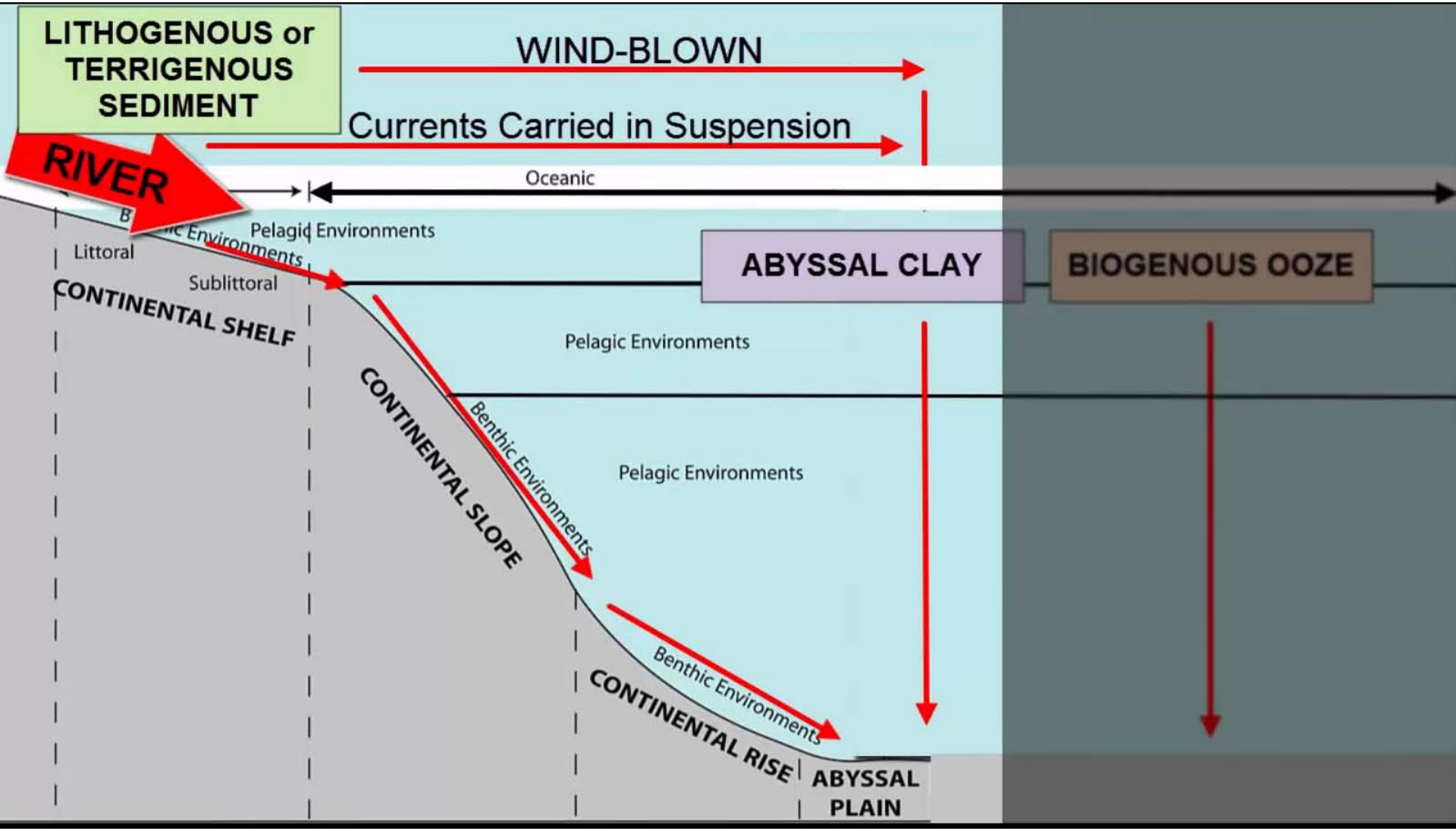
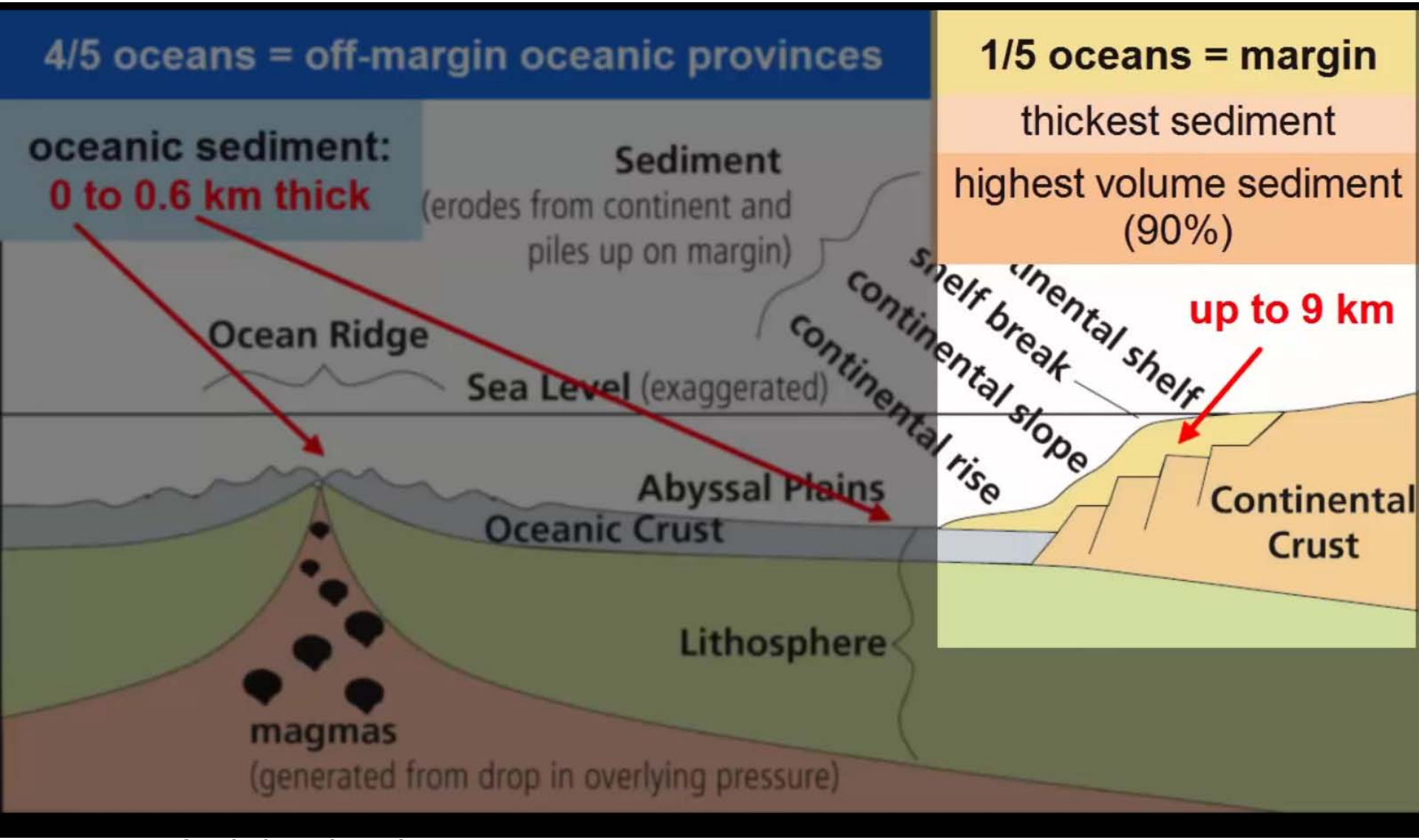
The oceanic (deep-water) environment

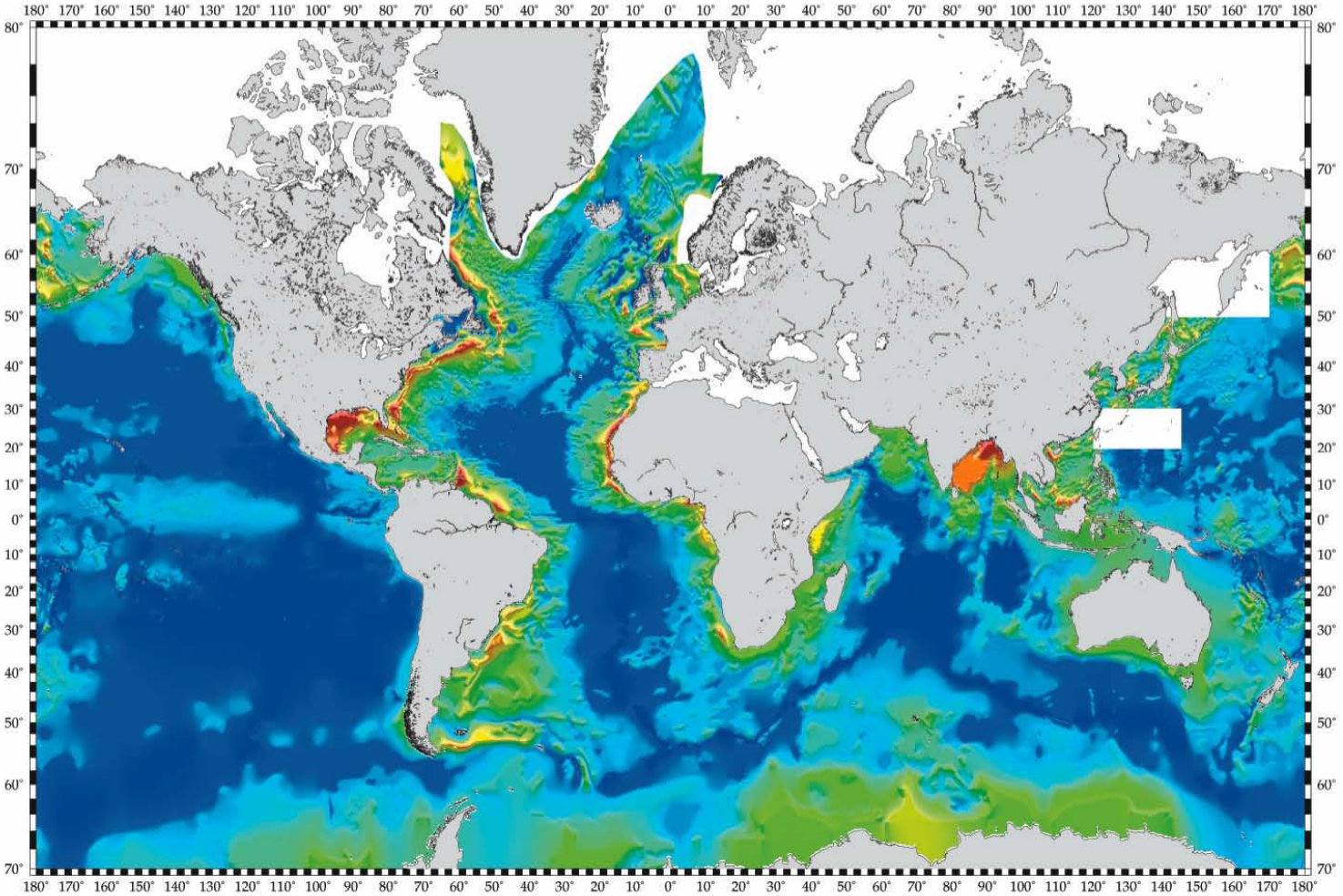
Terrigenous sediments – pelagic env.



