Ecography

ECOG-05190
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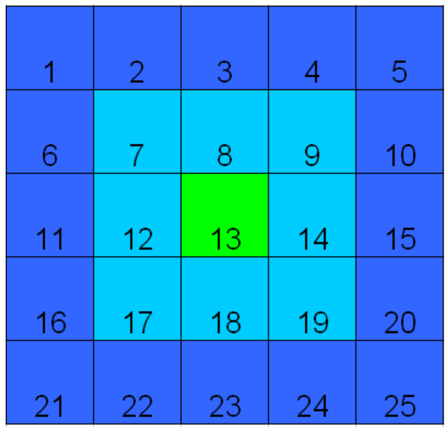
Supplementary material

Appendix 1. Diagram showing the neighborhood approach used to calculate β-diversity between the focal cell (green cell, #13) and each of the remaining 24 cells. The eight cells in light-blue color are the first-order neighboring cells; the 16 cells in blue color are the second-order neighboring cells.



Appendix 2. Results of Simultaneous Autoregressive models relating β-diversity metrics ($\beta_{sor.tax}$ and $\beta_{sor.phy}$), their turnover ($\beta_{sim.tax}$ and $\beta_{sim.phy}$) and nestedness ($\beta_{nes.tax}$ and $\beta_{nes.phy}$) components, and the ratio of β_{nes} to β_{sor} ($\beta_{ratio.tax}$ and $\beta_{ratio.phy}$) against latitude (LAT), mean annual temperature (MAT) and the first principal component (PC1) of the six climatic variables (see Methods). Values of SAR Coeff. and R^2 were derived from spatial autoregressive (SAR) models. LAT, MAT and PC1 were standardized (mean = 0, standard deviation = 1). SAR Coeff. corresponds to the standardized regression coefficient. R^2p represents the variance explained by predictor variables, and $R^2p\&s$ represents the variance explained by predictor plus space variables. β-diversity was measured as the average of all values of β-diversity between a focal grid cell and its first-order neighboring grid cells (i.e. using the neighborhood approach; see Appendix S1 for details). N = 853 in all cases.

(a) $\beta_{sor.tax}$

	Model for LAT		Model for MAT		Model for PC1		Model for LAT + MAT + PC1	
	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value
LAT	-0.020	<0.001					-0.023	<0.001
LAT*LAT	-0.007	0.007					-0.006	0.062
MAT			0.018	<0.001			0.008	0.035
MAT*MAT			-0.005	0.072			-0.015	<0.001
PC1					0.008	0.030	0.002	0.622
PC1*PC1					-0.008	<0.001	-0.005	0.009
R^2p	0.067		0.048		0.022		0.120	
$R^2p\&s$	0.083		0.086		0.041		0.140	

(b) $\beta_{sor.phy}$

	Model for LAT		Model for MAT		Model for PC1		Model for LAT + MAT + PC1	
	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value
LAT	-0.018	<0.001					-0.029	<0.001
LAT*LAT	-0.006	0.005					<0.001	0.800
MAT			0.007	0.006			-0.007	0.015
MAT*MAT			-0.004	0.124			-0.017	<0.001
PC1					0.005	0.102	0.001	0.685
PC1*PC1					-0.005	<0.001	-0.004	0.006
R^2p	0.101		0.011		0.018		0.164	
$R^2p\&s$	0.112		0.045		0.042		0.165	

(c) $\beta_{sim.tax}$

	Model for LAT		Model for MAT		Model for PC1		Model for LAT + MAT + PC1	
	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value
LAT	-0.028	<0.001					-0.033	<0.001
LAT*LAT	0.003	0.147					0.006	0.012
MAT			0.021	<0.001			0.004	0.130

MAT*MAT			0.002	0.341			-0.015	<0.001
PC1					0.006	0.053	<0.001	0.973
PC1*PC1					-0.007	<0.001	-0.003	0.020
R^2p	0.188		0.132		0.039		0.269	
R^2p&s	0.214		0.193		0.071		0.280	

(d) $\beta_{sim.phy}$

	Model for LAT		Model for MAT		Model for PC1		Model for LAT + MAT + PC1	
	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value
LAT	-0.021	<0.001					-0.026	<0.001
LAT*LAT	0.004	0.003					0.006	<0.001
MAT			0.012	<0.001			<0.001	0.624
MAT*MAT			0.003	0.022			-0.010	<0.001
PC1					0.003	0.098	<0.001	0.989
PC1*PC1					-0.004	<0.001	-0.002	0.027
R^2p	0.250		0.123		0.036		0.315	
R^2p&s	0.275		0.190		0.076		0.321	

(e) $\beta_{nes.tax}$

	Model for LAT		Model for MAT		Model for PC1		Model for LAT + MAT + PC1	
	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value
LAT	0.009	<0.001					0.010	0.005
LAT*LAT	-0.011	<0.001					-0.011	<0.001
MAT			-0.004	0.119			0.003	0.402
MAT*MAT			-0.008	0.001			<0.001	0.913
PC1					0.003	0.315	0.003	0.357
PC1*PC1					-0.001	0.522	-0.002	0.280
R^2p	0.061		0.026		0.003		0.061	
R^2p&s	0.070		0.030		0.011		0.071	

