

Hi Cinzia,

What I've done is to look at α and β -diversity as they relate to geography, but also to their environment of deposition. You may recall the paper in Science last month (Hopping Hotspots) that proposed a relationship between diversity and tectonic setting through the most recent 40 Ma. The authors looked at the distribution of benthic forams as a proxy of overall diversity, seemingly to propose that high levels of diversity could be sustained by environmental disturbance in a tectonic setting. Although that may be the case in their dataset we find other things. For example many of the places of highest diversity within the Cenozoic are associated rather with passive continental margins. To look at this I did a bunch of things that I'm only beginning to write up. The gist is that I performed a principal component analysis on five environmental gradients (which I propose are more important to diversity in the fossil record than tectonic setting) based on lithological data from the Paleobiology Database. The results of the analysis show in Table 1 that much of the difference in the data is accounted for by the first three factor loadings, which I reconstitute and cluster into 40 different groups. In the end the number of these cluster groups, which are really depositional habitats but could be compared to habitats correlate very well with both α ($\rho=0.815$) and β -diversity ($\rho=0.738$, Table 2). The results will be developed into a paper very soon.

Table 1: Principal Component Analysis of Sedimentary Lithologies

Variable	Factor loadings				
	F1	F2	F3	F4	F5
Covariance	2548.0	560.3	455.7	223.2	187.6
Tot. Covar. (in %)	64.1	14.1	11.5	5.6	4.7
Depth	0.053	-0.864	0.180	0.456	0.105
Pct Sand	-0.032	-0.229	0.687	-0.647	-0.234
Pct Silt	-0.022	-0.336	-0.466	-0.583	0.574
Pct Clay	0.754	0.217	0.347	0.070	0.510
Pct Lime Mud	0.654	-0.203	-0.397	-0.169	-0.587

Table 2: Pearson correlation of α -diversity environmental/diversity indices

Variable	Pearson Coeff.	P-value
Number of Habitats	0.815	3.40839e-39
Local Depth Range	0.479	1.94517e-25
Local Depth Mean	0.383	0.00000
β -Diversity	0.524	0.00000

Table 3: Pearson correlation of β -diversity environmental/diversity indices

Variable	Pearson Coeff.	P-value
Number of Habitats	0.738	0.00000
Local Depth Range	0.441	0.00000
Local Depth Mean	0.661	0.00000

Figure 1: Illustration of α -diversity within each geographical 1° cell. High α -diversity corresponds to hot colors, whereas grid cells with low diversity have a corresponding cool color. Note that some of the highest observed diversities occur along the passive margin of the Southeastern United States.

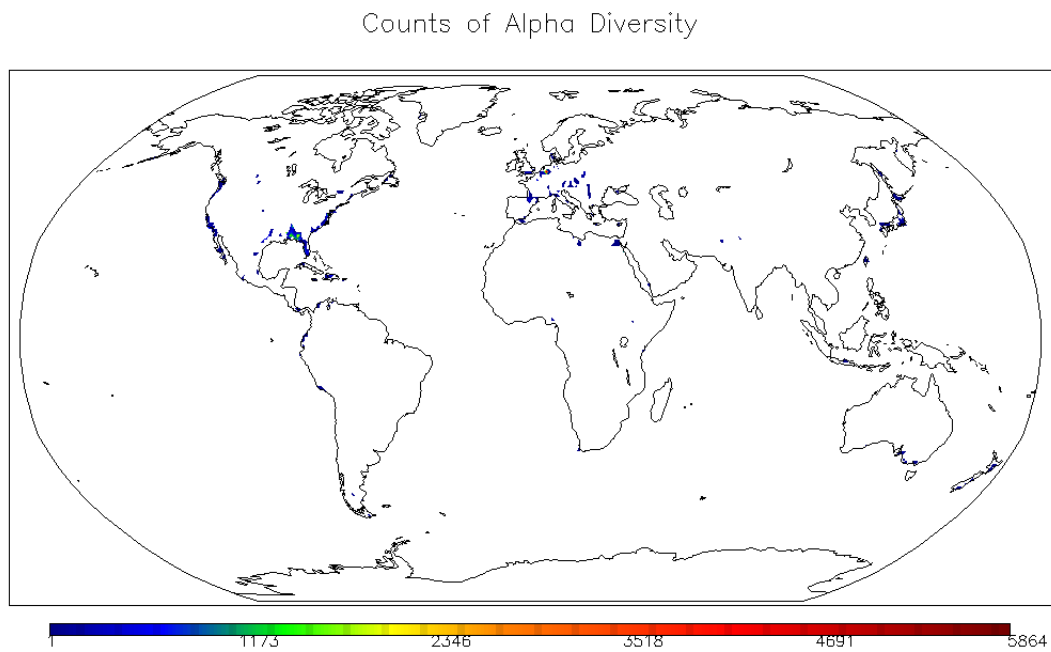


Figure 2: Ordination of 40 depositional habitats in the space of the principal factors F1 and F2

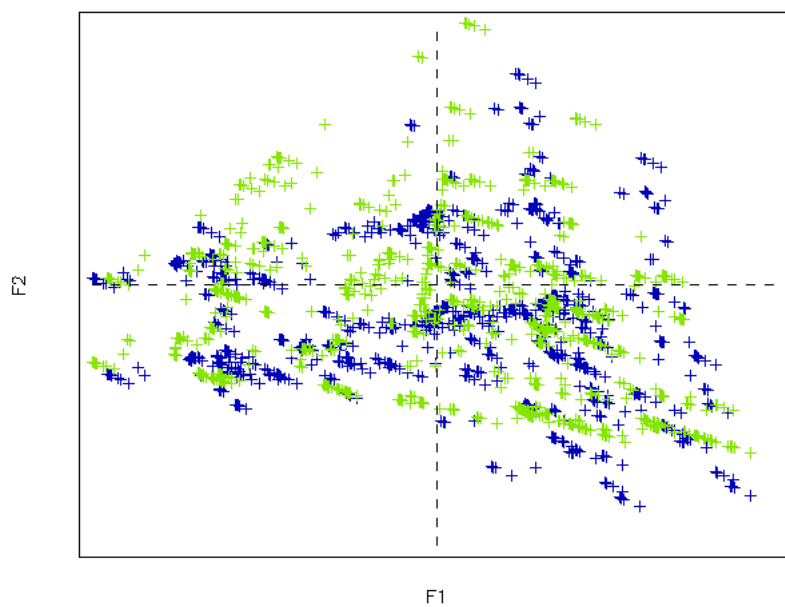


Figure 3: Landscape of global fossil α -diversity and the number of depositional habitats (represented by colors). Geographic location is given on the two horizontal axes, the α -diversity of each 1° grid is represented by that grid's height along the vertical axis, and the number of depositional habitats within that grid is represented by the color of the peak (abundant habitats in red and few in blue). This illustrates the correlation between α -diversity and depositional habitats from Table 2.

