

How much sediment is there?

Sediment on Continental Crust

Volume = $524 * 10^6 \text{ km}^3$

Area = $177 * 10^6 \text{ km}^2$

Thickness = 2,960 m

Thickness [km]
1
0

From UNESCO

1:5,000,000 global maps

From Ronov atlases

Sediment on Oceanic Crust

Volume = $82 * 10^6 \text{ km}^3$

Area = $333 * 10^6 \text{ km}^2$

Thickness = 250 m

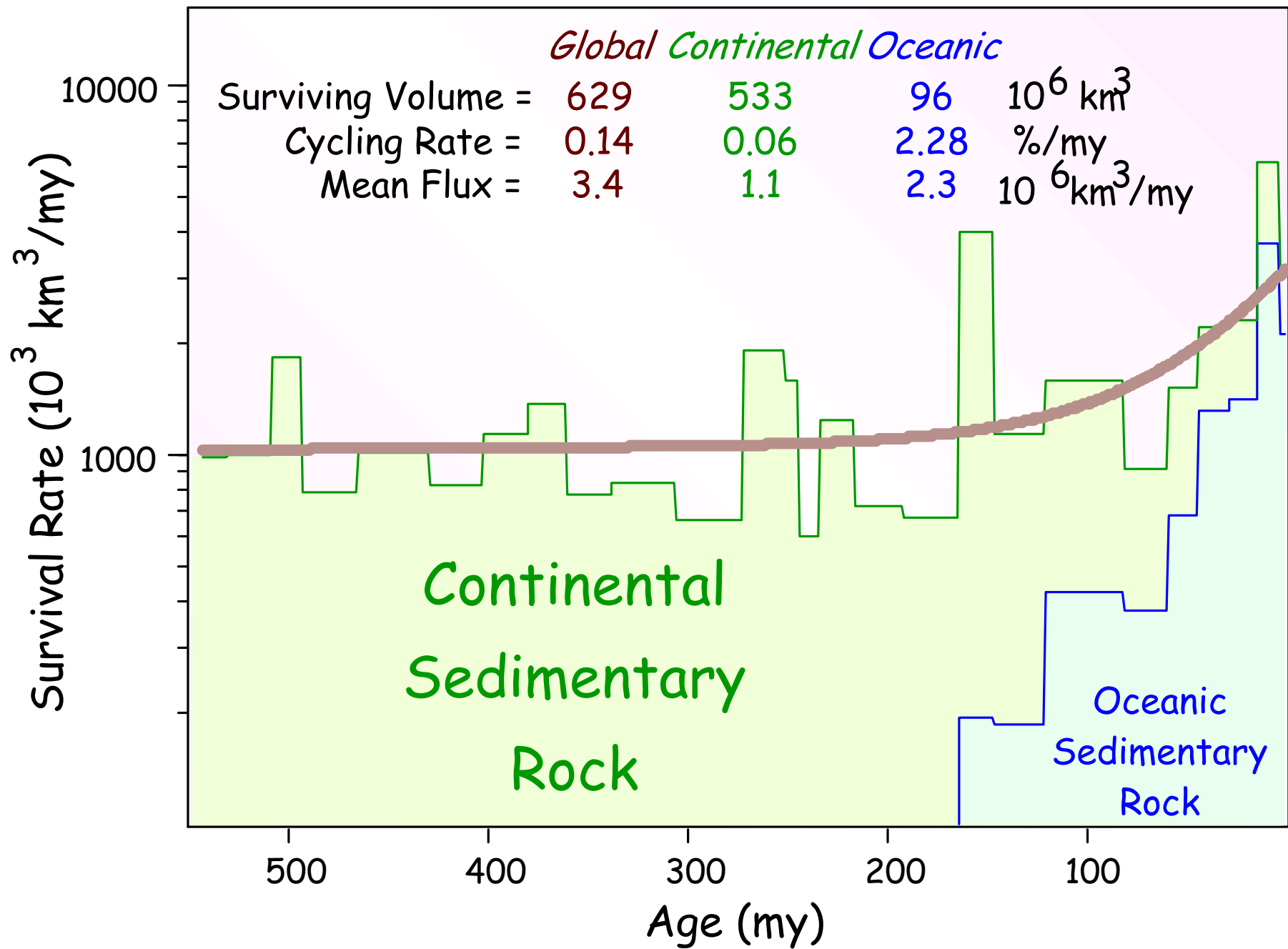


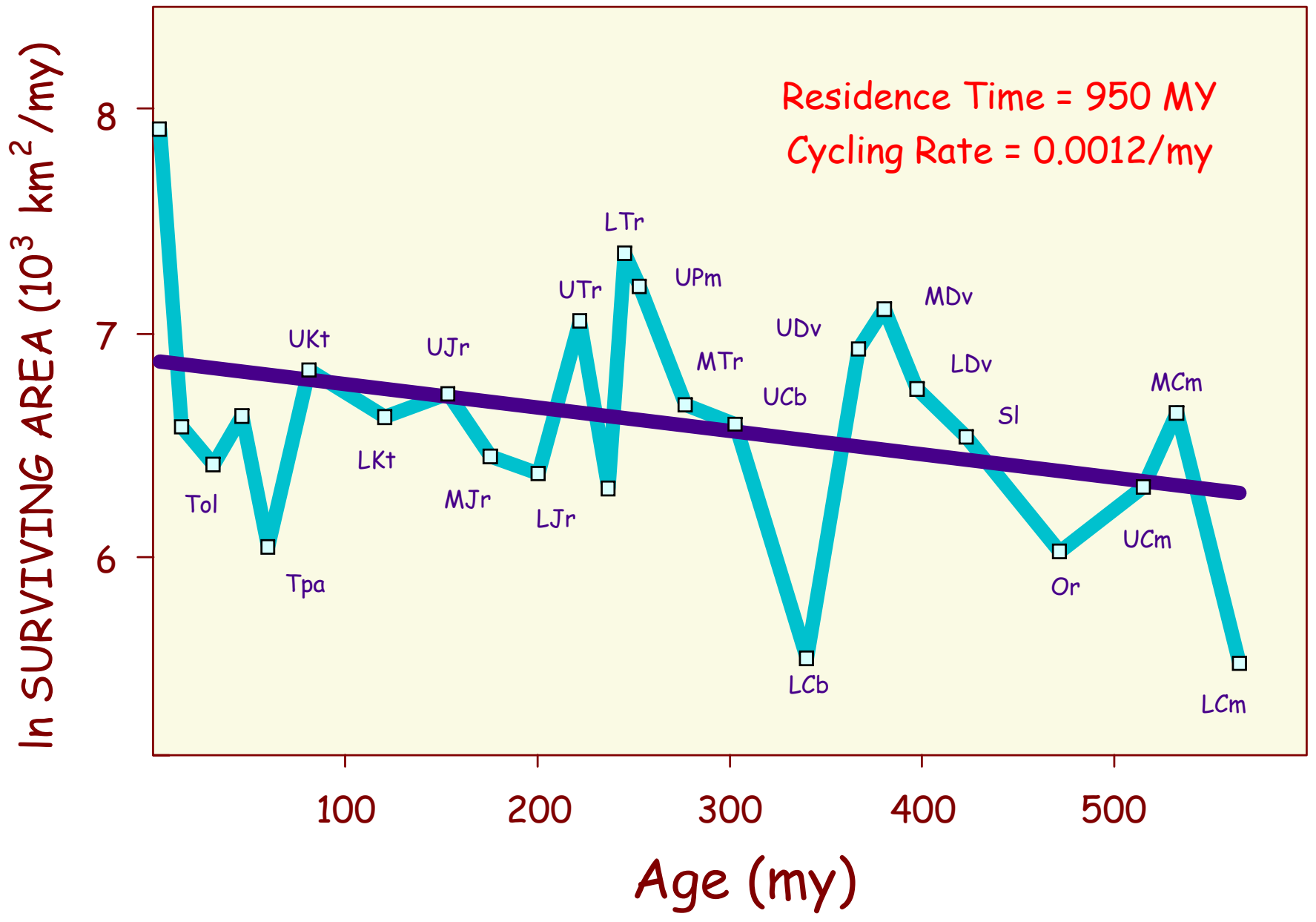
0 1,000



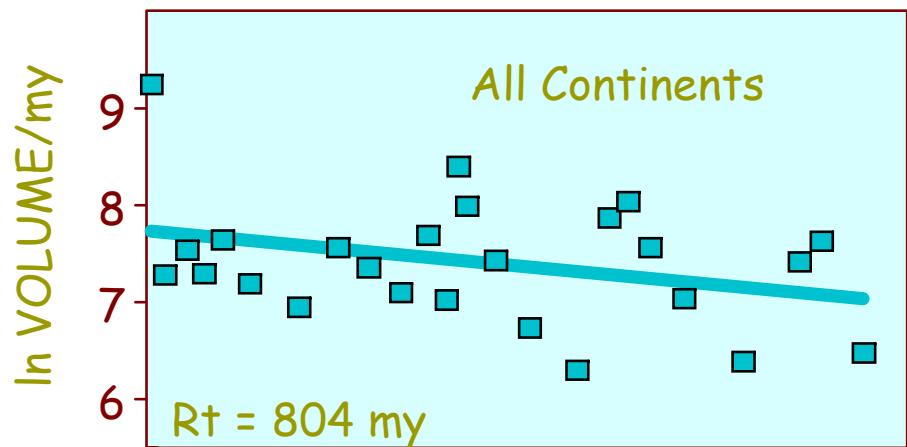
Area [km²]



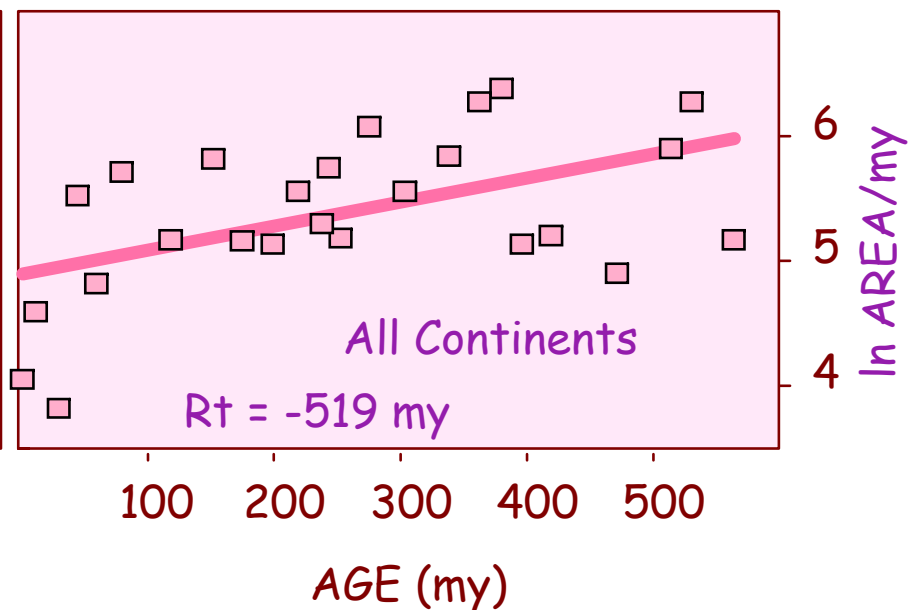
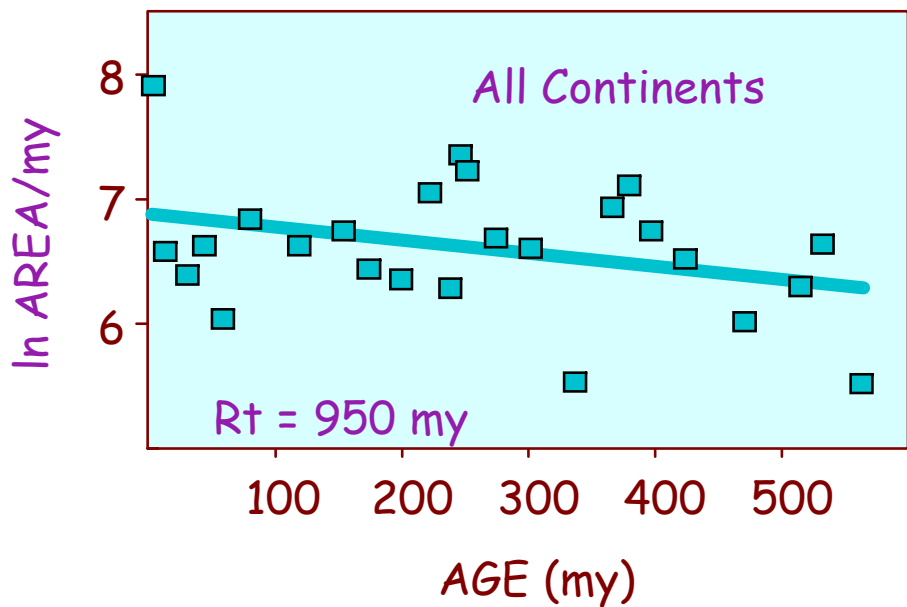
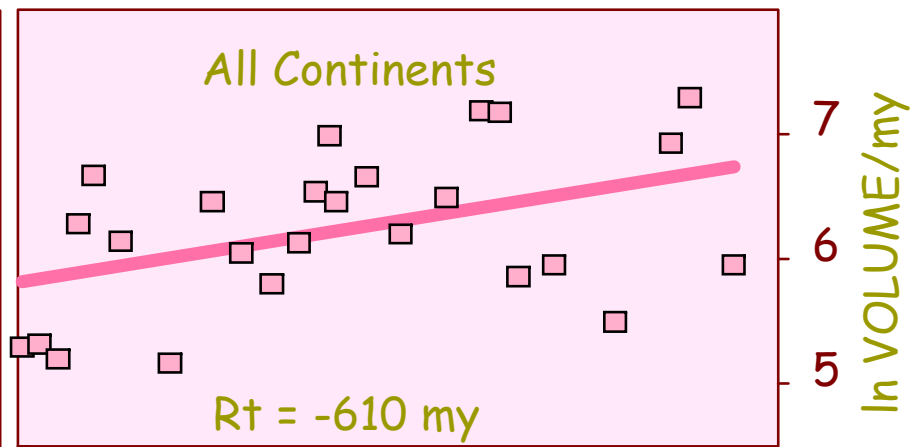