Sediments along ocean margins



Total Sediment Thickness of the World's Oceans & Marginal Seas



Thickness in Meters

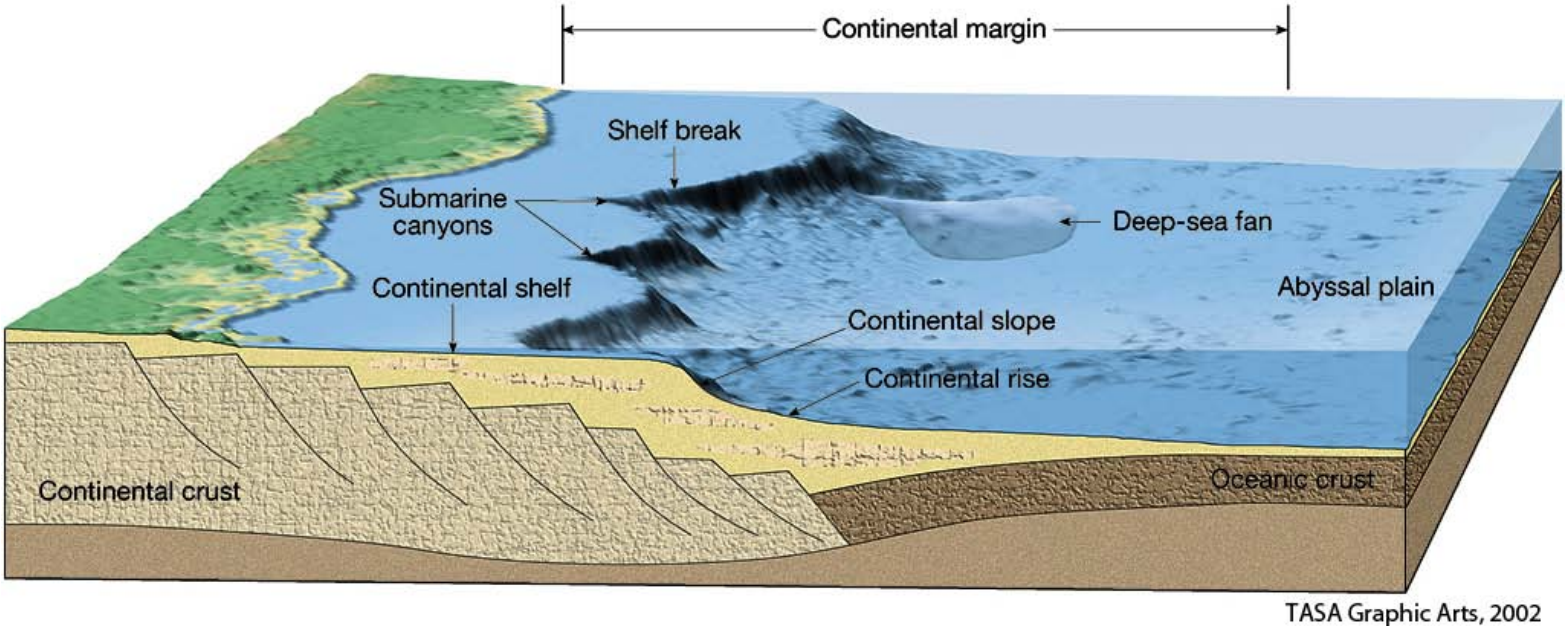
A digital total sediment thickness database for the world's oceans and marginal seas is being compiled by the National Geophysical Data Center (NGDC) ,Marine Geology & Geophysics Division. The data are gridded with a spacing of *5* arc-minutes by *5* arc-minutes. Sediment thickness data were compiled from three principle sources: previously published isopach maps; ocean drilling results, both ODP and DSDP; and seismic reflection profiles archived at NGDC as well as seismic data and isopach maps available as part of the IOC's Geological/Geophysical Atlas of the Pacific (GAPA) project.

The distribution of sediments in the oceans is controlled by five primary factors:
1) Age of the underlying crust
2) Tectonic history of the ocean crust
3) Structural trends in basement
4) Nature and location of sediment sources, and
5) The nature of the sedimentary processes delivering sediments to depocenters

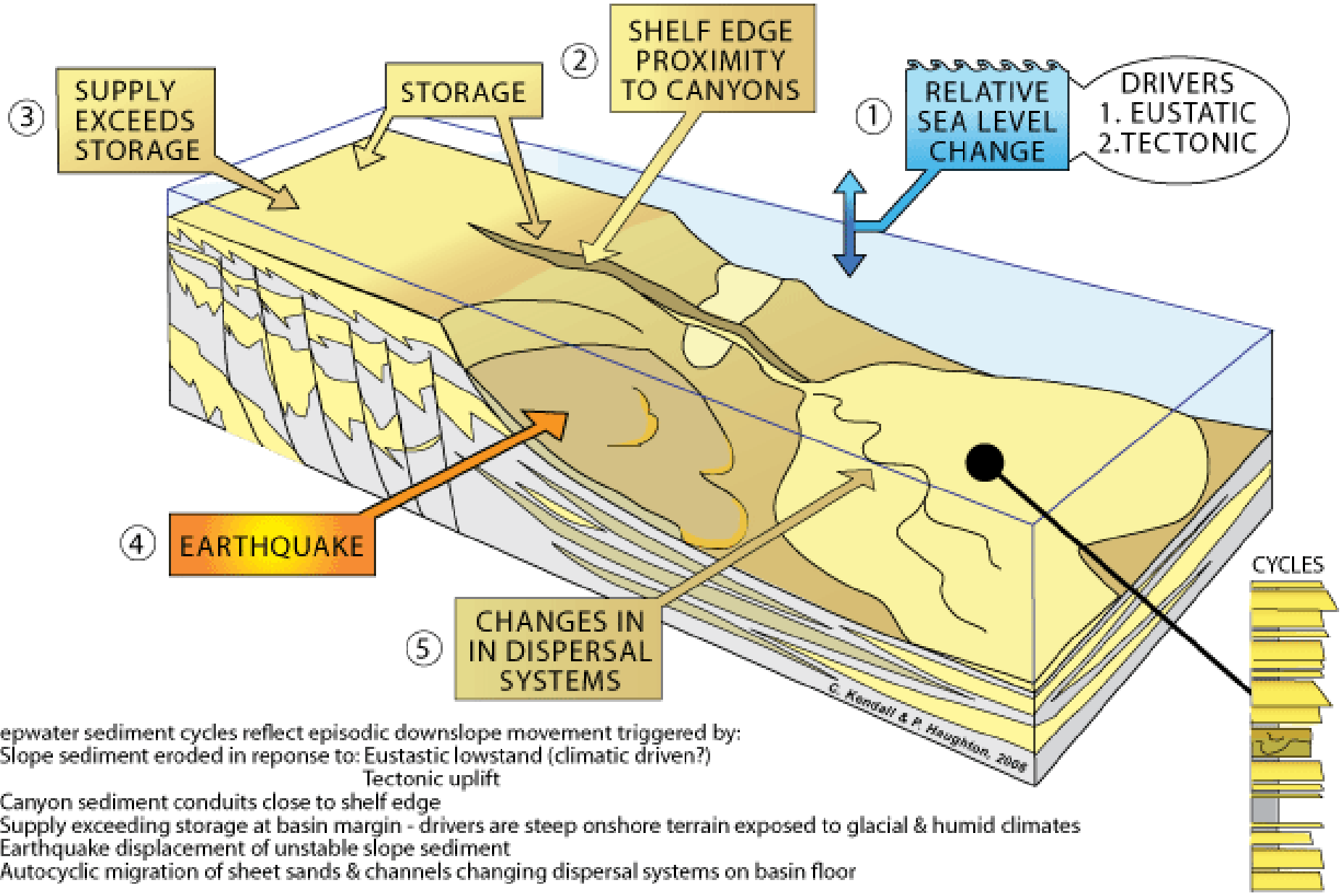
The data values are in meters and represent the depth to acoustic basement. It should be noted that acoustic basement may not actually represent the base of the sediments. These data are intended to provide a minimum value for the thickness of the sediment in a particular geographic region.

http://www.ngdc.noaa.gov/mgg/sedthick/sedthick.html

Features of passive margins



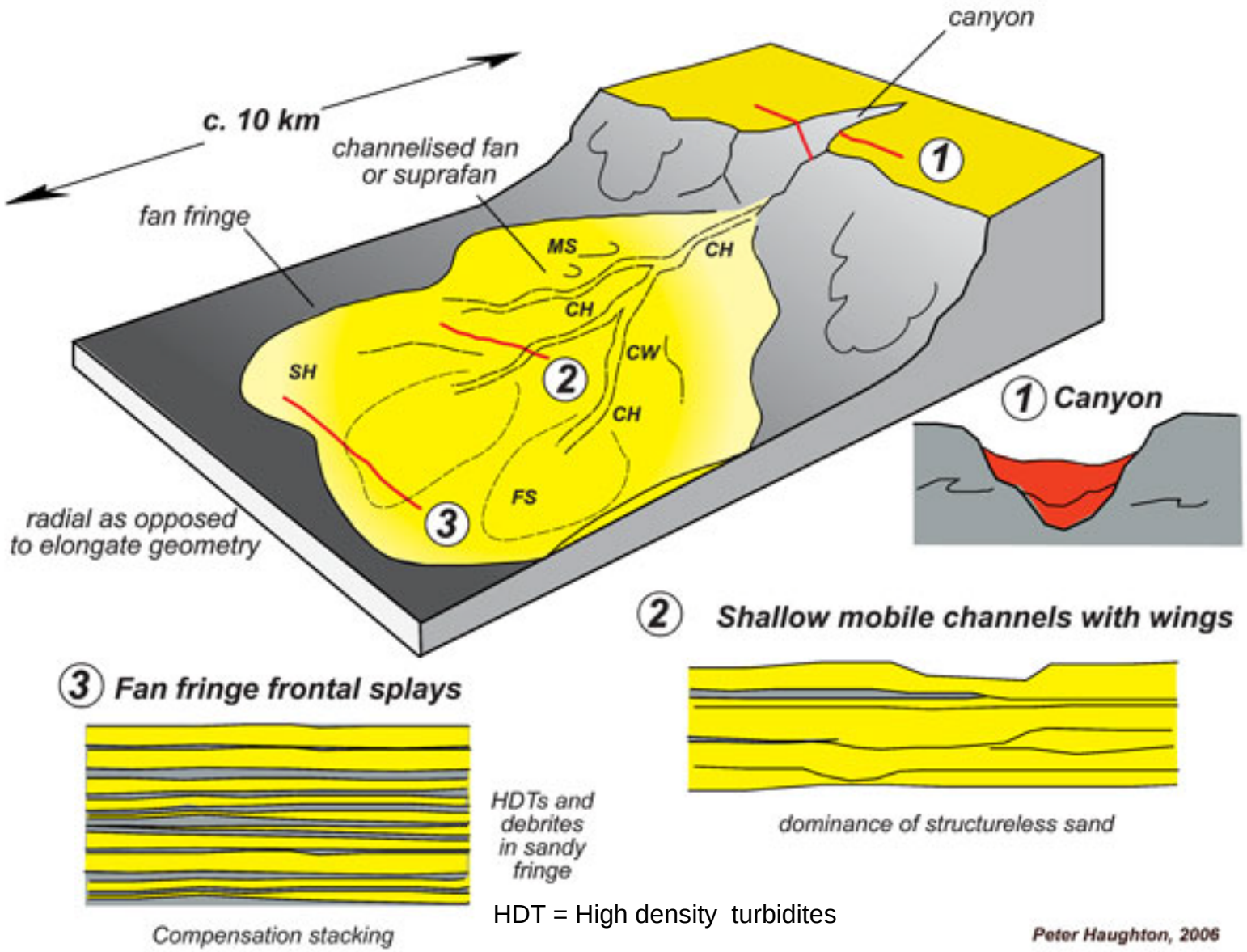
SEDIMENT SUPPLY TO DEEP WATER



Deepwater sediment cycles reflect episodic downslope movement triggered by:

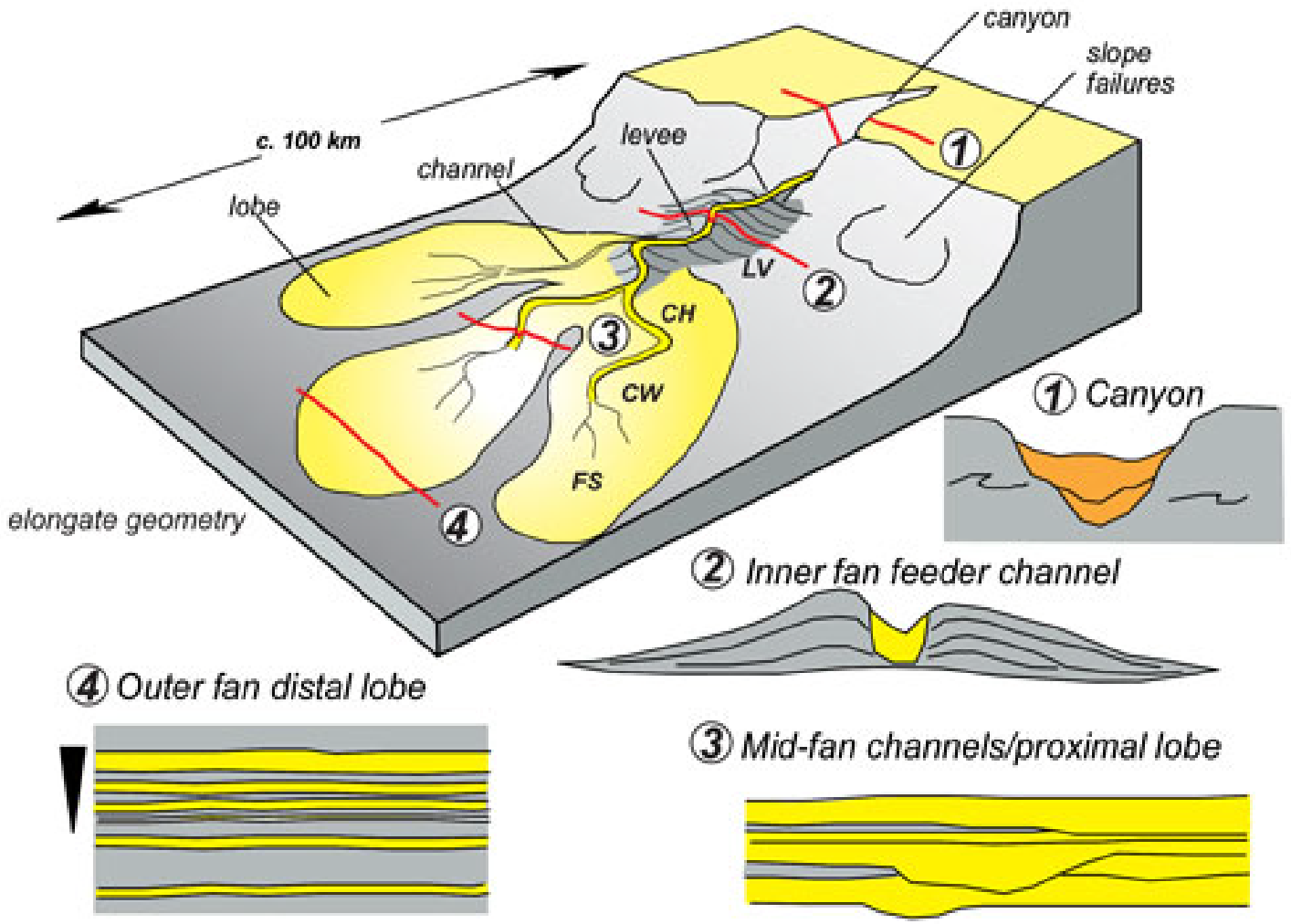
1. Slope sediment eroded in reponse to: Eustastic lowstand (climatic driven?)
   Tectonic uplift
2. Canyon sediment conduits close to shelf edge
3. Supply exceeding storage at basin margin - drivers are steep onshore terrain exposed to glacial & humid climates
4. Earthquake displacement of unstable slope sediment
5. Autocyclic migration of sheet sands & channels changing dispersal systems on basin floor

Sand-rich fan

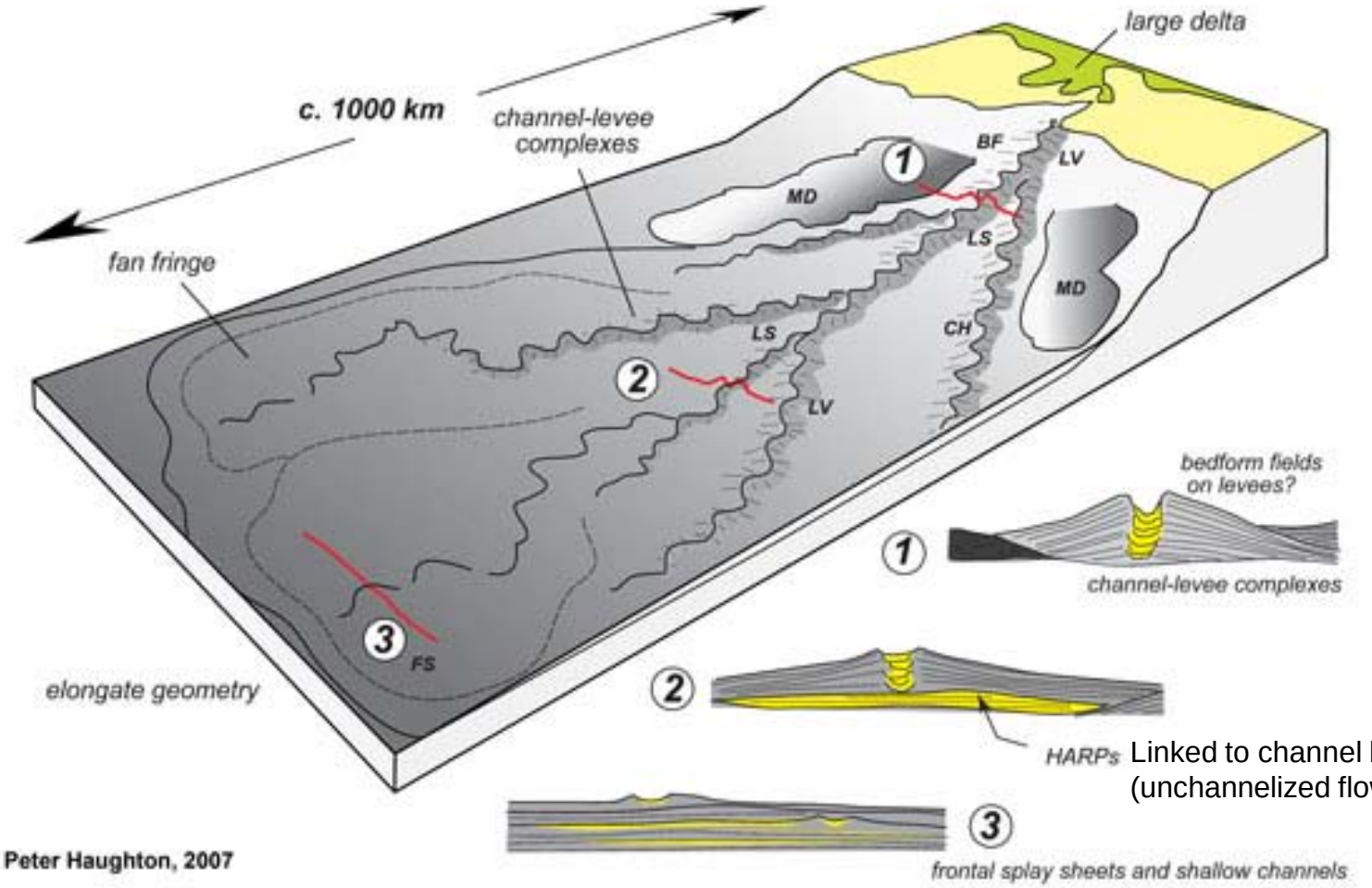


HDT = High density turbidites

Mixed sand/mud system



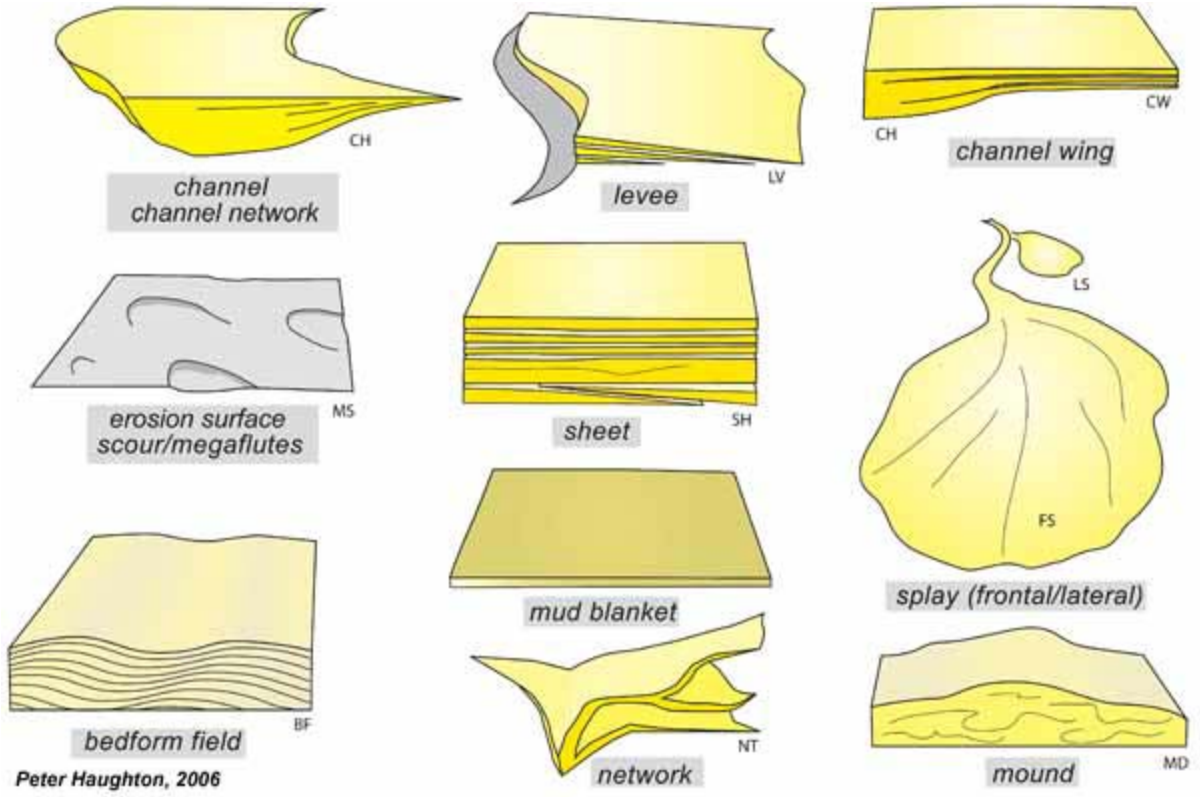
Mud-rich submarine fan

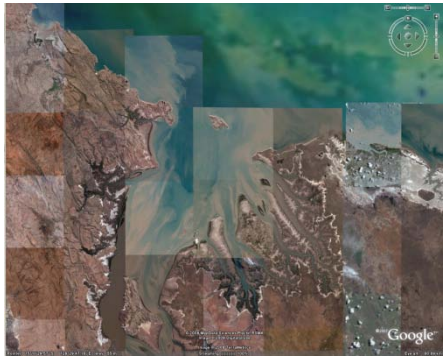


Linked to channel bifurcation (unchannelized flow phase)

