 0.922)	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	2.95E-10	0.01135	-0.02228	-3.19E-07	0.022265
climatic stability	0.110318	0.045802	0.020324	0.110333	0.200147
biome stability	0.218661	0.055949	0.108722	0.218681	0.328382
topographic heterogeneity	0.0777	0.013758	0.05069	0.0777	0.10469
productivity	0.078684	0.027898	0.023823	0.078711	0.133344
seasonality	-0.3768	0.090239	-0.55405	-0.37678	-0.1998
Species richness: Full model – climatic stability	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	2.95E-10	0.01135	-0.02228	-3.19E-07	0.022265
biome stability	0.251593	0.054439	0.144605	0.251618	0.358339
topographic heterogeneity	0.081068	0.013695	0.05418	0.081068	0.107933
productivity	0.074932	0.027927	0.020016	0.07496	0.129649
seasonality	-0.35949	0.090221	-0.53674	-0.35947	-0.18256
Species richness: Full model – biome stability	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	3.07E-10	0.01135	-0.02228	-3.19E-07	0.022265
climatic stability	0.153947	0.044844	0.065824	0.153966	0.241884
topographic heterogeneity	0.074893	0.013761	0.047877	0.074892	0.10189
productivity	0.116109	0.026349	0.064245	0.116151	0.167691
seasonality	-0.36328	0.090891	-0.54185	-0.36325	-0.18504
Species richness: Full model – productivity	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	3.36E-10	0.01135	-0.02228	-3.19E-07	0.022265
climatic stability	0.103429	0.04607	0.012908	0.103445	0.193782
biome stability	0.273936	0.052767	0.170145	0.273991	0.377326
topographic heterogeneity	0.079022	0.013766	0.051995	0.079021	0.106027
seasonality	-0.4186	0.089529	-0.59438	-0.41862	-0.24293
Species richness: Full model – seasonality	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	1.83E-11	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	0.094774	0.045959	0.004485	0.094784	0.184922
biome stability	0.209097	0.056273	0.098546	0.209109	0.319475
topographic heterogeneity	0.079444	0.013767	0.052417	0.079443	0.106451
productivity	0.097205	0.02766	0.042796	0.097237	0.151385
Species richness: Full model – topographic heterogeneity	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	3.14E-10	0.01135	-0.02228	-3.19E-07	0.022265
climatic stability	0.136571	0.04566	0.046856	0.136585	0.226123

biome stability	0.201623	0.055986	0.091603	0.201647	0.311411
productivity	0.083788	0.027905	0.028922	0.083813	0.138471
seasonality	-0.39212	0.090358	-0.56965	-0.39209	-0.21493
Taxonomic beta diversity: Full model (pseudo-R^2 = 0.924)	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-2.51E-10	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	0.009601	0.070171	-0.12828	0.00963	0.147194
biome stability	0.111702	0.085325	-0.05588	0.111712	0.279075
topographic heterogeneity	-0.11146	0.01497	-0.14084	-0.11147	-0.08208
productivity	-0.08014	0.036724	-0.15221	-0.08015	-0.00806
seasonality	0.294752	0.126702	0.046265	0.294648	0.543587
Taxonomic beta diversity: Full model – climatic stability	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-2.38E-10	0.01135	-0.02228	-3.20E-07	0.022265
biome stability	0.114552	0.082759	-0.04802	0.114572	0.276867
topographic heterogeneity	-0.11133	0.014928	-0.14063	-0.11134	-0.08203
productivity	-0.08047	0.036643	-0.15238	-0.08049	-0.00855
seasonality	0.295689	0.126434	0.047719	0.295588	0.543991
Taxonomic beta diversity: Full model – biome stability	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-2.47E-10	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	0.031826	0.068114	-0.10203	0.031858	0.165377
topographic heterogeneity	-0.11225	0.01496	-0.14161	-0.11226	-0.08289
productivity	-0.06578	0.035059	-0.13459	-0.06579	0.003024
seasonality	0.298034	0.12672	0.049504	0.297932	0.546897
Taxonomic beta diversity: Full model – productivity	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-2.66E-10	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	0.019151	0.070181	-0.11875	0.01918	0.156763
biome stability	0.056181	0.081623	-0.10409	0.056176	0.216331
topographic heterogeneity	-0.1128	0.014963	-0.14216	-0.11281	-0.08343
seasonality	0.331643	0.125795	0.084906	0.331549	0.578671
Taxonomic beta diversity: Full model – seasonality	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-1.90E-12	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	0.019456	0.069971	-0.11803	0.019483	0.156663
biome stability	0.115483	0.085224	-0.05191	0.115494	0.282656
topographic heterogeneity	-0.11299	0.014951	-0.14232	-0.11299	-0.08364
productivity	-0.0914	0.036378	-0.1628	-0.09142	-0.02
Taxonomic beta diversity: Full model – topographic heterogeneity	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-2.71E-10	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	-0.02883	0.071091	-0.16849	-0.02881	0.110592
biome stability	0.137732	0.086582	-0.03233	0.137745	0.307564
productivity	-0.09169	0.037071	-0.16445	-0.09171	-0.01893
seasonality	0.3402	0.128199	0.088783	0.340093	0.591978
Taxonomic beta diversity: Full model.SR (pseudo-R^2 = 0.948)	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	13.87861	0.372267	13.14779	13.87857	14.60896