Terrigenous Clastics

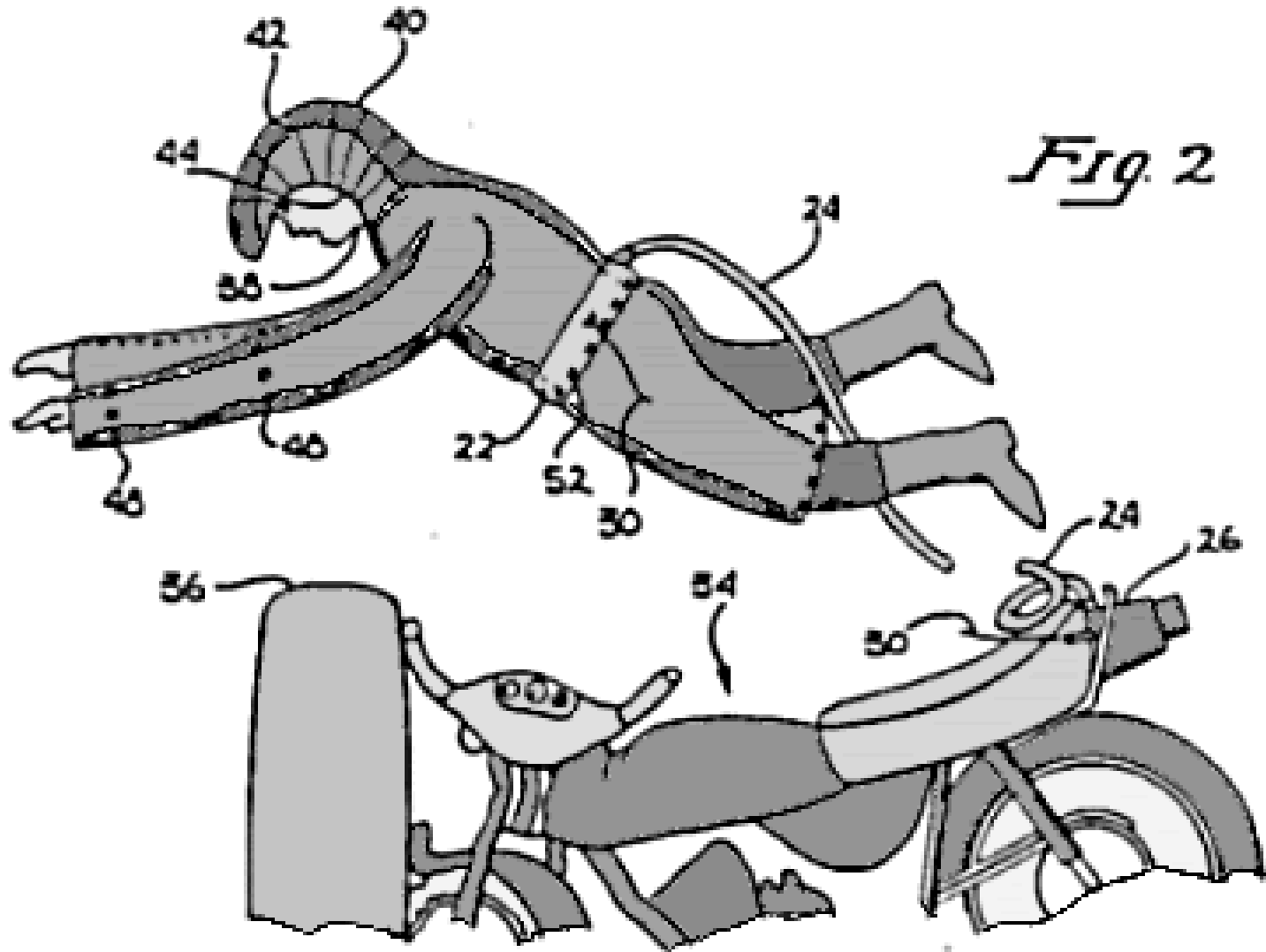


Marine Carbonates

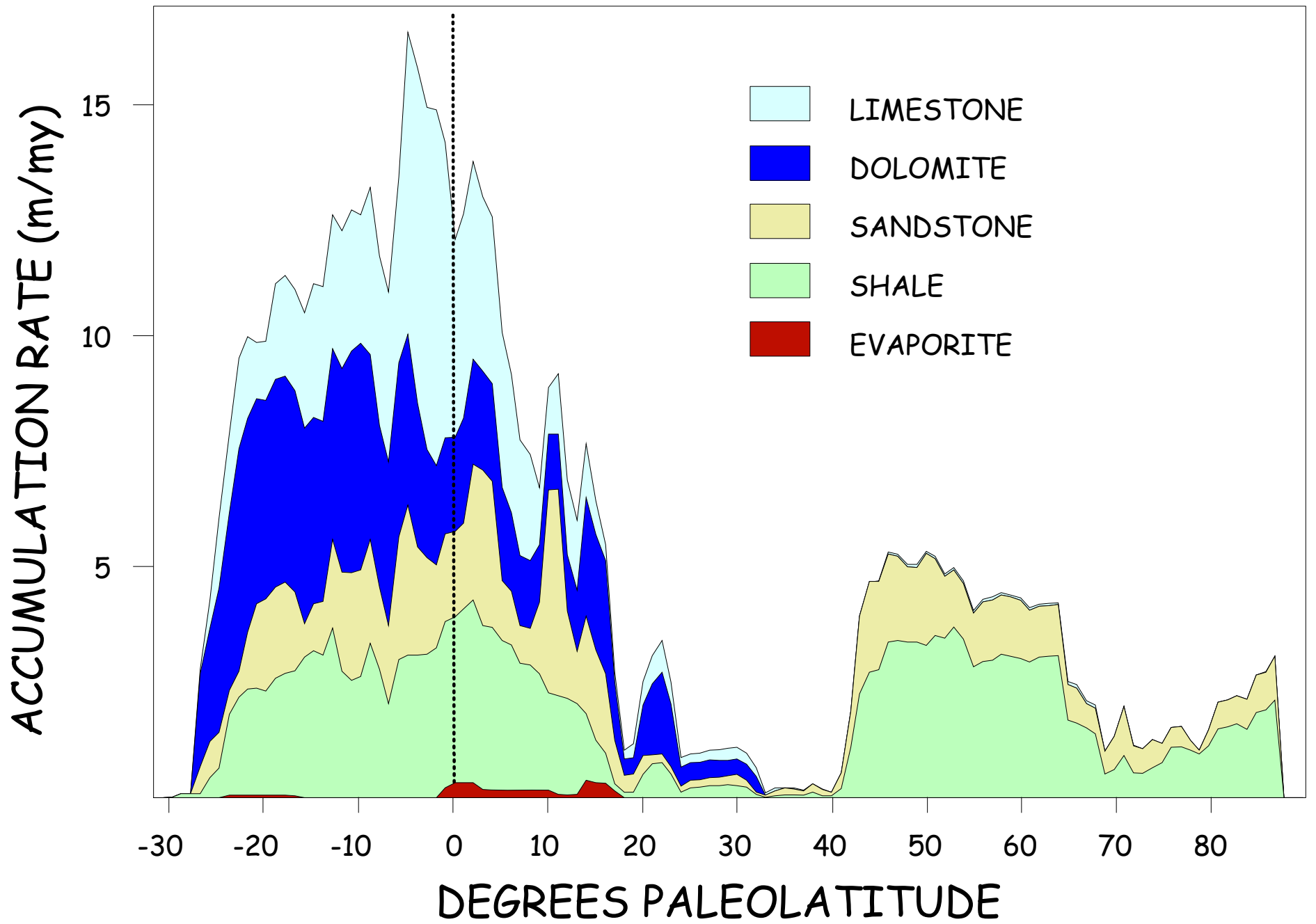


Surviving amounts of terrigenous clastic sediment exhibit **negative** age/volume and age/area slopes. This is the geologic cycle.

