THE FATE OF COLD-WATER CARBONATE:

THE SCALE OF TIME-AVERAGING OF MOLLUSCAN ARAGONITE ON THE PRODUCTIVE ALASKAN ARCTIC SHELF

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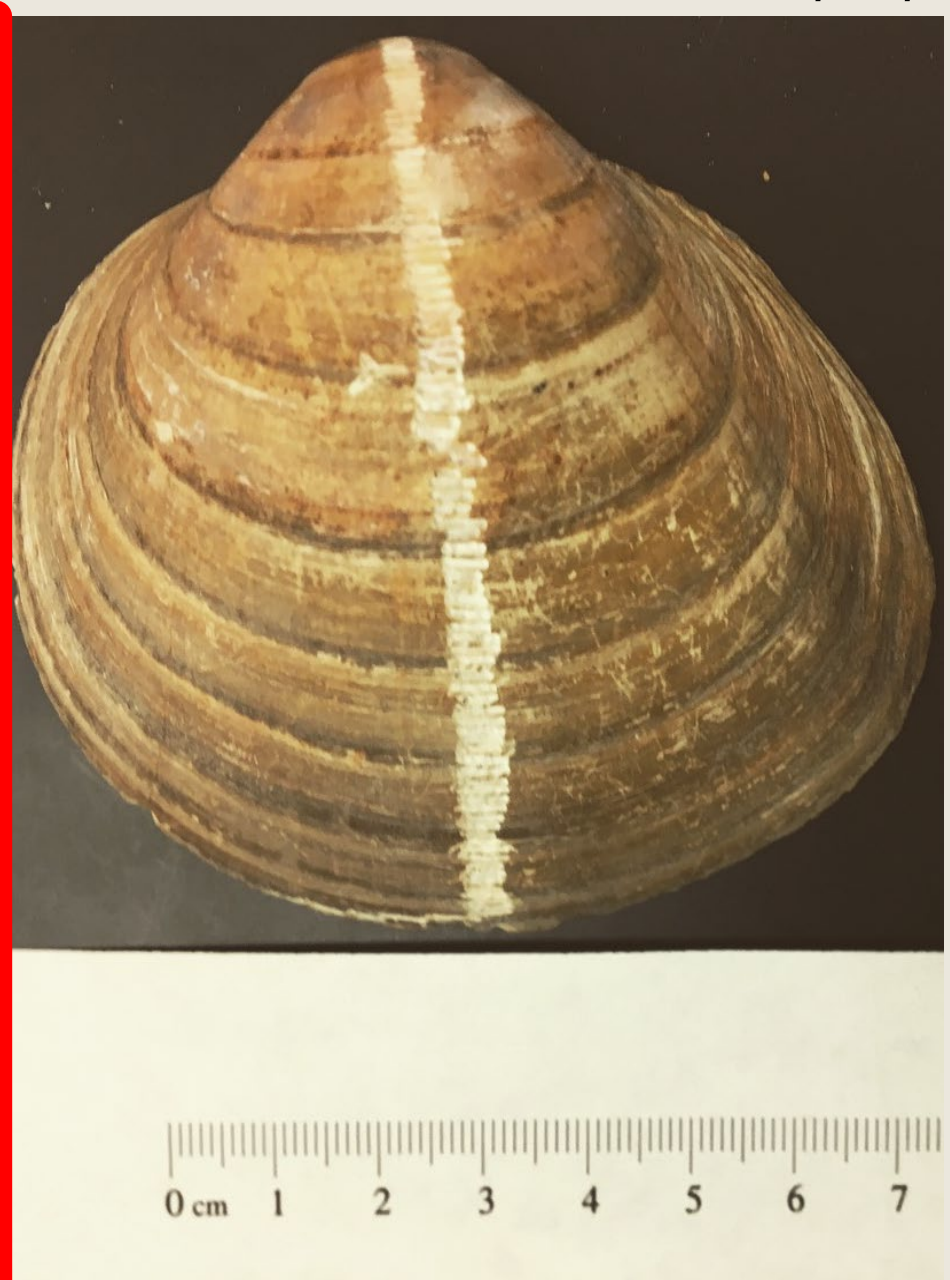
Live-Dead Analysis