FS = frontal splay ; LS = Lateral splay ; CH = Channel ; LV = Levee ; MD = mound ; HARP = High Amplitude Reflection Packets

Architectural elements of deepwater systems

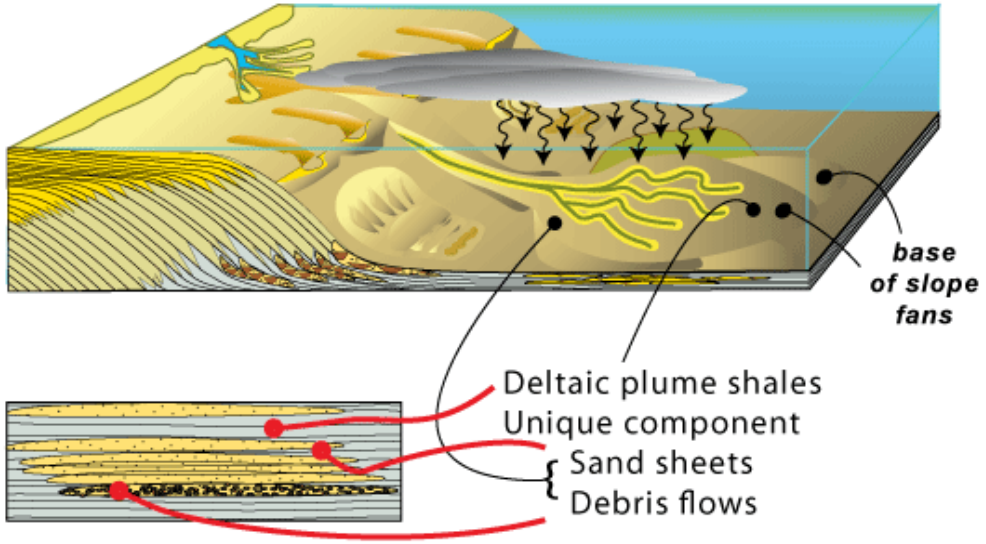




The fine grained portions of sediment plumes
storm winnowed shelf sediment
glacially rafted material,
pelagic fauna, and air born dust
may dominate the depositional setting

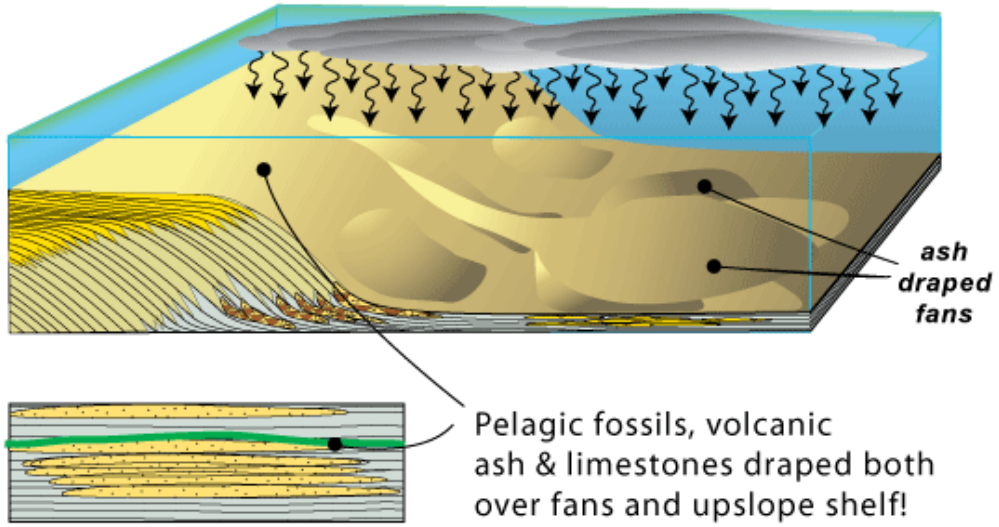
DEEPWATER ALLOSTRATIGRAPHIC MARKERS

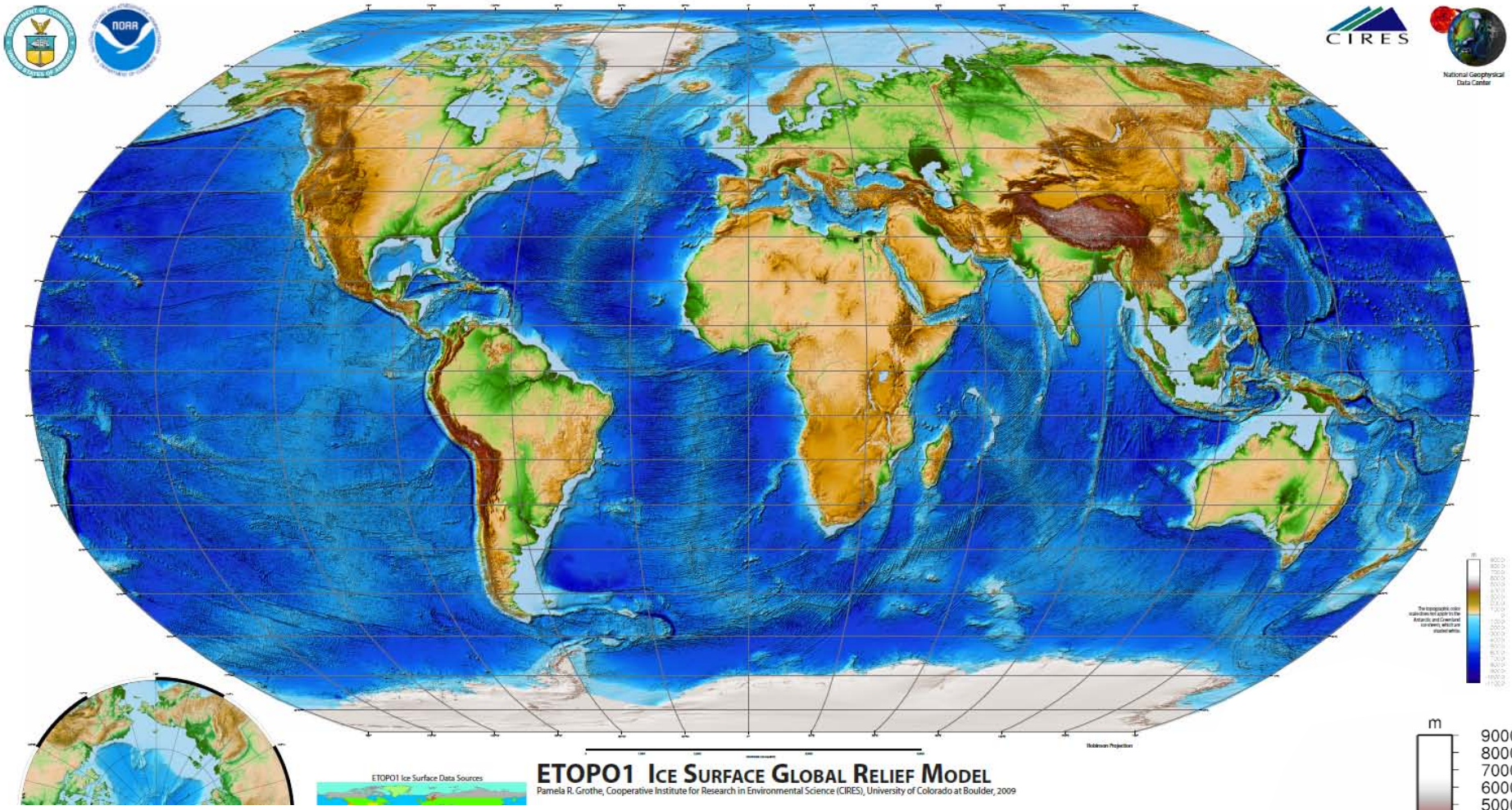
Synchronous widespread Lithostratigraphic layers &
Biostratigraphic markers provide relative age & order



High resolution biostratigraphic
markers and seismic enhance these tools

Biomarkers, volcanic ash & pelagic limestones
form best stratigraphic markers of deepwater