climatic stability	0.134676	0.057272	0.022041	0.134732	0.246892
biome stability	0.328313	0.069891	0.190997	0.328337	0.465373
topographic heterogeneity	-0.0466	0.014486	-0.07503	-0.0466	-0.01817
productivity	-0.02796	0.032115	-0.09102	-0.02796	0.035043
seasonality	-0.16241	0.108194	-0.37453	-0.16252	0.05014
log(SR)	-3.1164	0.083553	-3.28046	-3.11639	-2.9525
Taxonomic beta diversity: Full model – climatic stability.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	13.8369	0.372437	13.10579	13.83685	14.56763
biome stability	0.367212	0.068176	0.233216	0.367251	0.500865
topographic heterogeneity	-0.04379	0.014446	-0.07215	-0.0438	-0.01545
productivity	-0.03268	0.032143	-0.0958	-0.03268	0.030376
seasonality	-0.14264	0.108233	-0.35488	-0.14274	0.069951
log(SR)	-3.10703	0.083591	-3.27118	-3.10703	-2.94307
Taxonomic beta diversity: Full model – biome stability.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	13.74174	0.372543	13.01045	13.74167	14.4727
climatic stability	0.197368	0.056205	0.086823	0.197427	0.307485
topographic heterogeneity	-0.04995	0.014498	-0.0784	-0.04995	-0.02149
productivity	0.019501	0.030686	-0.04079	0.019514	0.079667
seasonality	-0.14168	0.108974	-0.35537	-0.14177	0.072368
log(SR)	-3.08566	0.083615	-3.24986	-3.08565	-2.92166
Taxonomic beta diversity: Full model – productivity.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	13.89564	0.371728	13.16587	13.89561	14.62493
climatic stability	0.137801	0.057149	0.025411	0.137857	0.249781
biome stability	0.308992	0.066261	0.178794	0.309019	0.438925
topographic heterogeneity	-0.04702	0.014477	-0.07543	-0.04703	-0.01861
seasonality	-0.14939	0.107133	-0.35942	-0.1495	0.061085
log(SR)	-3.12022	0.083431	-3.28405	-3.12022	-2.95656
Taxonomic beta diversity: Full model – seasonality.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	13.82605	0.370941	13.0979	13.826	14.55386
climatic stability	0.128131	0.057242	0.015576	0.12818	0.240307
biome stability	0.324548	0.07001	0.187013	0.324565	0.461856
topographic heterogeneity	-0.04599	0.014487	-0.07442	-0.04599	-0.01756
productivity	-0.02129	0.031857	-0.08386	-0.02129	0.041188
log(SR)	-3.1046	0.083255	-3.26809	-3.10459	-2.9413
Taxonomic beta diversity: Full model – topographic heterogeneity.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	14.0495	0.369197	13.32463	14.04949	14.77377
climatic stability	0.119832	0.057401	0.006964	0.119881	0.232321
biome stability	0.340947	0.070157	0.203095	0.340974	0.478517
productivity	-0.03143	0.032212	-0.09468	-0.03143	0.031761
seasonality	-0.15261	0.108637	-0.3656	-0.15273	0.060807
log(SR)	-3.15477	0.082863	-3.31746	-3.15477	-2.99221
Phylogenetic diversity: Full model (pseudo-R^2 = 0.934)	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile

(Intercept)	4.08E-10	0.01135	-0.02228	-3.19E-07	0.022265
climatic stability	0.107332	0.048229	0.012568	0.107348	0.201916
biome stability	0.294842	0.058892	0.179128	0.294862	0.410335
topographic heterogeneity	0.083446	0.013878	0.056196	0.083447	0.110668
productivity	0.099357	0.028815	0.042705	0.099381	0.155823
seasonality	-0.52358	0.094012	-0.70821	-0.52358	-0.33916
Phylogenetic diversity: Full model – climatic stability	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	4.59E-10	0.01135	-0.02228	-3.19E-07	0.022265
biome stability	0.326839	0.057265	0.214305	0.326865	0.439126
topographic heterogeneity	0.086408	0.013822	0.059266	0.08641	0.11352
productivity	0.095674	0.028826	0.039	0.095698	0.152163
seasonality	-0.5075	0.093955	-0.69204	-0.50749	-0.32321
log(SR)	4.59E-10	0.01135	-0.02228	-3.19E-07	0.022265
Phylogenetic diversity: Full model – biome stability	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	4.03E-10	0.01135	-0.02228	-3.19E-07	0.022265
climatic stability	0.165955	0.047434	0.072743	0.165976	0.258969
topographic heterogeneity	0.079737	0.013891	0.052462	0.079737	0.106986
productivity	0.147587	0.02738	0.093705	0.147627	0.201198
seasonality	-0.50709	0.095031	-0.69376	-0.50707	-0.32071
Phylogenetic diversity: Full model – productivity	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	4.47E-10	0.01135	-0.02228	-3.19E-07	0.022265
climatic stability	0.098022	0.048566	0.002595	0.09804	0.193264
biome stability	0.364493	0.05577	0.254819	0.364544	0.473783
topographic heterogeneity	0.085043	0.013889	0.057771	0.085044	0.112286
seasonality	-0.57499	0.093448	-0.75844	-0.57501	-0.39161
Phylogenetic diversity: Full model – seasonality	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	2.19E-11	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	0.086277	0.04866	-0.00931	0.086287	0.181722
biome stability	0.282514	0.059548	0.165541	0.282524	0.39932
topographic heterogeneity	0.085753	0.013898	0.058463	0.085754	0.113015
productivity	0.123782	0.028694	0.067352	0.123812	0.179996
Phylogenetic diversity: Full model – topographic heterogeneity	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	4.55E-10	0.01135	-0.02228	-3.19E-07	0.022265
climatic stability	0.135363	0.048294	0.040466	0.135382	0.230068
biome stability	0.276184	0.059166	0.159929	0.276205	0.392213
productivity	0.105097	0.028895	0.048296	0.105118	0.161729
seasonality	-0.54171	0.09442	-0.72717	-0.54169	-0.35652
Phylogenetic diversity: Full model.SR (pseudo-R^2 = 0.984)	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-13.2888	0.274862	-13.8279	-13.2891	-12.749
biome stability	0.101016	0.032649	0.036801	0.101044	0.165018
topographic heterogeneity	0.020471	0.012753	-0.00458	0.020475	0.045477
productivity	0.029161	0.020377	-0.01083	0.029154	0.069156
seasonality	-0.18626	0.057174	-0.29833	-0.18635	-0.07384