Meadows et al. 2019, DSR II

Seafloor Environment

Meadows et al. 2019, *in prep*



Historic Ecology

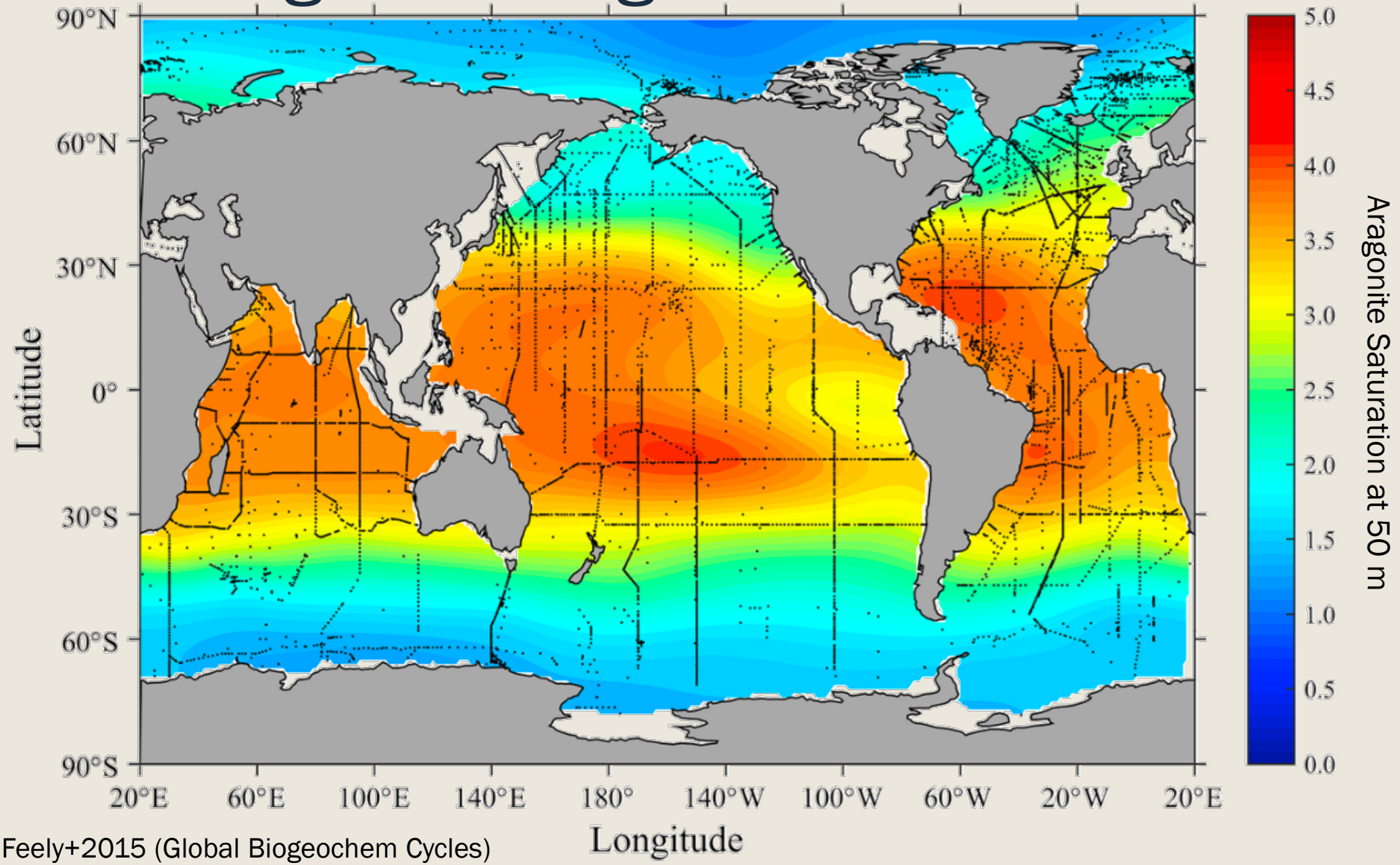
Meadows 2019, *in prep*

Aragonite Persistence in the Arctic

- Ages of shells in surface mixed layer, Amino Acid Racemization
- Textures of age-dated shells, Scanning Electron Microscope