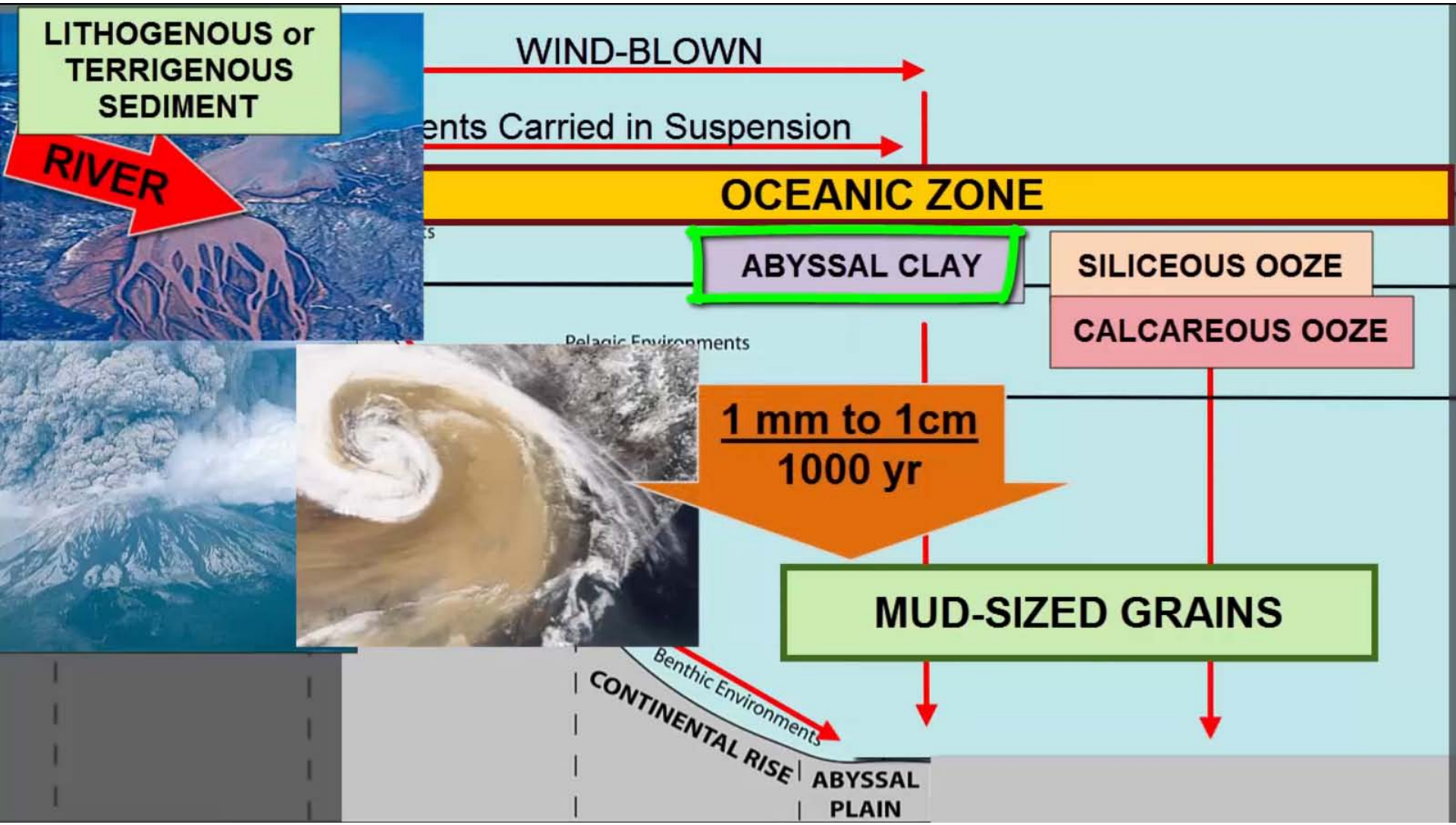




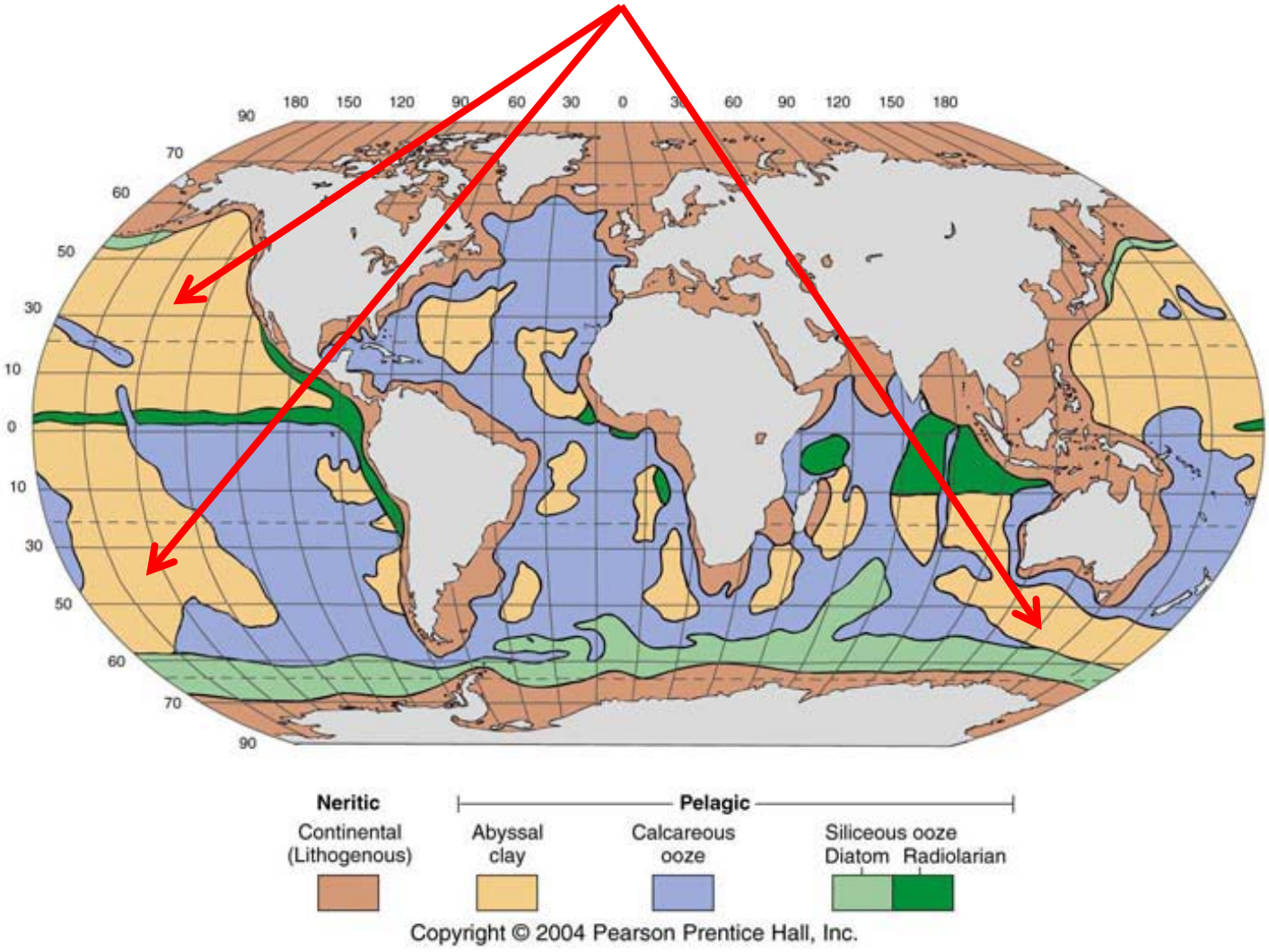
ETOPO1 Ice Surface Global Relief Model

Pamela R. Grothe, Cooperative Institute for Research in Environmental Science (CIRES), University of Colorado at Boulder, 2009

Abyssal (red) clay

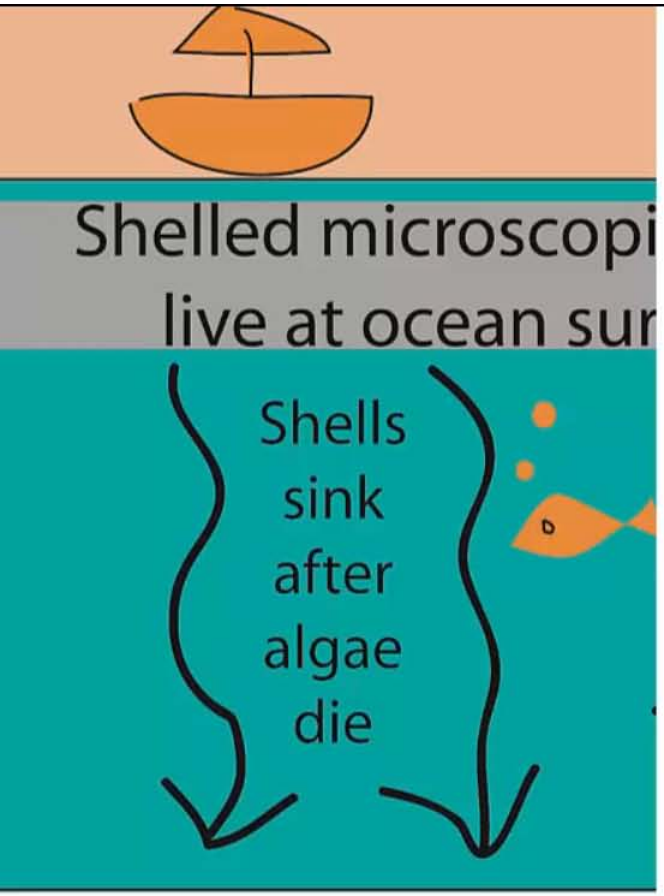


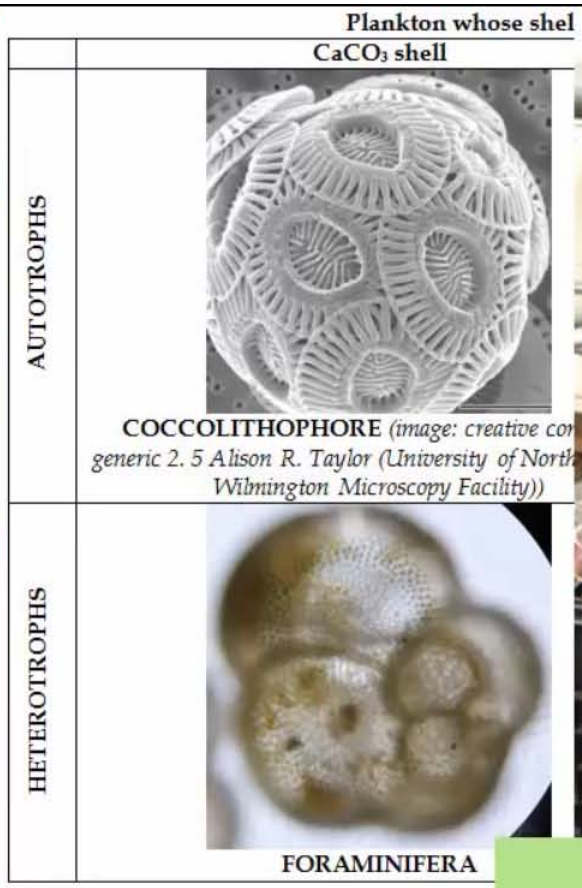
Distribution of red clays

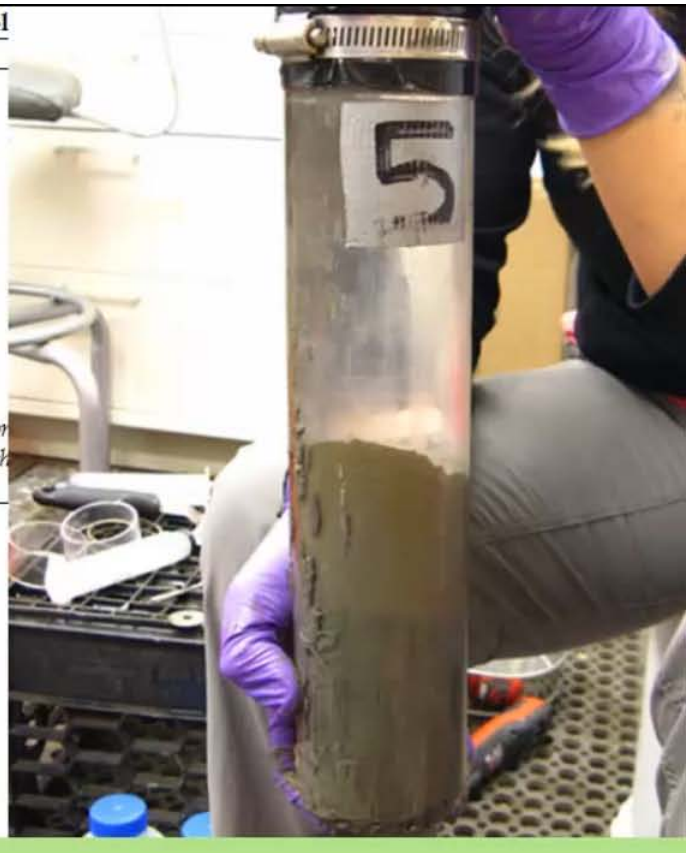


Biogenous ooze

55% surface coverage
(10% by volume)