log(SR)	2.983968	0.061667	2.862731	2.984016	3.104822
Phylogenetic diversity: Full model – climatic stability.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-13.2888	0.274862	-13.8279	-13.2891	-12.749
biome stability	0.101016	0.032649	0.036801	0.101044	0.165018
topographic heterogeneity	0.020471	0.012753	-0.00458	0.020475	0.045477
productivity	0.029161	0.020377	-0.01083	0.029154	0.069156
seasonality	-0.18626	0.057174	-0.29833	-0.18635	-0.07384
log(SR)	2.983968	0.061667	2.862731	2.984016	3.104822
Phylogenetic diversity: Full model – biome stability.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-13.3787	0.274359	-13.9166	-13.3789	-12.8397
climatic stability	0.039474	0.026878	-0.01353	0.039546	0.092036
topographic heterogeneity	0.015418	0.012823	-0.00977	0.01542	0.040567
productivity	0.052852	0.018713	0.016089	0.052856	0.089553
seasonality	-0.17279	0.057747	-0.28604	-0.17286	-0.05929
log(SR)	3.004133	0.061554	2.883082	3.004194	3.124736
Phylogenetic diversity: Full model – productivity.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-13.3189	0.273588	-13.8555	-13.3191	-12.7816
climatic stability	0.020813	0.027417	-0.03327	0.020892	0.074416
biome stability	0.11447	0.030644	0.054288	0.114463	0.174625
topographic heterogeneity	0.018716	0.012869	-0.00656	0.018719	0.043956
seasonality	-0.21107	0.056293	-0.32131	-0.21119	-0.10029
log(SR)	2.990712	0.06138	2.870052	2.990754	3.111019
Phylogenetic diversity: Full model – seasonality.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-13.3691	0.2766	-13.9115	-13.3694	-12.8259
climatic stability	0.008103	0.027592	-0.04623	0.008146	0.062138
biome stability	0.081668	0.033918	0.01512	0.081641	0.148299
topographic heterogeneity	0.018673	0.012903	-0.00667	0.018676	0.043978
productivity	0.044155	0.020097	0.004664	0.044164	0.083563
log(SR)	3.001993	0.062057	2.879983	3.002044	3.123605
Phylogenetic diversity: Full model – topographic heterogeneity.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-13.3069	0.274852	-13.8462	-13.3071	-12.7673
climatic stability	0.027528	0.02722	-0.02618	0.027611	0.080734
biome stability	0.090046	0.033479	0.024279	0.090047	0.155746
productivity	0.02912	0.020396	-0.01091	0.029111	0.069158
seasonality	-0.19269	0.057852	-0.306	-0.1928	-0.07887
log(SR)	2.988025	0.061664	2.866841	2.988057	3.108914
Phylogenetic beta diversity: Full model (pseudo-R^2 = 0.910)	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-1.88E-10	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	-0.00019	0.052834	-0.10401	-0.00018	0.103416
biome stability	-0.337	0.064485	-0.4635	-0.33704	-0.21036
topographic heterogeneity	-0.08643	0.014099	-0.11411	-0.08643	-0.05877
productivity	-0.16194	0.030499	-0.22179	-0.16195	-0.10208
seasonality	0.219788	0.101125	0.021441	0.219708	0.418387

Phylogenetic beta diversity: Full model – climatic stability	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-2.06E-10	0.01135	-0.02228	-3.20E-07	0.022265
biome stability	-0.3371	0.062484	-0.45969	-0.33714	-0.2144
topographic heterogeneity	-0.08644	0.014039	-0.114	-0.08644	-0.05889
productivity	-0.16195	0.030438	-0.22169	-0.16197	-0.10221
seasonality	0.219666	0.100813	0.021927	0.219589	0.417649