Lindsey Leigh Graham

Challenges of Aragonite Under-saturation

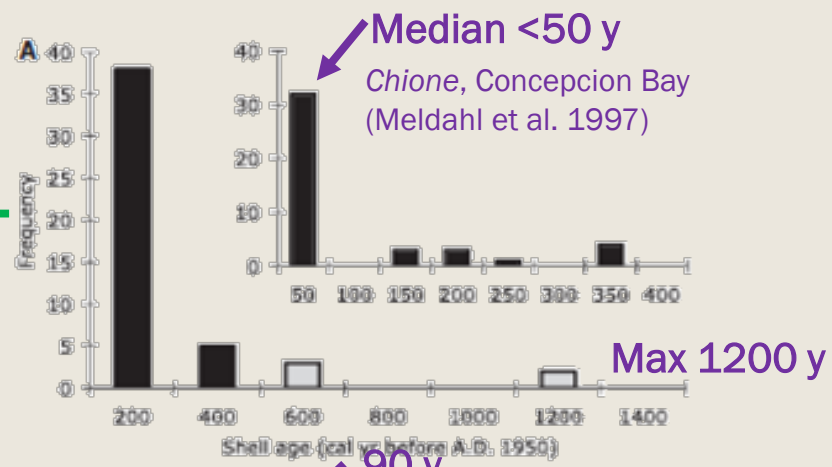


Jiang, Feely+2015 (Global Biogeochem Cycles)

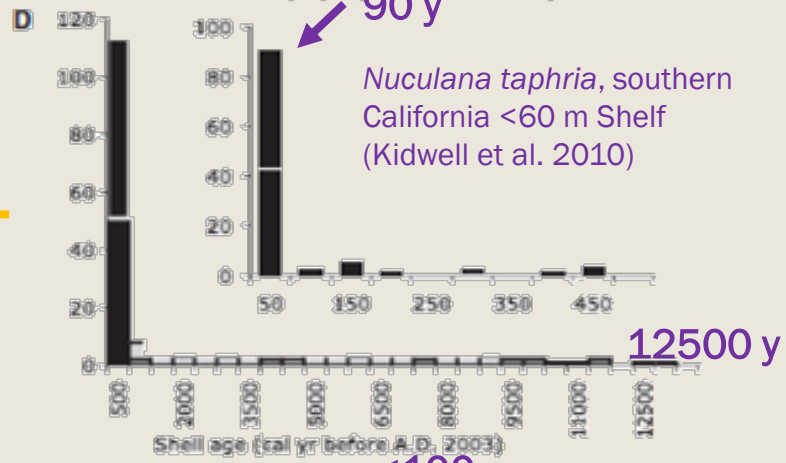
Shells do persist in Temperate & Tropical seabeds

- Still lose 99% from undersat. pore waters
- but 1% persist for thousands of years

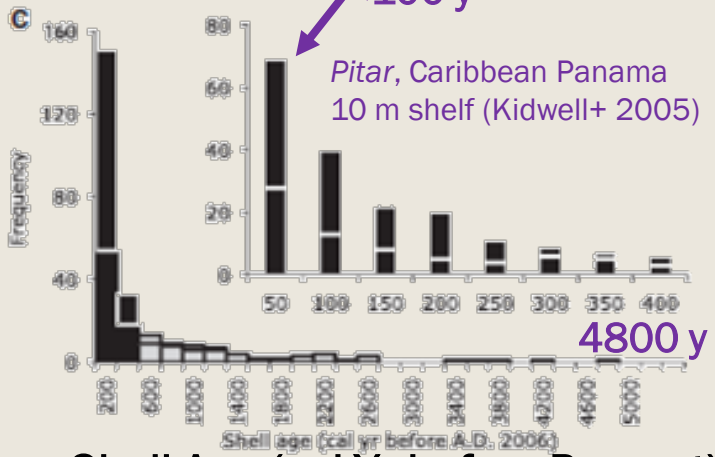
Temperate

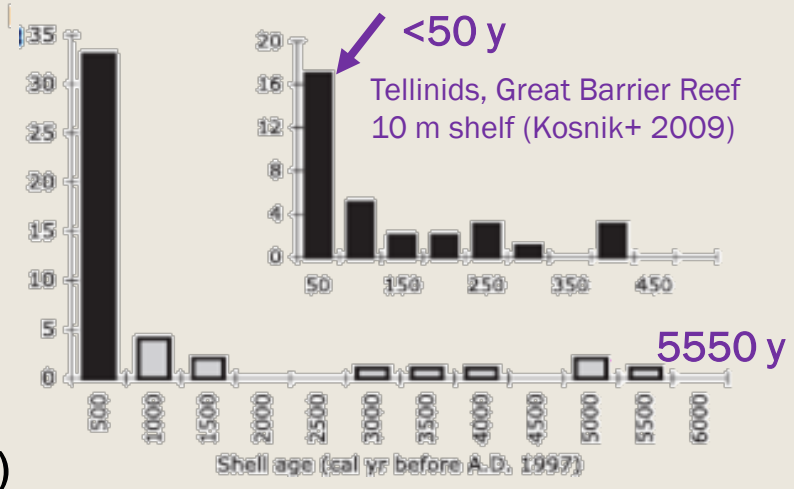


Subtropics



Tropics





Shell Age (cal Yr before Present)

Review of Amino Acid Racemization dates in Kidwell 2013 *Palaeontology*

What permits survival in Arctic seabeds?