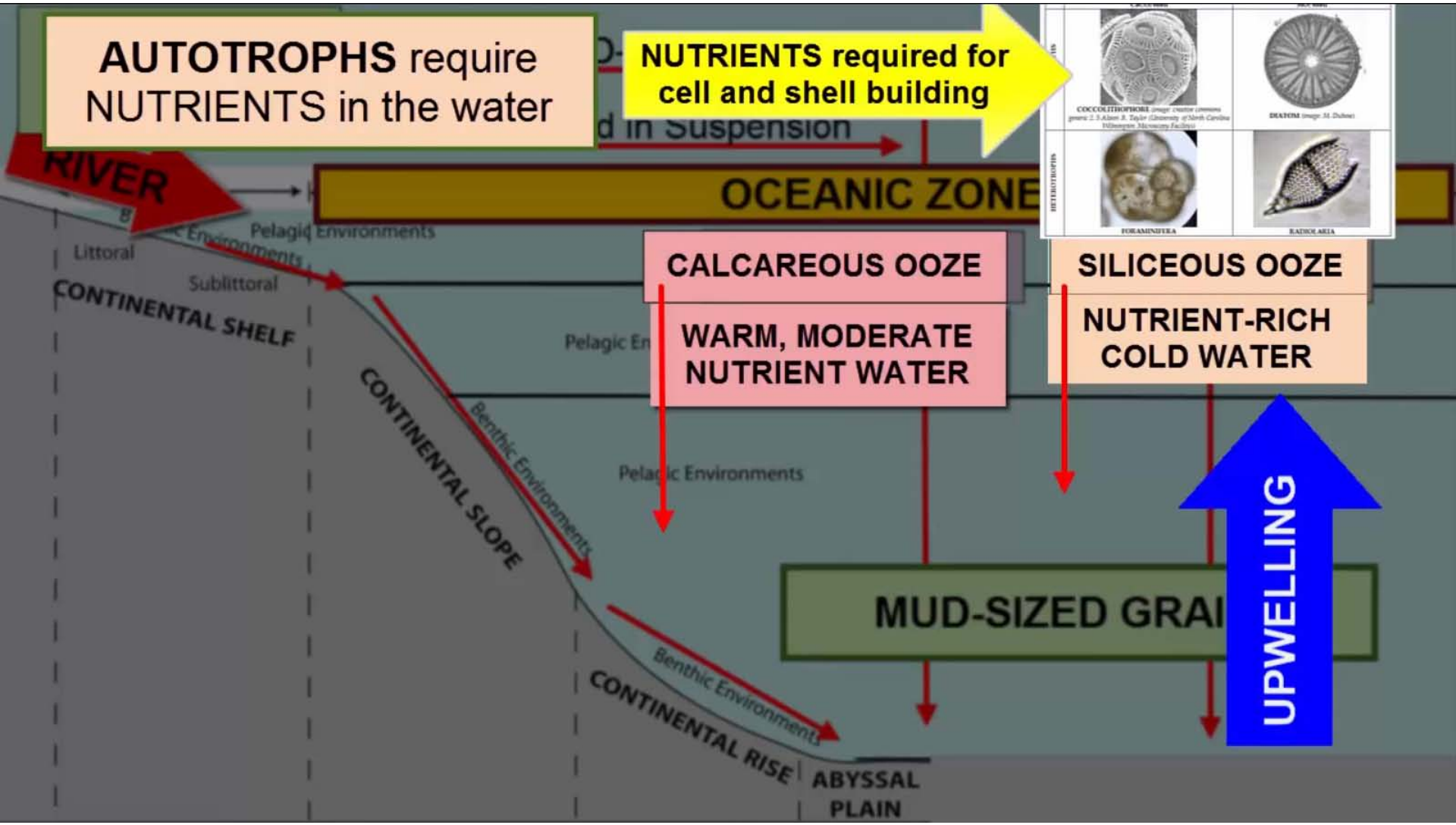




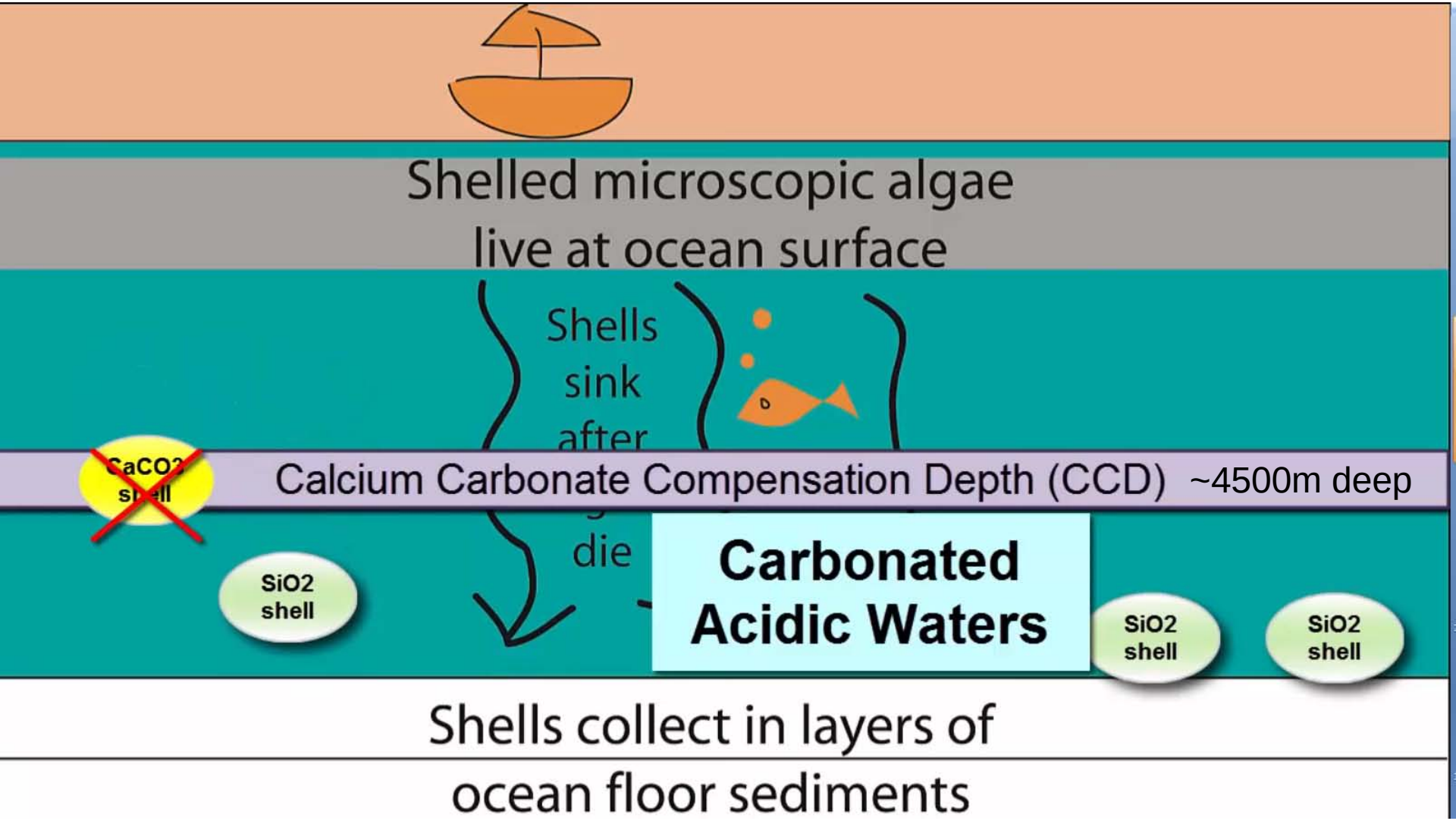
Shells collect in layers of ocean floor sediments