Phylogenetic beta diversity: Full model – biome stability	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-1.85E-10	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	-0.06815	0.052108	-0.17051	-0.06814	0.034063
topographic heterogeneity	-0.08271	0.014124	-0.11044	-0.08271	-0.055
productivity	-0.21373	0.029146	-0.27087	-0.21376	-0.15647
seasonality	0.207022	0.102482	0.006043	0.206933	0.40831

Phylogenetic beta diversity: Full model – productivity	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-2.57E-10	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	0.015609	0.053396	-0.08929	0.015622	0.12034
biome stability	-0.44987	0.061598	-0.57066	-0.44994	-0.32885
topographic heterogeneity	-0.0892	0.014119	-0.11692	-0.0892	-0.0615
seasonality	0.302598	0.100917	0.104599	0.30254	0.500734

Phylogenetic beta diversity: Full model – seasonality	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-2.29E-11	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	0.008125	0.052666	-0.09536	0.008144	0.11141
biome stability	-0.33266	0.064416	-0.45903	-0.33271	-0.20616
topographic heterogeneity	-0.08749	0.014088	-0.11515	-0.08749	-0.05985
productivity	-0.17199	0.030137	-0.23113	-0.172	-0.11283

Phylogenetic beta diversity: Full model – topographic heterogeneity	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	-2.33E-10	0.01135	-0.02228	-3.20E-07	0.022265
climatic stability	-0.02968	0.052941	-0.1337	-0.02966	0.074148
biome stability	-0.31702	0.064799	-0.44414	-0.31707	-0.18976
productivity	-0.16903	0.030591	-0.22907	-0.16904	-0.10899
seasonality	0.24246	0.101583	0.043253	0.242368	0.441993

Phylogenetic beta diversity: Full model.SR (pseudo-R^2 = 0.948)	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	12.23145	0.307333	11.62677	12.23186	12.83331
climatic stability	0.120052	0.034258	0.052579	0.120115	0.187114
biome stability	-0.17281	0.041966	-0.25519	-0.17283	-0.09041
topographic heterogeneity	-0.01824	0.013277	-0.04431	-0.01823	0.007805
productivity	-0.09006	0.023282	-0.13584	-0.09005	-0.04443
seasonality	-0.17215	0.071265	-0.31184	-0.17224	-0.03207
log(SR)	-2.74653	0.068963	-2.88166	-2.74663	-2.61099

Phylogenetic beta diversity: Full model – climatic stability.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	12.13304	0.308157	11.52698	12.13338	12.73671
biome stability	-0.13794	0.041472	-0.21939	-0.13794	-0.05655
topographic heterogeneity	-0.01314	0.013235	-0.03914	-0.01314	0.012813

productivity	-0.09392	0.023509	-0.14014	-0.0939	-0.04785
seasonality	-0.143	0.071844	-0.28393	-0.14306	-0.00188
log(SR)	-2.72444	0.069149	-2.85998	-2.72451	-2.58858

Phylogenetic beta diversity: Full model – biome stability.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	12.36294	0.308163	11.75637	12.36345	12.96619
climatic stability	0.085629	0.033851	0.018967	0.085687	0.151903
topographic heterogeneity	-0.01425	0.013277	-0.04033	-0.01425	0.011784
productivity	-0.12668	0.021748	-0.16939	-0.12668	-0.08402
seasonality	-0.19326	0.072189	-0.33465	-0.1934	-0.05127
log(SR)	-2.77606	0.06915	-2.91149	-2.77618	-2.6401

Phylogenetic beta diversity: Full model – productivity.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	12.34498	0.306652	11.74147	12.34545	12.94536
climatic stability	0.125182	0.034315	0.057632	0.125232	0.192386
biome stability	-0.23477	0.03892	-0.31124	-0.23476	-0.15841
topographic heterogeneity	-0.01852	0.013288	-0.04462	-0.01852	0.00754
seasonality	-0.12021	0.0702	-0.25781	-0.1203	0.017784
log(SR)	-2.77202	0.068811	-2.90681	-2.77213	-2.63675