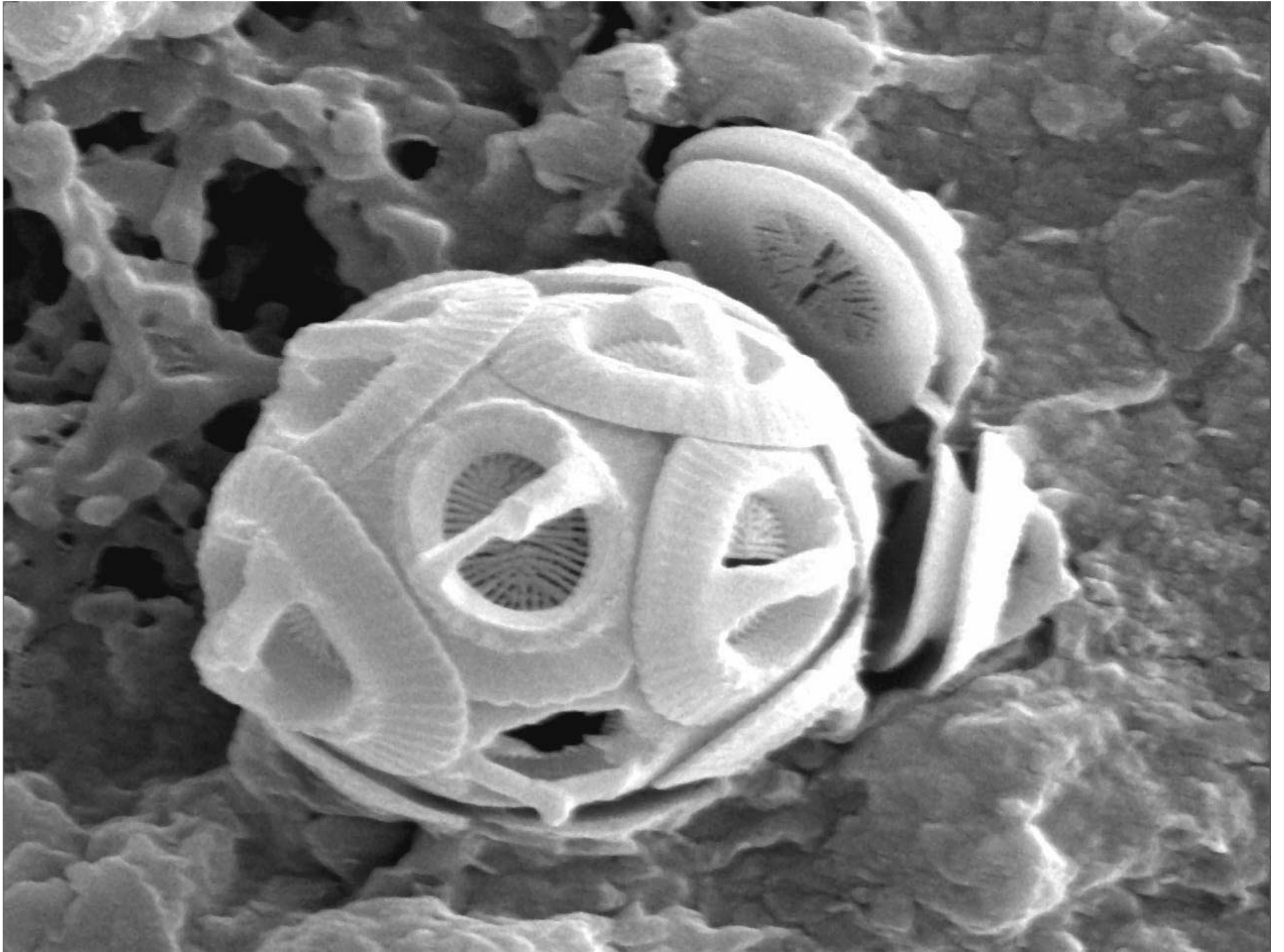
Surviving amounts of marine carbonate sediment exhibit **positive** age/volume and age/area slopes. This is a problem.