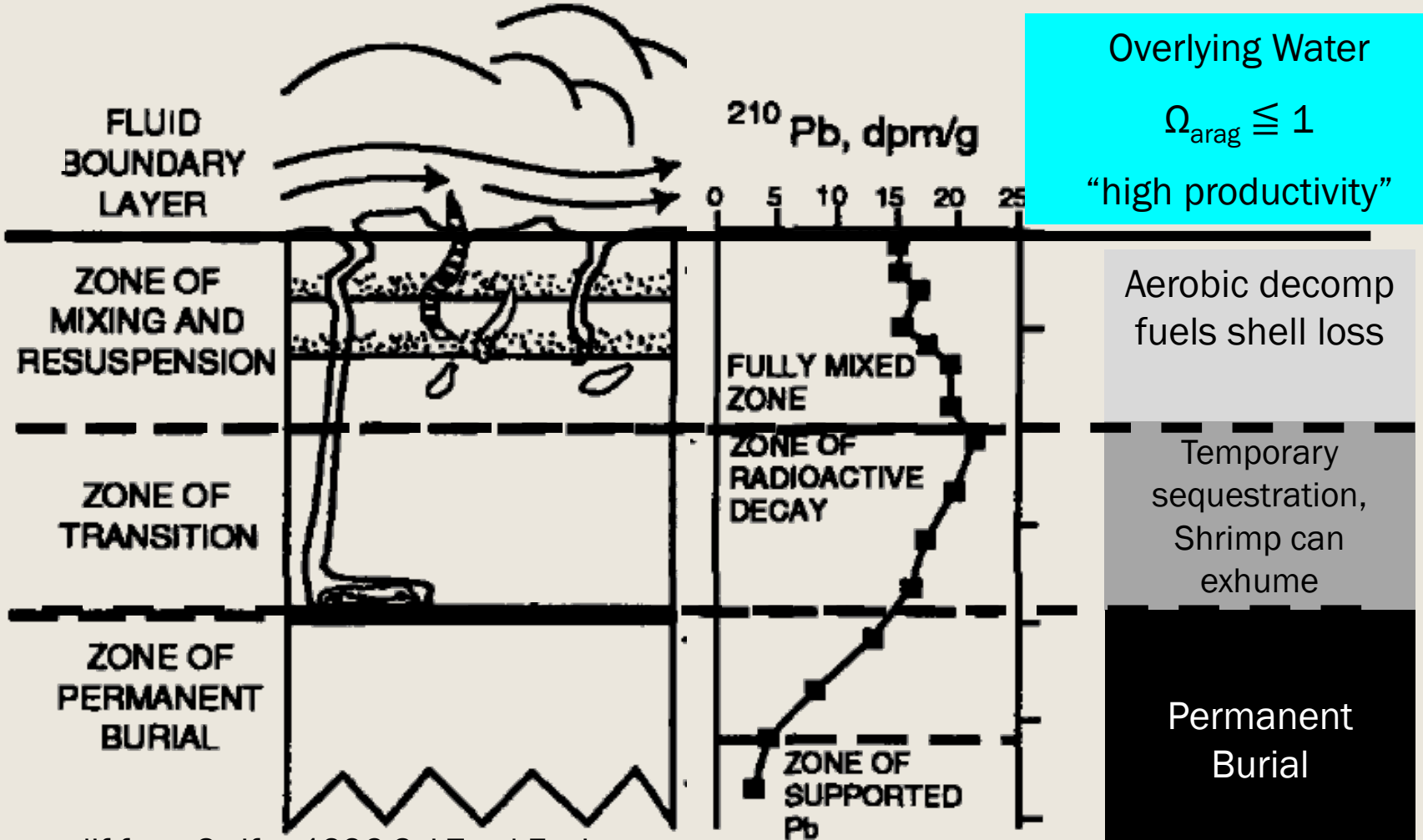


Fig modif from Swift+ 1996 Sci Total Enviro

Overlying Water

$\Omega_{arag} \leqq 1$

"high productivity"

Aerobic decomp fuels shell loss

Temporary sequestration, Shrimp can exhume

Permanent Burial

Shorter Residence?