Phylogenetic beta diversity: Full model – seasonality.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	12.14176	0.306113	11.53962	12.14212	12.74134
climatic stability	0.110386	0.034289	0.042887	0.110436	0.177542
biome stability	-0.18077	0.042169	-0.26349	-0.18081	-0.09793
topographic heterogeneity	-0.01818	0.013291	-0.04429	-0.01818	0.007883
productivity	-0.07989	0.023012	-0.12516	-0.07986	-0.03482
log(SR)	-2.72639	0.068689	-2.86101	-2.72648	-2.59142

Phylogenetic beta diversity: Full model – topographic heterogeneity.SR	mean	sd	0.025 quantile	0.5 quantile	0.975 quantile
(Intercept)	12.28369	0.304617	11.68449	12.28406	12.88034
climatic stability	0.11455	0.033967	0.04763	0.114618	0.181027
biome stability	-0.16824	0.041766	-0.25021	-0.16826	-0.08622
productivity	-0.09015	0.023263	-0.13589	-0.09013	-0.04456
seasonality	-0.17179	0.071168	-0.31129	-0.17189	-0.0319
log(SR)	-2.75826	0.068353	-2.89222	-2.75835	-2.62395

Table S3. Cape clades sampled for the calculation of phylogenetic diversity and phylogenetic beta diversity metrics of the Cape flora of South Africa. Numbers of species in total, species native to the Cape and Cape endemic species are based on (1).

Clade	Family	No species total	No species Cape	No species endemic	No species included	Data obtained	References
Babiana	Iridaceae	92	60	46	66	Dated tree	2
Bruniaceae	-	79	79	77	53	GenBank sequences	3,4
Cliffortia	Rosaceae	140	125	113	117	GenBank sequences	5
Coryciinae[1]	Orchidaceae	112	44	30	25	Published matrix	6
Disa	Orchidaceae	170	100	82	76	GenBank sequences	7,8
Ehrharta	Poaceae	36	20	12	19	Dated tree	9,10
Erica	Ericaceae	860	680	659	309	GenBank sequences	11
Gladiolus	Iridaceae	250	108	86	94	Dated tree	12,13
Heliophila	Brassicaceae	75	61	38	38	Dated tree	10,15
Lachnaea	Thymelaeaceae	40	40	40	38	GenBank sequences	Direct submission to GenBank, M. van der Bank (U. of Johannesburg)
Metalasia clade[2]	Asteraceae	61	61	54	57	GenBank sequences	15-17
Moraea	Iridaceae	220	122	84	110	Dated tree	2
Muraltia	Polygalaceae	118	109	101	68	Dated tree	9,18
Pelargonium	Geraniaceae	250	150	85	98	Dated tree	9,19
Penaeaceae	-	23	23	23	18	Published matrix	20
Pentameris	Poaceae	83	62	49	58	Dated tree	9, 21
Phyliceae[3]	Rhamnaceae	152	134	127	40	GenBank sequences	22
Podalyrieae[4]	Fabaceae	125	117	109	95	Dated tree	2, 23
Protea	Proteaceae	115	70	65	71	Dated tree	2, 24
Restionaceae	-	545	342	313	261	Dated tree	25
Stilbaceae	-	39	20	17	16	GenBank sequences	26
Total	**-**	**3,585**	**2,527**	**2,210**	**1,727**		

[1] Includes genera *Ceratandra*, *Disperis*, *Evotella*, and *Pterygodium.*
[2] Includes genera *Atrichantha*, *Calotesta*, *Dolichothrix*, *Hydroidea*, *Lachnospermum*, *Metalasia*, and *Phaenocoma*.
[3] Includes genera *Noltea*, *Phylica* and *Trichocephalus*.
[4] Includes genera *Amphithalea*, *Calpurnia*, *Cyclopia*, *Liparia*, *Podalyria*, *Stirtonanthus*, *Virgilia* and *Xiphotheca.*