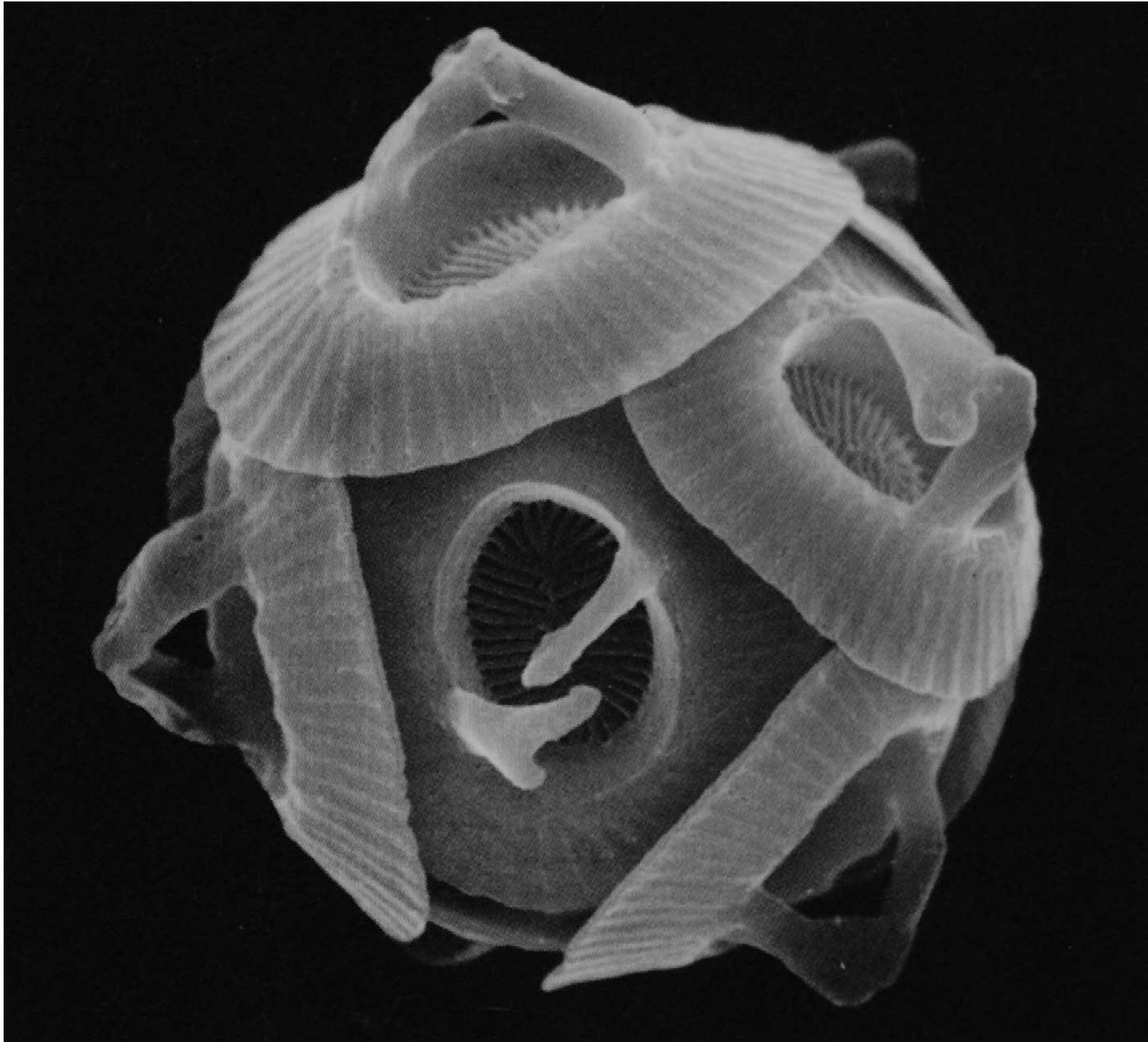


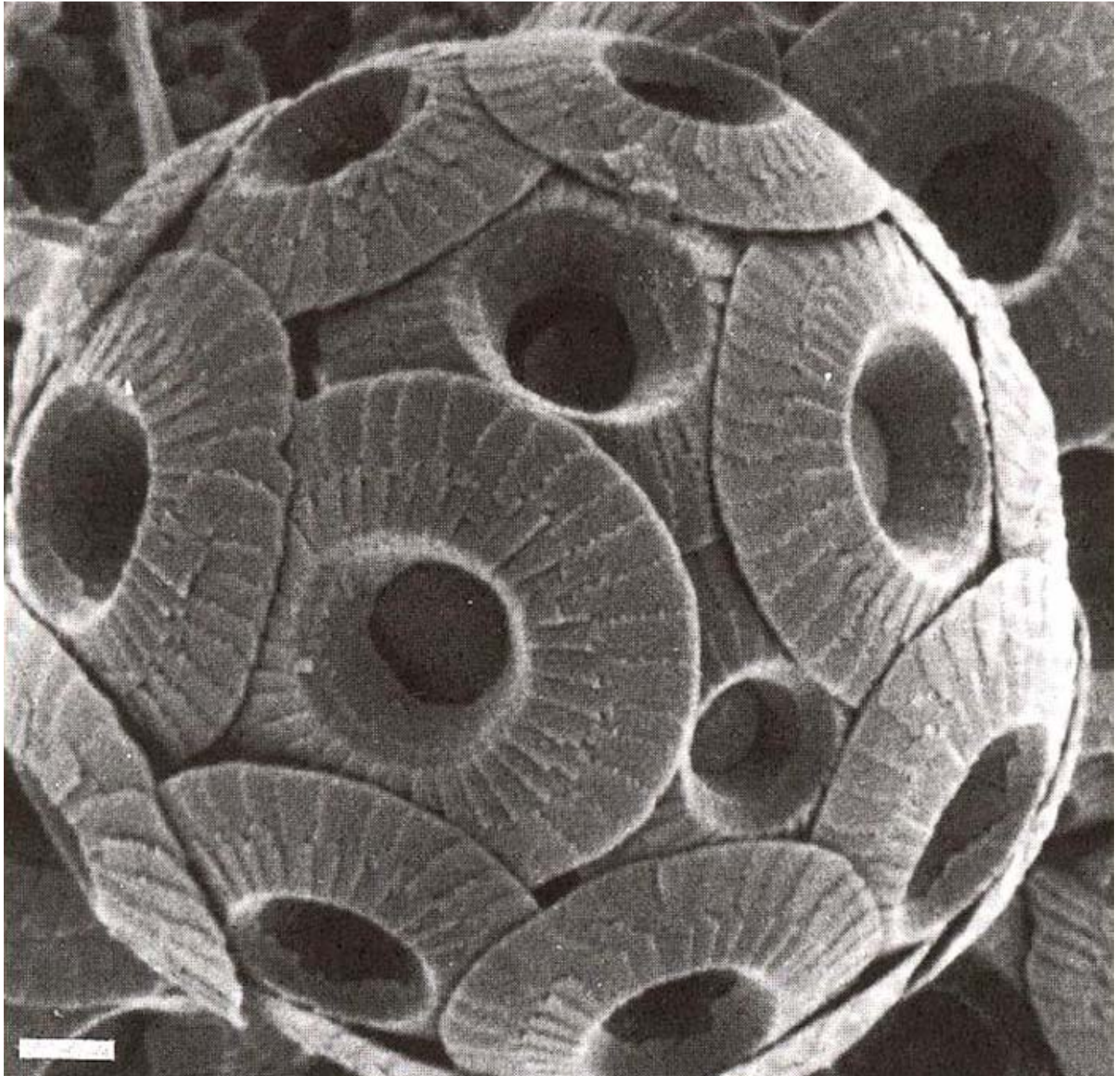
The answer to this problem is that over Phanerozoic time, increasingly amounts of the global carbonate reservoir have been accumulating in deep sea (rather than shallow shelf) settings.



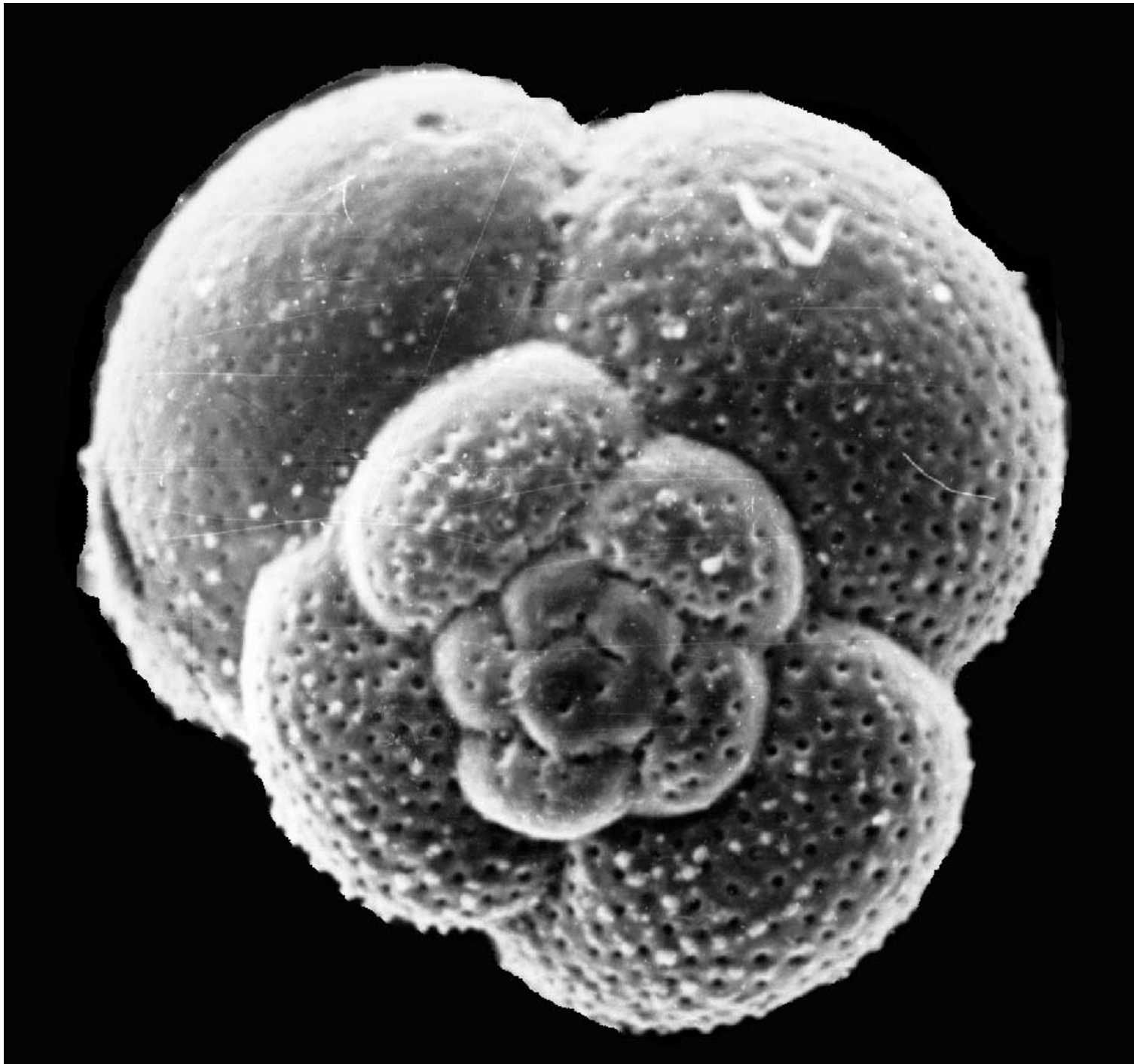
2) That volumes and areas of deep marine carbonate accumulation are primarily related to the explosive evolution and rapid diversification of calcareous marine plankton.