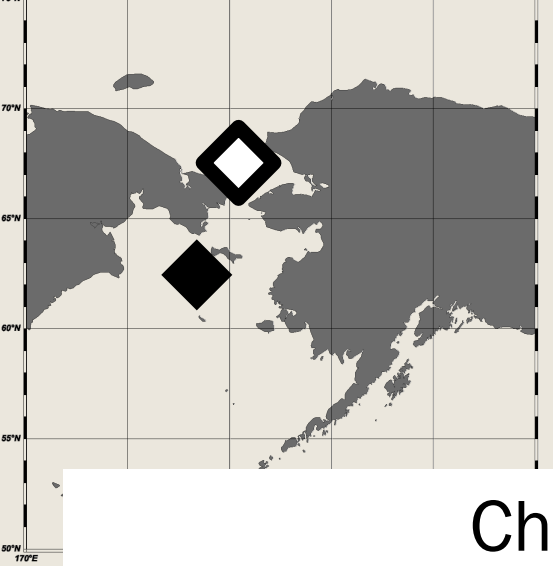
Refuge in super-sat pockets in "Taphonomically active zone"?

temporary deep burial where loss rates are lower?

Early diagenesis?

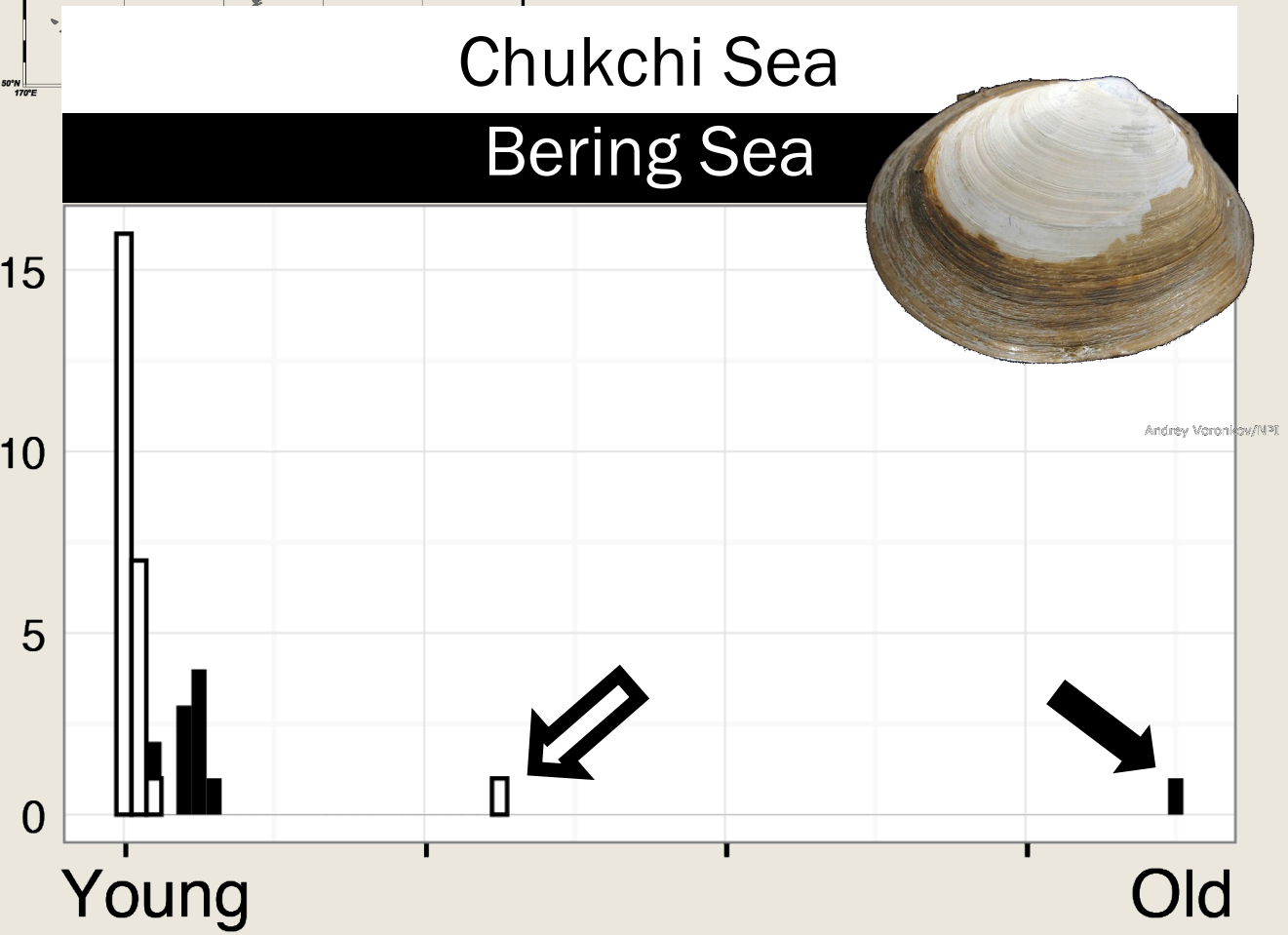
that reduces shell reactivity:

