Supplementary Table 1. Significant relationships between spatial turnover and selected environmental variables, controlling for species richness. There were 7891 degrees of freedom (df) in the case of linear models and 7890 in the case of quadratic models. Methods and abbreviations for estimates of variance explained are as for Table 1. For significant linear and quadratic terms, $^{+}$ and $^{-}$ indicate positive and negative slopes, respectively, with level of significance coded as: $^{+++/---}$, $P < 0.001$; $^{++/--}$, $0.001 \leq P < 0.01$; $^{+/-}$, $0.01 \leq P < 0.05$.

Effect	β_w		β_{sim}		β_j	
	F	Pp. expl. D	F	R^2	F	R^2
Mean						
Elevation	11.46^{---}	0.648	30.35^{+++}	0.103	—	—
Elevation^2	9.39^{++}		—		—	
Habitat diversity	36.91^{---}	0.642	16.25^{---}	0.090	12.02^{---}	0.337
Habitat diversity^2	—		10.18^{++}		—	
Temperature	47.94^{+++}	0.660	—	—	138.97^{+++}	0.368
Temperature^2	13.46^{---}		—		—	
NDVI	30.11^{+++}	0.649	24.89^{---}	0.110	31.64^{---}	0.365
NDVI^2	20.27^{---}		—		6.32^{+}	
Roughness						
Elevation	*	*	45.14^{+++}	0.124	106.34^{+++}	0.372
Elevation^2	*	*	—		—	
Habitat diversity	21.31^{+++}	0.637	13.63^{+++}	0.090	15.46^{+++}	0.330
Habitat diversity^2	12.57^{---}		3.95^{-}		6.28^{-}	
Temperature	*	*	43.03^{+++}	0.122	93.77^{+++}	0.370
Temperature^2	*	*	5.83-		39.02^{---}	
NDVI	*	*	18.08^{+++}	0.104	31.08^{+++}	0.362
NDVI^2	*	*	—		5.52^{-}	

* Model predictors for which convergence could not be achieved.

Supplementary Table 2. F-values and estimates of variance explained for relationships between overall patterns of turnover and the patterns of turnover for each quartile of the species-range size distribution separately. Methods and abbreviations for estimates of variance explained are as for Table 1. In each case there are 8969 degrees of freedom, slopes are positive, and $P < 0.0001$.

Range size quartile	β_w		β_{sim}		β_j	
	F	Pp. expl. D	F	R^2	F	R^2
1	160.7	0.019	295.0	0.070	440.5	0.014
2	1197.9	0.039	453.8	0.084	1207.5	0.088
3	1848.8	0.045	1315.8	0.171	4385.2	0.315
4	3894.6	0.047	21234.5	0.602	54184.6	0.694

Supplementary Figure 1. Latitudinal variation in the mean distance between the centroid of a focal cell and that of its immediate neighbours on the equal area Behrmann grid employed in this study.