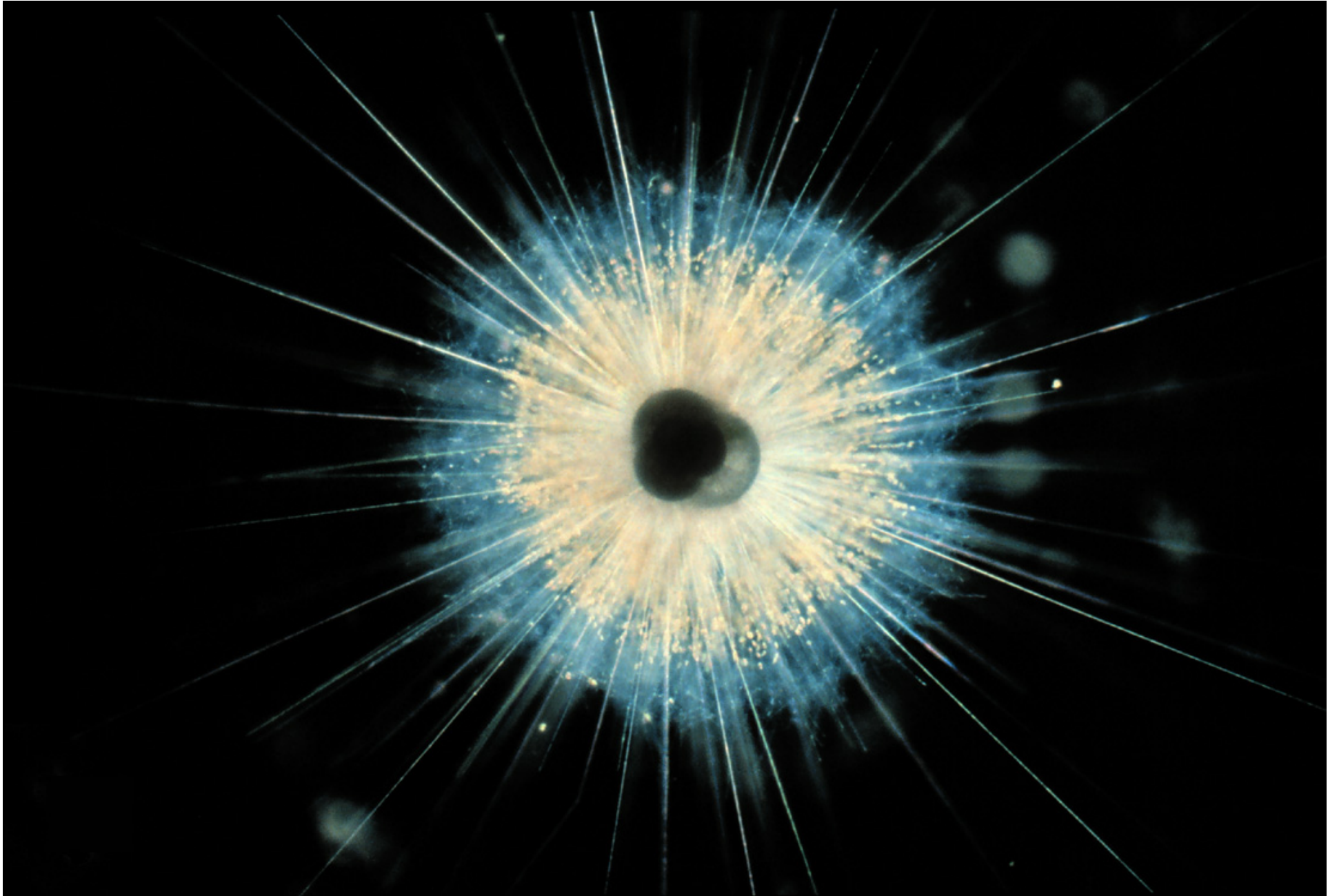




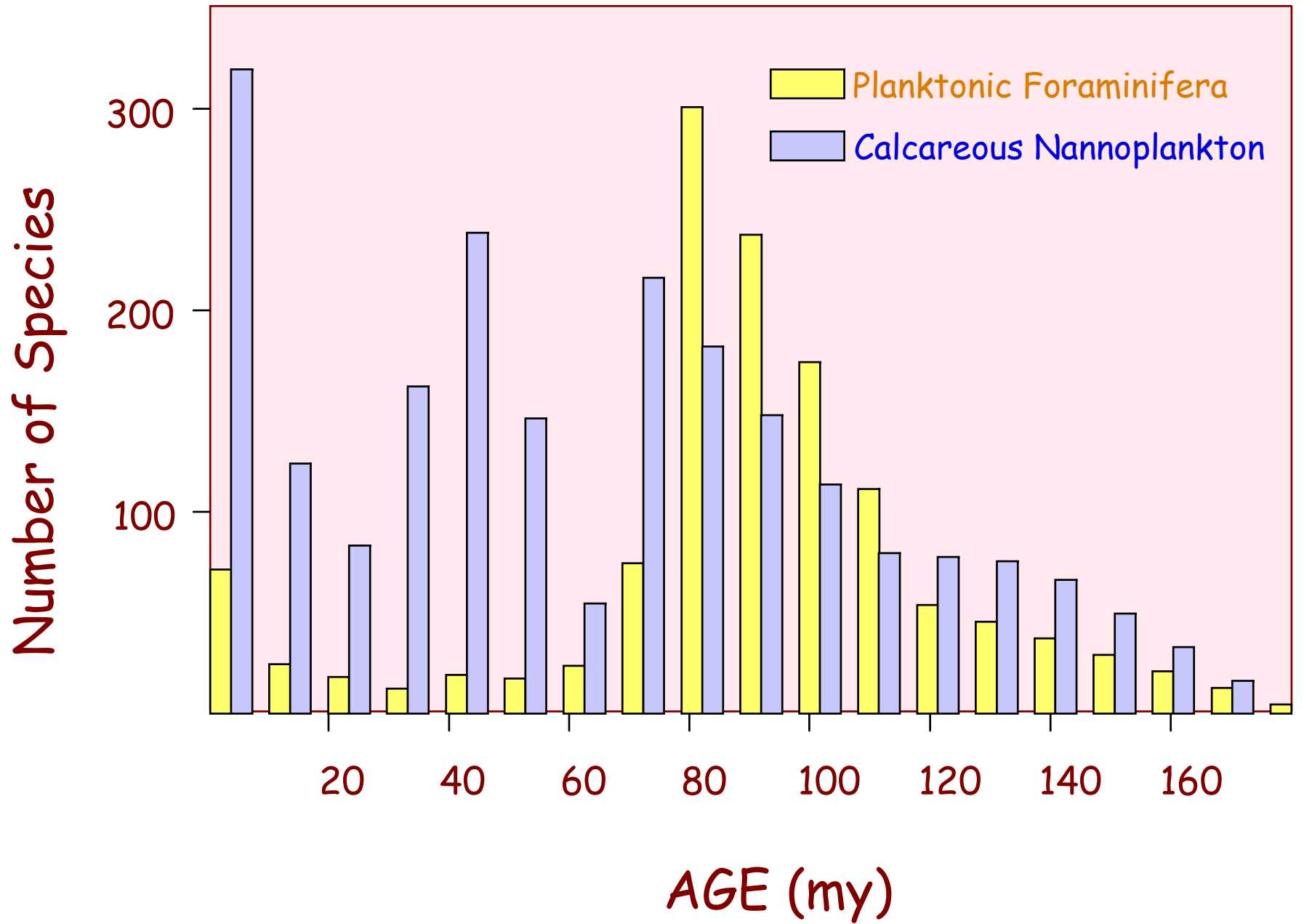


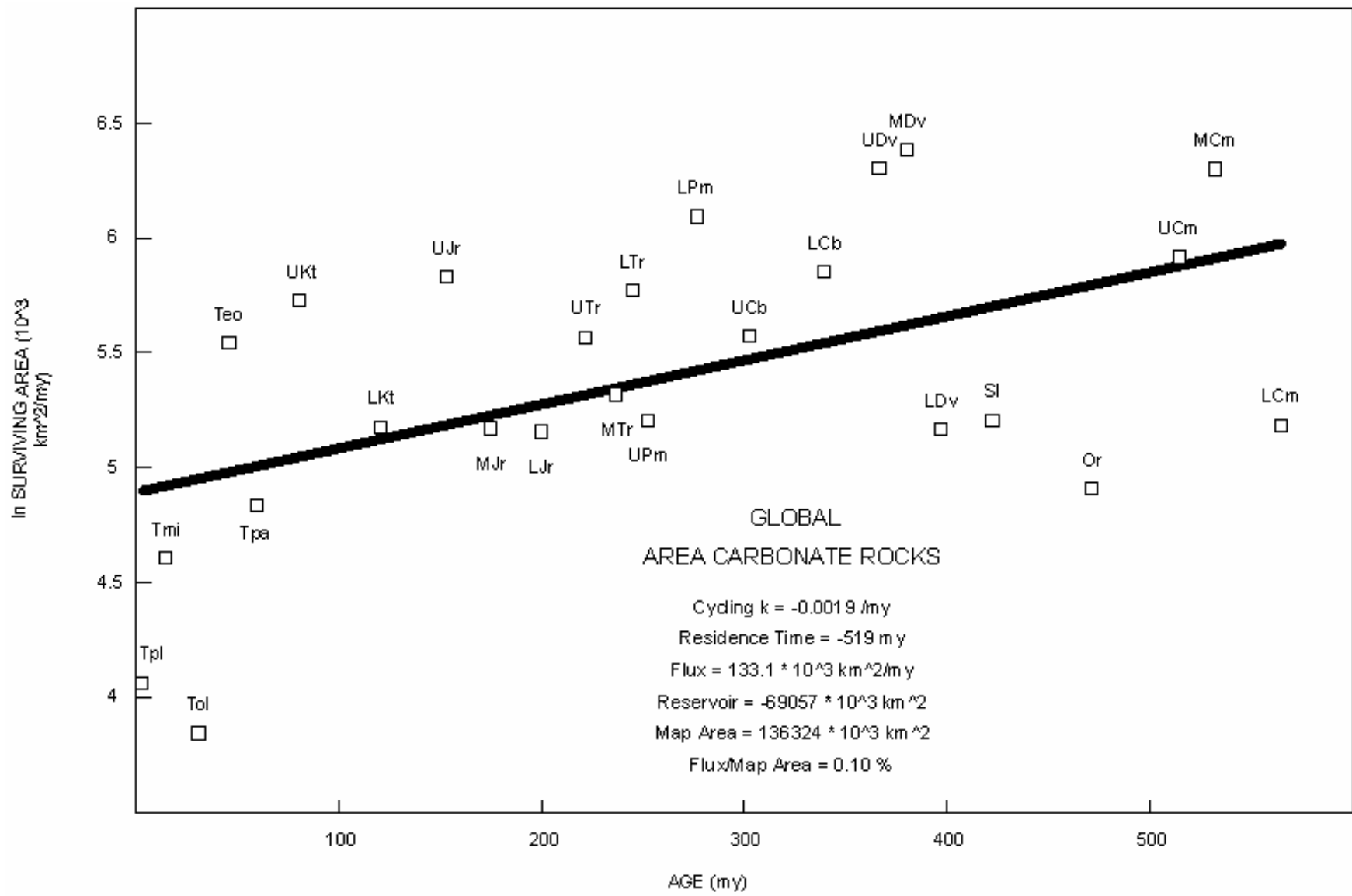


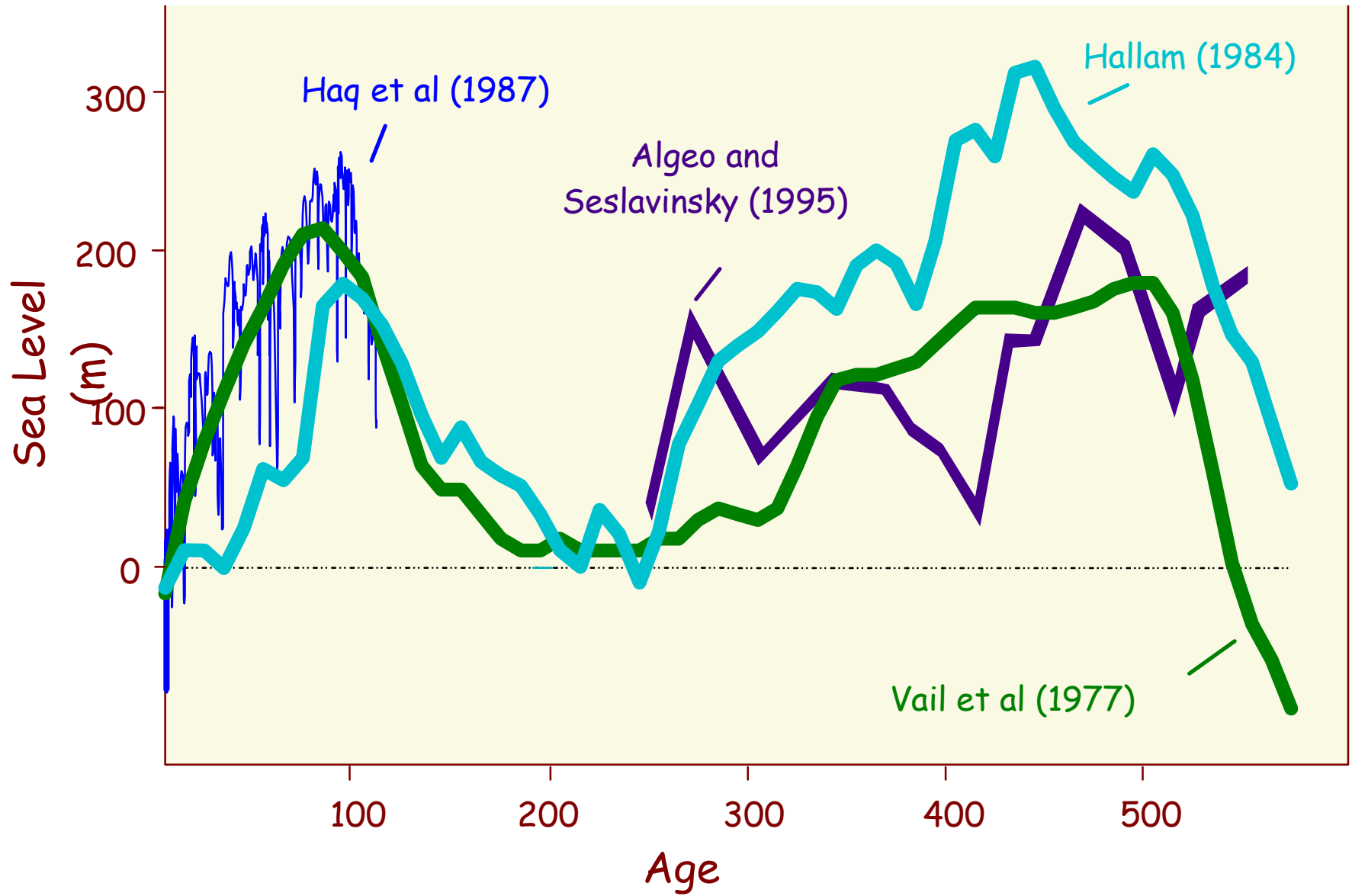




Globigerinoides ruber

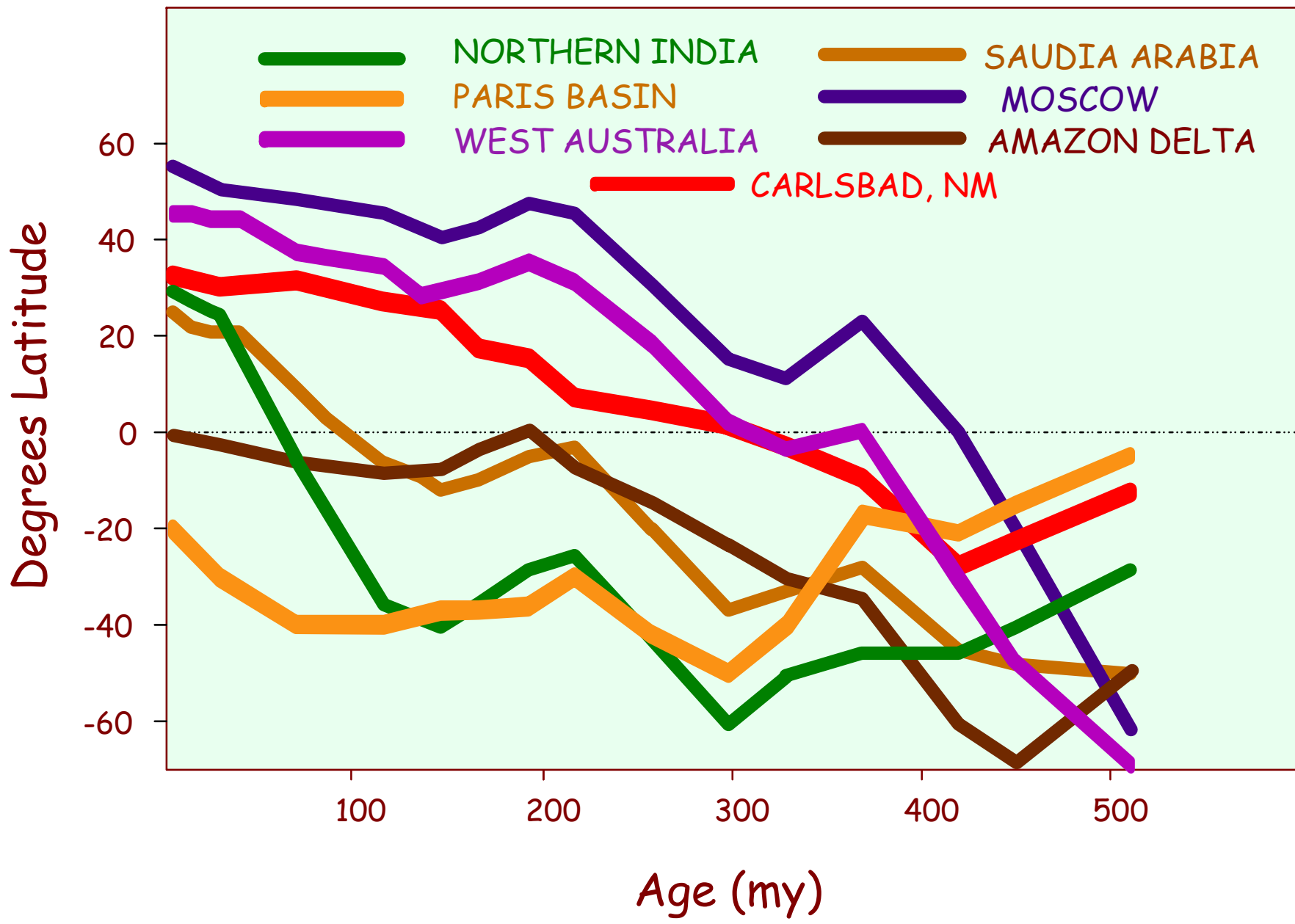






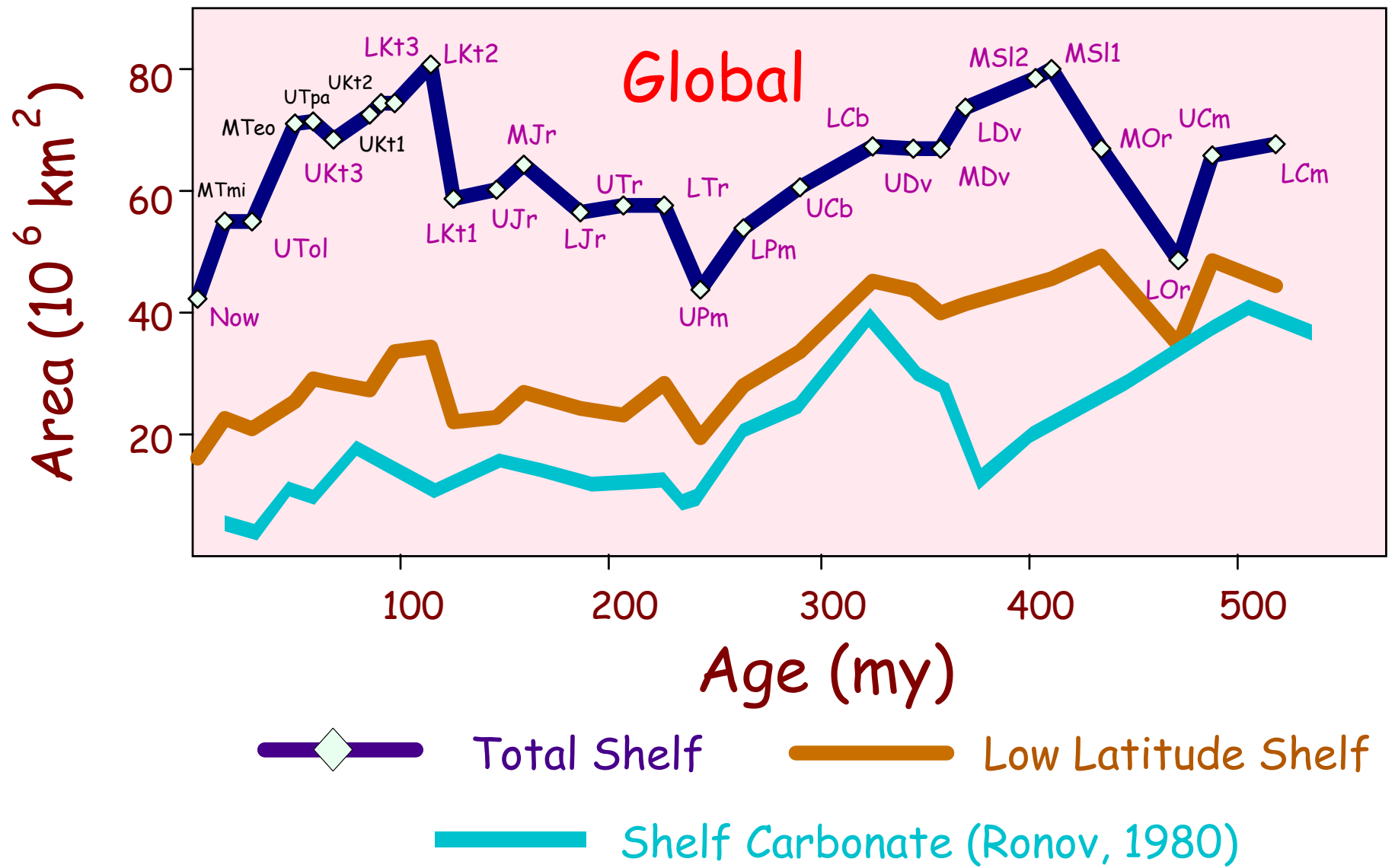
What is needed is one or more forcing functions (if you are a determinist, that is) that are generally **unidirectional** throughout **Phanerozoic time**.

Continental drift is one of perhaps several possible candidates.



So, how do Phanerozoic areas of low latitude shelf compare with inferred areas of carbonate accumulation?

On average, about **50%** of shelf areas within 30° of the equator have been sites of carbonate accumulation over the past ~600 Ma.



So, what are the conclusions here?

- 1) Drift of global continents over the past 600 Ma appears to be a viable mechanism by which to induce transfer of carbonate sedimentation from shallow to deep marine settings.
- 2) This process alone is **insufficient** to explain an accelerated rate of transfer that has evidently occurred since the mid-Mesozoic.
- 3) Over the past 100 or so Ma, evolution of planktic calcifiers and/or lowering of global sealevel have served to augment the rate of this transfer.