References for Table S3:

1. Manning JC, Goldblatt P (2012) Plants of the Greater Cape Floristic Region I: The Core Cape flora (South African National Biodiversity Institute, Pretoria). *Strelitzia* 9.
2. Schnitzler J, et al. (2011) Causes of plant diversification in the Cape biodiversity hotspot of South Africa. *Systematic Biology* 60(3):343-357.
3. Quint M & Classen-Bochoff R (2006) Phylogeny of Bruniaceae based on matK and its sequence data. *International Journal of Plant Sciences* 167(1):135-146.
4. Classen-Bockhoff R, Oliver EGH, Hall AV, & Quint M (2011) A new classification of the South African endemic family Bruniaceae based on molecular and morphological data. *Taxon* 60(4):1138-1155.
5. Whitehouse CM (2002) Systematics of the genus *Cliffortia* L. (Rosaceae). PhD (University of Cape Town, Cape Town).

6. Waterman RJ, Pauw A, Barraclough TG, & Savolainen V (2009) Pollinators underestimated: A molecular phylogeny reveals widespread floral convergence in oil-secreting orchids (sub-tribe Coryciinae) of the Cape of South Africa. *Molecular Phylogenetics & Evolution* 51(1):100-110.
7. Bytebier B, Antonelli A, Bellstedt DU, & Linder HP (2010) Estimating the age of fire in the Cape flora of South Africa from an orchid phylogeny. *Proceedings of the Royal Society B* 278: 188-195.
8. Bytebier B, Bellstedt DU, & Linder HP (2007) A molecular phylogeny for the large African orchid genus *Disa*. *Molecular Phylogenetics & Evolution* 43:75-90.
9. Verboom GA, et al. (2009) Origin and diversification of the Greater Cape flora: Ancient species repository, hot-bed of recent radiation, or both? *Molecular Phylogenetics & Evolution* 51:44-53.
10. Verboom GA, Linder HP, & Stock WD (2003) Phylogenetics of the grass genus *Ehrharta*: Evidence for radiation in the summer-arid zone of the South African Cape. *Evolution* 57:1008-1021.
11. Pirie MD, Oliver E, & Bellstedt DU (2011) A densely sampled ITS phylogeny of the Cape flagship genus *Erica* L. suggests numerous shifts in floral macro-morphology. *Molecular Phylogenetics & Evolution* 61:593-601.
12. Valente LM, Manning JC, Goldblatt P, & Vargas P (2012) Did pollination shifts drive diversification in Southern African *Gladiolus*? Evaluating the model of pollinator-driven speciation. *American Naturalist* 180(1):83-98.
13. Valente LM, Savolainen V, Manning JC, Goldblatt P, & Vargas P (2011) Explaining disparities in species richness between Mediterranean floristic regions: a case study in *Gladiolus* (Iridaceae). *Global Ecology and Biogeography* 20(6):881-892.
14. Mummenhoff K, Al-Shehbaz IA, Bakker FT, Linder HP, & Muhlhausen A (2005) Phylogeny, morphological evolution, and speciation of endemic Brassicaceae genera in the Cape Flora of southern Africa. *Annals of the Missouri Botanical Garden* 92(3):400-424.
15. Bengtson A, Anderberg AA, & Karis PO (2011) Phylogeny and generic delimitation of the *Metalasia* clade (Asteraceae-Gnaphalieae). *International Journal of Plant Sciences* 172(8):1067-1075.
16. Bengtson A, Anderberg AA, & Karis PO (2014) Phylogeny and evolution of the South African genus *Metalasia* (Asteraceae-Gnaphalieae) inferred from molecular and morphological data. *Botanical Journal of the Linnean Society* 174(2):173-198.
17. Bengtson A, Nylinder S, Karis PO, & Anderberg AA (2015) Evolution and diversification related to rainfall regimes: diversification patterns in the South African genus *Metalasia* (Asteraceae-Gnaphalieae). *Journal of Biogeography* 42(1):121-131.
18. Forest F, Nanni I, Chase MW, Crane PR, & Hawkins JA (2007) Diversification of a large genus in a continental biodiversity hotspot: Temporal and spatial origin of *Muraltia* (Polygalaceae) in the Cape of South Africa. *Molecular Phylogenetics & Evolution* 43(1):60-74.
19. Bakker FT, Culham A, Hettiarachi P, Touloumenidou T, & Gibby M (2004) Phylogeny of Pelargonium (Geraniaceae) based on DNA sequences from three genomes. *Taxon* 53(1):17-28.
20. Rutschmann F, Eriksson T, Abu Salim K, & Conti E (2007) Assessing calibration uncertainty in molecular dating: The assignment of fossils to alternative calibration points. *Systematic Biology* 56(4):591-608.
21. Galley C & Linder HP (2007) The phylogeny of the *Pentaschistis* clade (Danthonioideae, Poaceae) based on chloroplast DNA, and the evolution and loss of complex characters. *Evolution* 61(4):864-884.
22. Onstein RE, Carter RJ, Xing YW, & Linder HP (2014) Diversification rate shifts in the Cape Floristic Region: The right traits in the right place at the right time. *Perspectives in Plant Ecology Evolution and Systematics* 16(6):331-340.
23. Boatwright JS, et al. (2008) Systematic position of the anomalous genus *Cadia* and the phylogeny of the tribe Podalyrieae (Fabaceae). *Systematic Botany* 33:133-147.
24. Valente LM, et al. (2010) Diversification of the African genus *Protea* (Proteaceae) in the Cape biodiversity hotspot and beyond: equal rates in different biomes. *Evolution* 64(3):745-759.
25. Litsios G, et al. (2014) Effects of a fire response trait on diversification in replicated radiations. *Evolution* 68(2):453-465.
26. Oxelman B, Kornhall P, Olmstead RC, & Bremer B (2005) Further disintegration of Scrophulariaceae. *Taxon* 54(2):411-425.