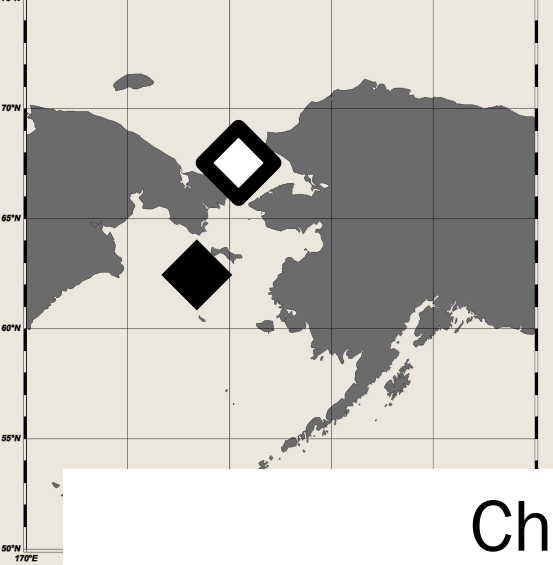
- crystallite coarsening
- precipitation of crust
- change mineralogy…



“Age” Frequency Distribution

Macoma spp.





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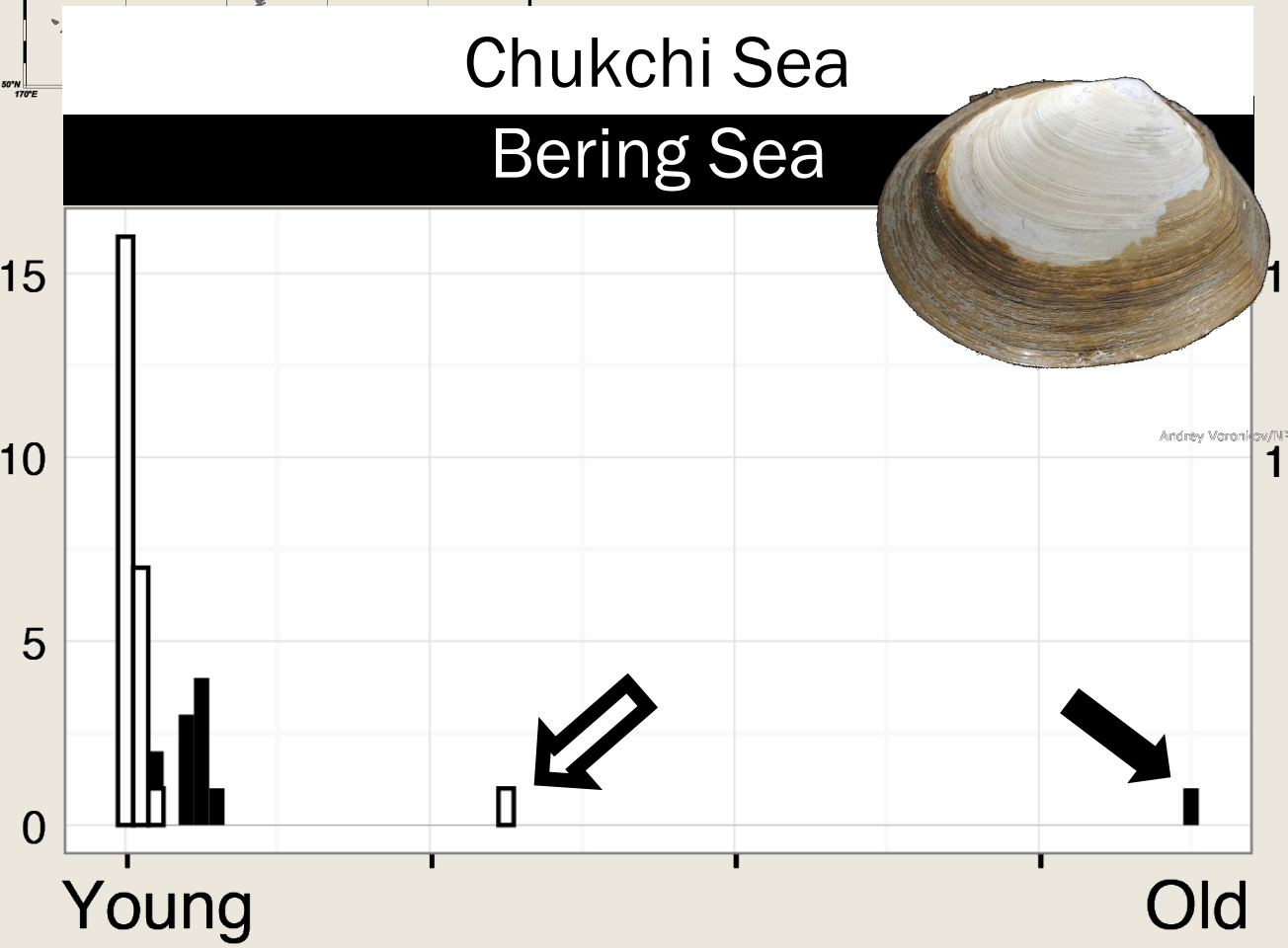
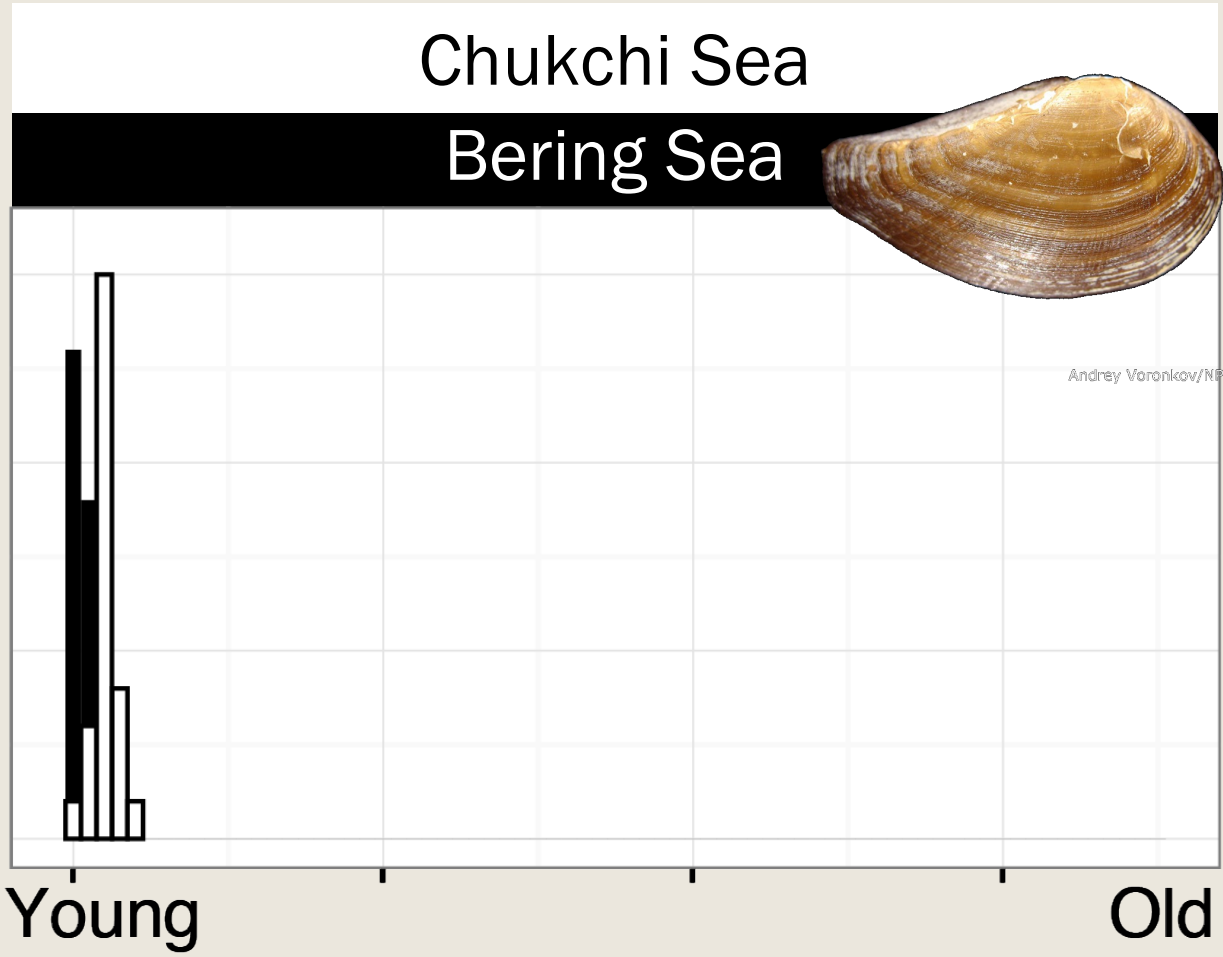