(f) $\beta_{nes.phy}$

	Model for LAT		Model for MAT		Model for PC1		Model for LAT + MAT + PC1	
	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value
LAT	0.003	0.188					-0.003	0.242
LAT*LAT	-0.010	<0.001					-0.007	<0.001
MAT			-0.006	0.001			-0.007	0.006
MAT*MAT			-0.007	<0.001			-0.007	0.011
PC1					0.002	0.482	0.002	0.487
PC1*PC1					-0.001	0.338	-0.002	0.137
R^2p	0.060		0.042		<0.001		0.079	
R^2p&s	0.064		0.041		0.011		0.082	

(g) $\beta_{ratio.tax}$

	Model for LAT		Model for MAT		Model for PC1		Model for LAT + MAT + PC1	
	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value
LAT	0.076	<0.001					0.085	<0.001
LAT*LAT	-0.026	<0.001					-0.031	<0.001
MAT			-0.055	<0.001			-0.010	0.283
MAT*MAT			-0.018	0.016			0.030	0.001
PC1					-0.015	0.126	-0.002	0.860
PC1*PC1					0.017	<0.001	0.008	0.084
R^2p	0.161		0.122		0.029		0.208	
R^2p&s	0.183		0.157		0.056		0.219	

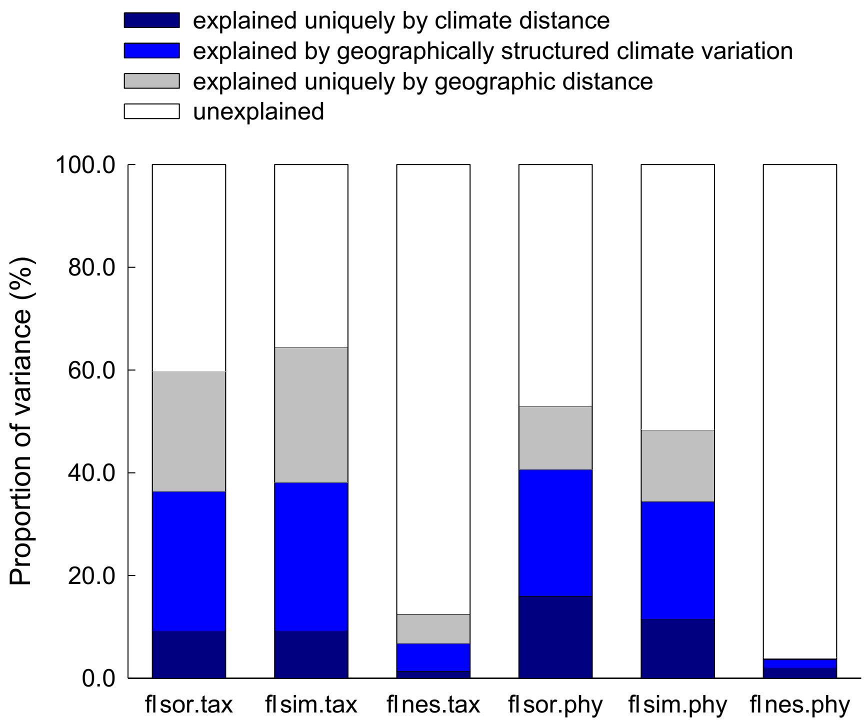
(h) $\beta_{ratio.phy}$

	Model for LAT		Model for MAT		Model for PC1		Model for LAT + MAT + PC1	
	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value	SAR Coeff.	P Value
LAT	0.075	<0.001					0.076	<0.001
LAT*LAT	-0.036	<0.001					-0.037	<0.001
MAT			-0.059	<0.001			-0.017	0.073
MAT*MAT			-0.027	<0.001			0.018	0.053
PC1					-0.014	0.145	-0.003	0.782
PC1*PC1					0.014	0.003	0.006	0.221
R^2p	0.184		0.145		0.023		0.220	
R^2p&s	0.201		0.172		0.051		0.231	

Appendix 3. Results of multiple regression on distance matrices (MRM) relating each β-diversity metric to geographic distance, climatic distance and elevational range difference, altogether. We report the partial standardized regression coefficients for each explanatory distance variable and the coefficient of determination (R^2) of the complete model. Significance was tested using a permutation test (999 permutations): ** P < 0.001, * P < 0.05, ns P > 0.05.

	$\beta_{sor.tax}$	$\beta_{sim.tax}$	$\beta_{nes.tax}$	$\beta_{sor.phy}$	$\beta_{sim.phy}$	$\beta_{nes.phy}$
Geographical distance	0.539**	0.588**	-0.301**	0.387**	0.431**	0.047*
Climatic distance	0.349**	0.340**	-0.110**	0.456**	0.383**	0.170**
Elev. range difference	0.040**	-0.046**	0.151**	0.034**	-0.035*	0.072**
R^2	0.599**	0.645**	0.147**	0.529**	0.485**	0.044**

Appendix 4. Variance in β-diversity and their components explained uniquely by climatic distance, by geographically structured climate variation, and uniquely by geographic distance. Explained variation was calculated based on coefficient of determination derived from MRM analysis. Geographically structured climate variation for $\beta_{nes.tax}$ and $\beta_{nes.phy}$ in panel b represents negative values derived from variation partitioning analyses.



Appendix 5. Coefficients of determination (R^2) of statistic models with β-diversity metrics being dependent variables and geographic distance (Geog), climatic distance (Clim) and elevational range difference (Elev) being independent variables.

	Geog + Clim	Geog + Clim + Elev	Difference
$\beta_{sor.tax}$	0.598	0.599	0.001
$\beta_{sor.phy}$	0.529	0.530	0.001