Fig. S5. Topographic heterogeneity (A) within two minute grid cells and (B) between neighbouring sets (up to eight) of two minute cells (see Materials & Methods). Within cell topographic heterogeneity for the CFR is correlated with between cell topographic heterogeneity (r = 0.632); the former measure was used as a covariate in our spatial regression models.

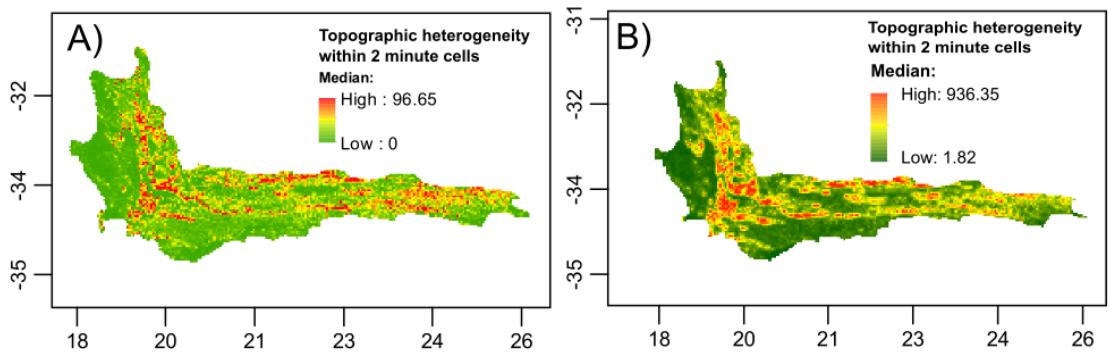


Fig. S6: Bivariate plots of the relationships between the five covariates (all r < 0.6).