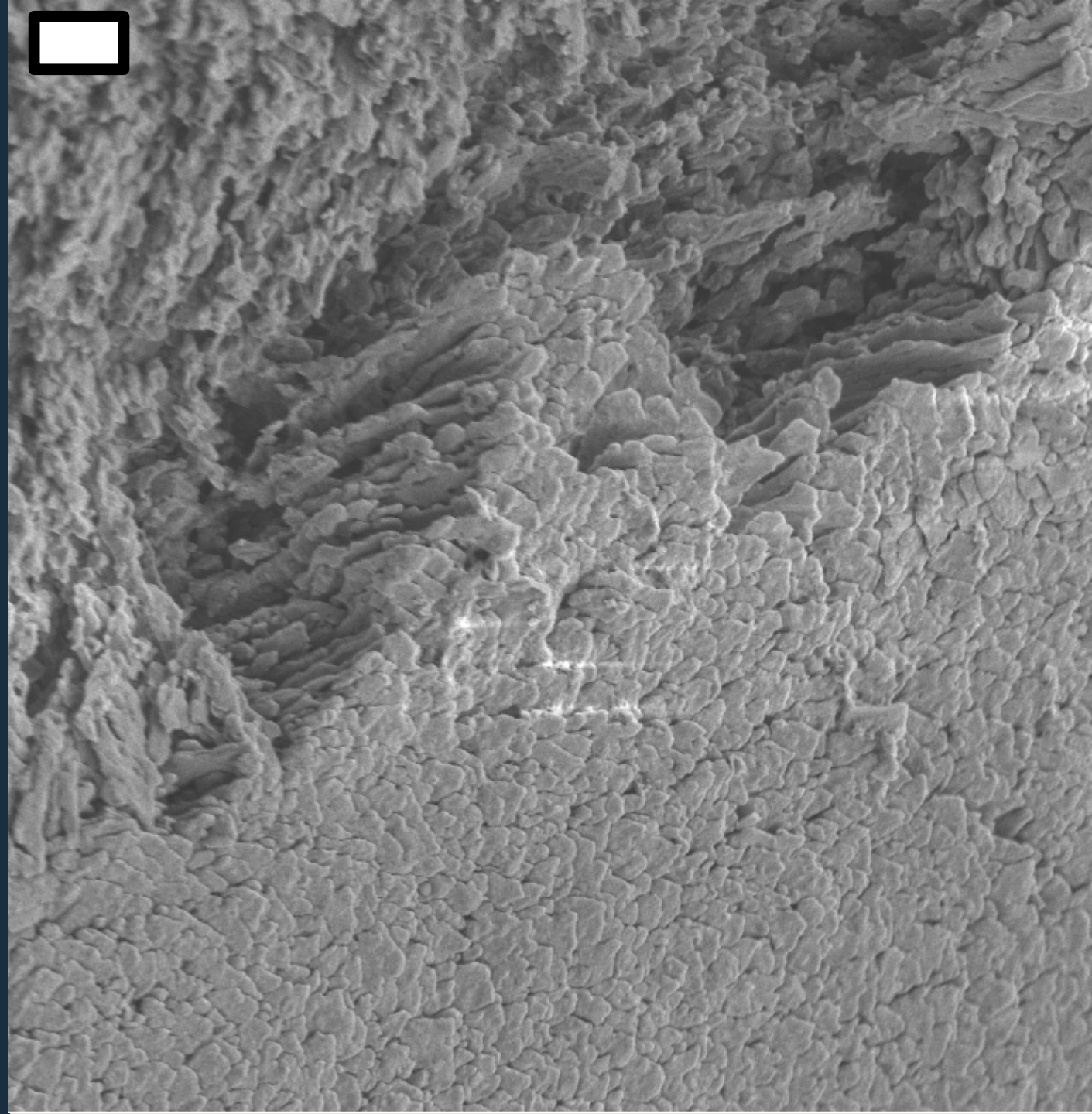


Nuculana radiata



Conclusions

- L-Shaped Age Frequency Distribution is found in the Arctic – High loss but persistence of some shells
- Shell disintegration is via microbial maceration or other loss of organic matrix – not mineral dissolution!
- Oldest shells have surficial syntaxial rind – new deposition, probably microbial
- The role of under-saturation thus might largely be in the dissolution of crystallites released from the shell surface by microbial maceration of the OM ‘mortar’ (Glover & Kidwell, 1993 J. Geology)



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