BIOGENOUS OOZE
= *mud-sized shells*

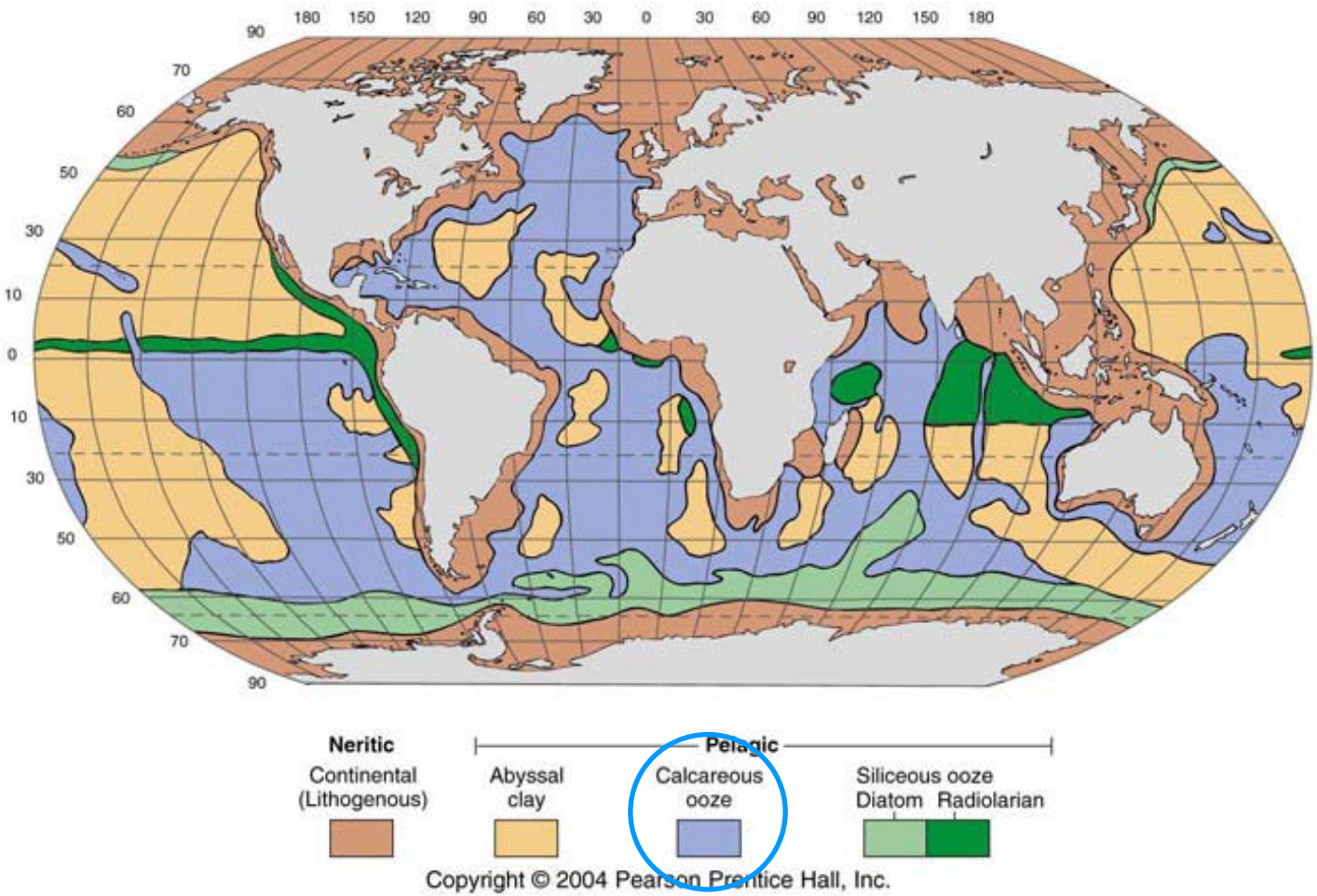
Calcareous and siliceous oozes

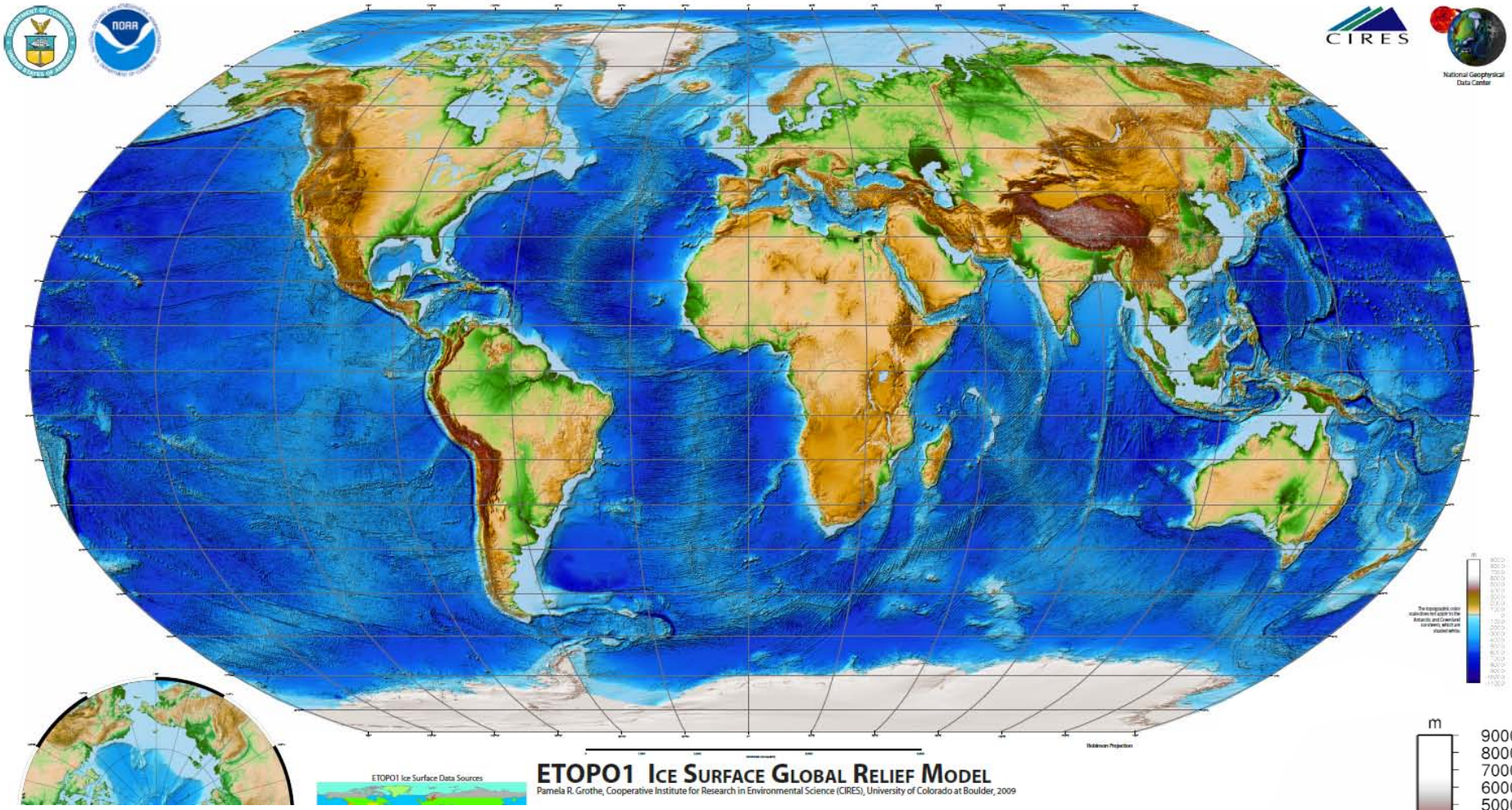


Carbonate Compensation Depth (CCD)



Distribution of calcareous ooze





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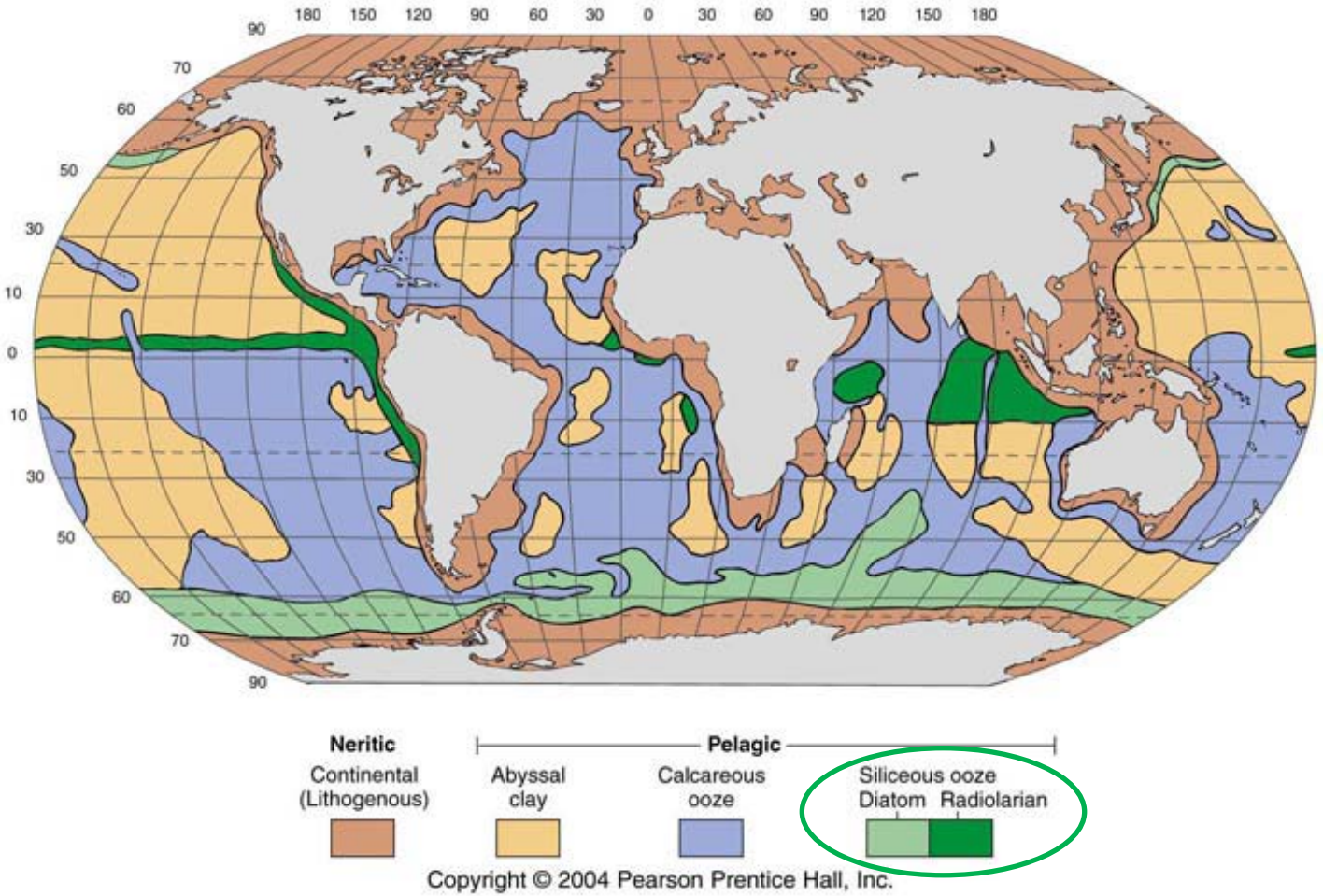
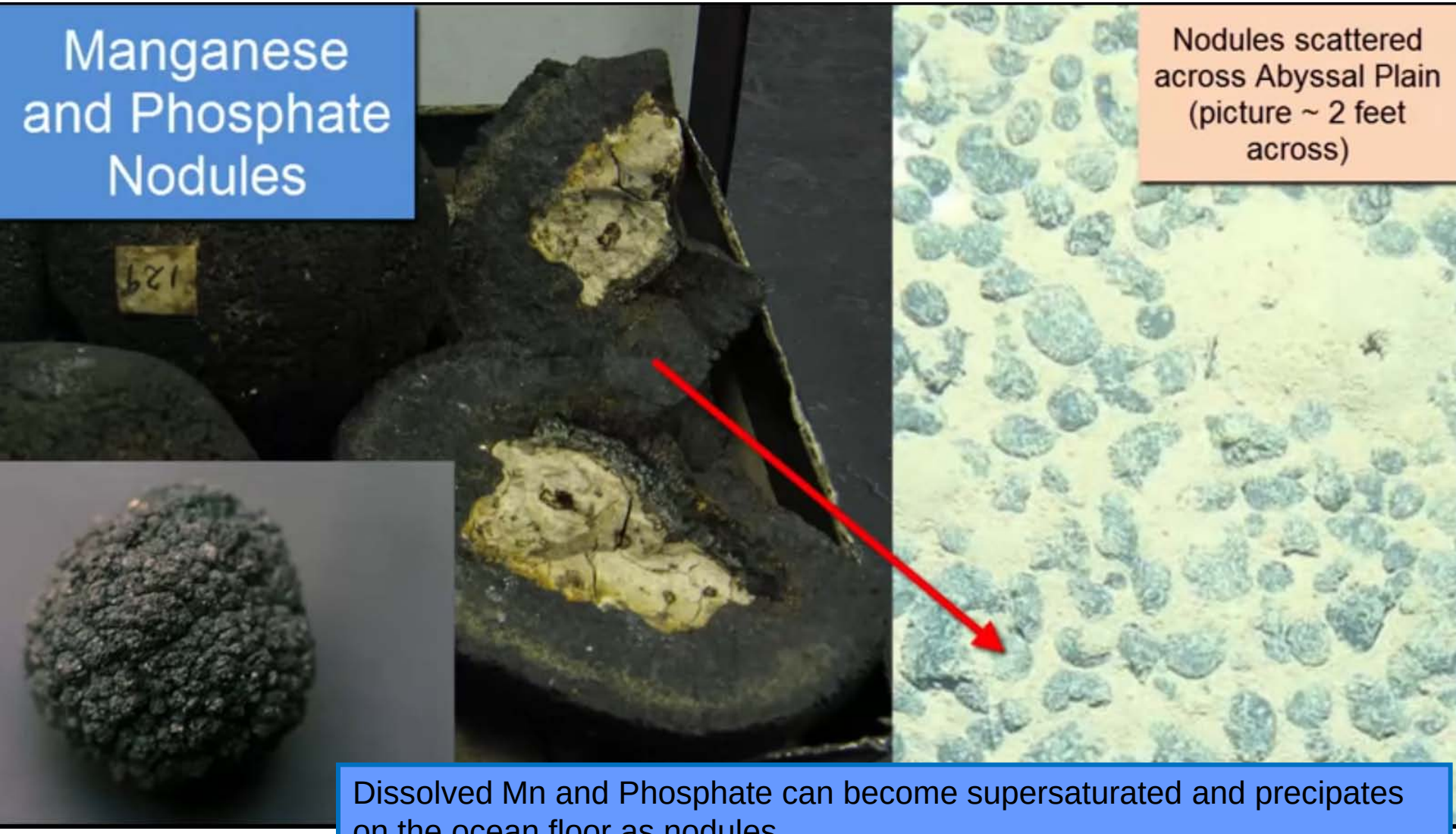
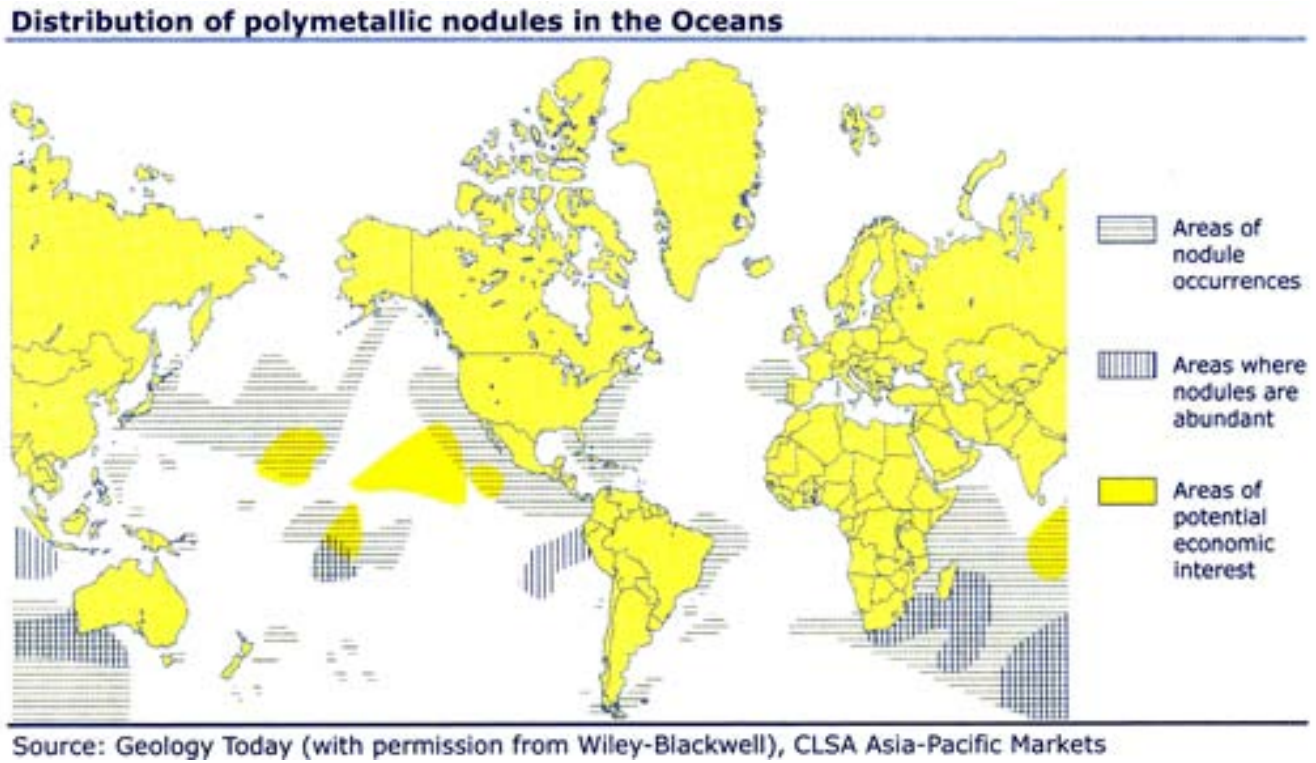
Distribution of siliceous ooze



Hydrogenous and diagenetic metal nodules (deep sea)

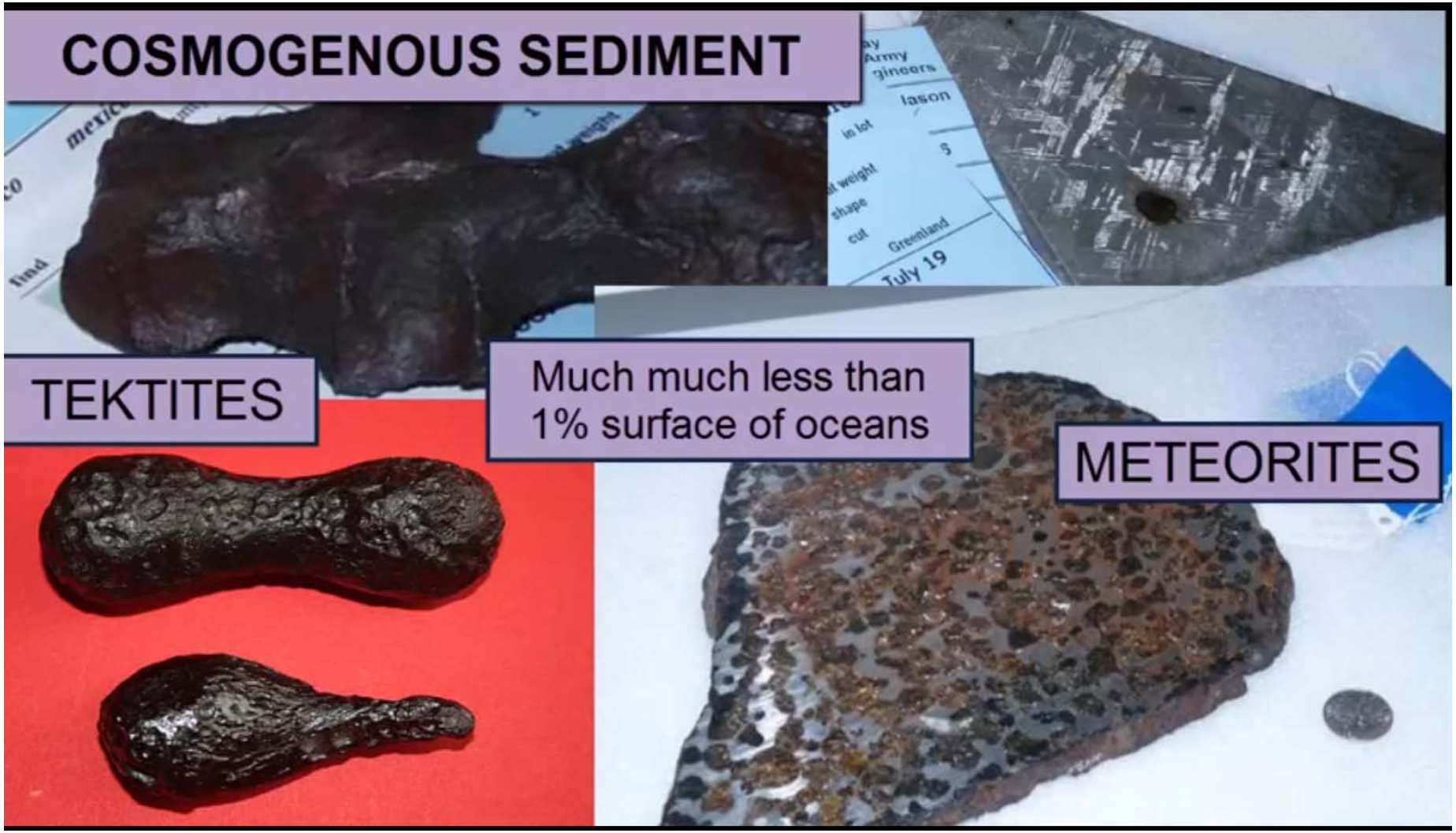


Dissolved Mn and Phosphate can become supersaturated and precipates on the ocean floor as nodules

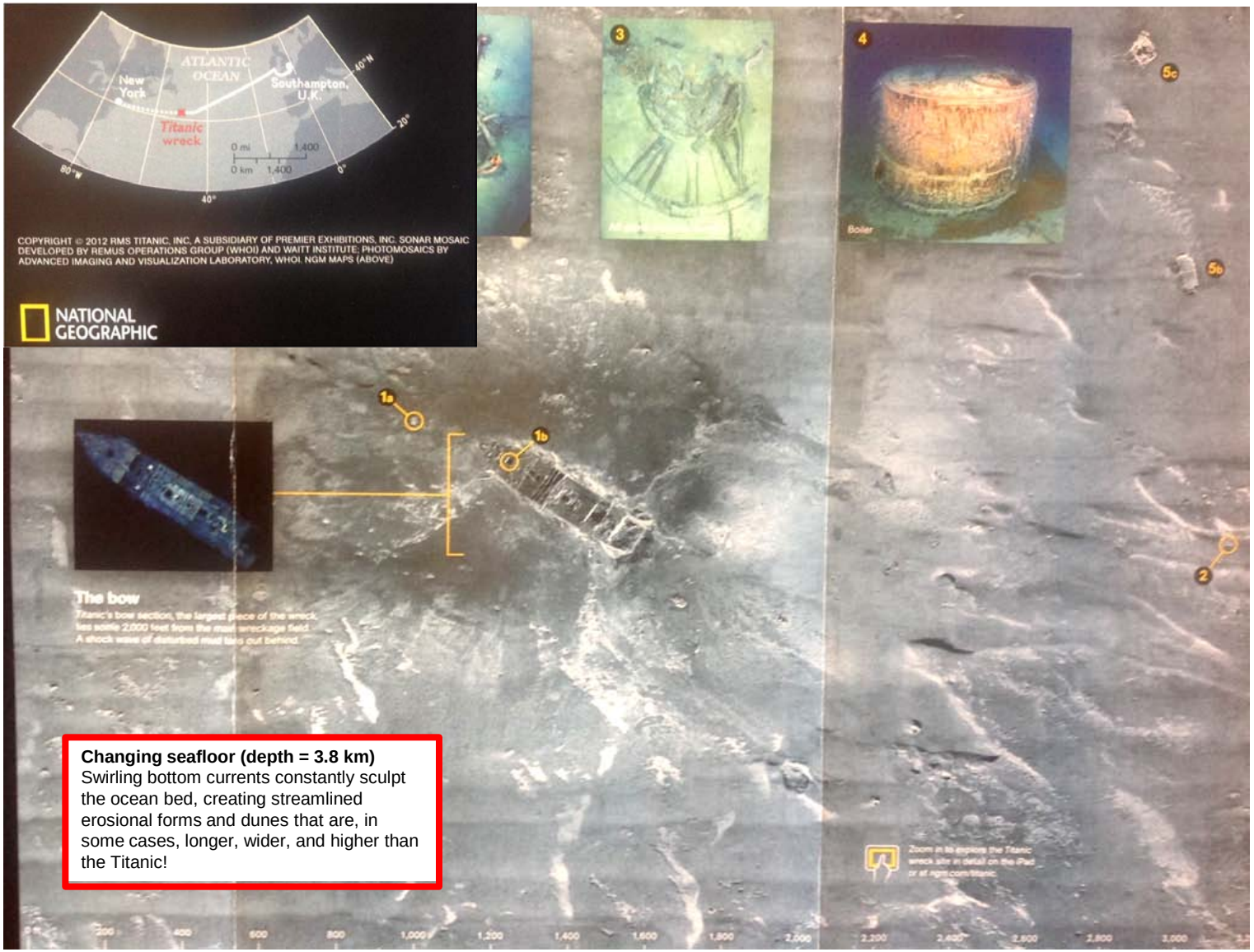


https://www.geolsoc.org.uk/Geoscientist/Archive/September-2015/Deep-sea-minerals

Meteorites and tektites



Deep seafloor bedforms…



5c

5a

5b

N

3

2

4

The stern

The mangled stern, the second largest part of the wreck, lies roughly in line with the bow, but that is probably coincidence. It corkscrewed as it sank, so the stern's rear section rests closest to the bow.

Zoom in to explore the Titanic wreck site in detail on the iPad or at ngm.com/titanic

1,600 1,800 2,000 2,200 2,400 2,600 2,800 3,000 3,200 3,400 3,600 3,800 4,000 4,200 4,400 4,600 4,800

Summary of basic factors

- Basic principles:
  - Source
  - Means of transport
  - Rate of supply
  - Potential for dissolution or change on the sea floor
- Main sediment sources:
  - Terrigenuous
  - Marine organisms (fallout)
  - Volcanoes
  - Cosmic fallout
- Transport mechanisms
  - Wind
  - Gravity flows
  - Ocean currents (sediment plumes)
  - Settling
  - Ice rafting