Stratigraphic Interpretation

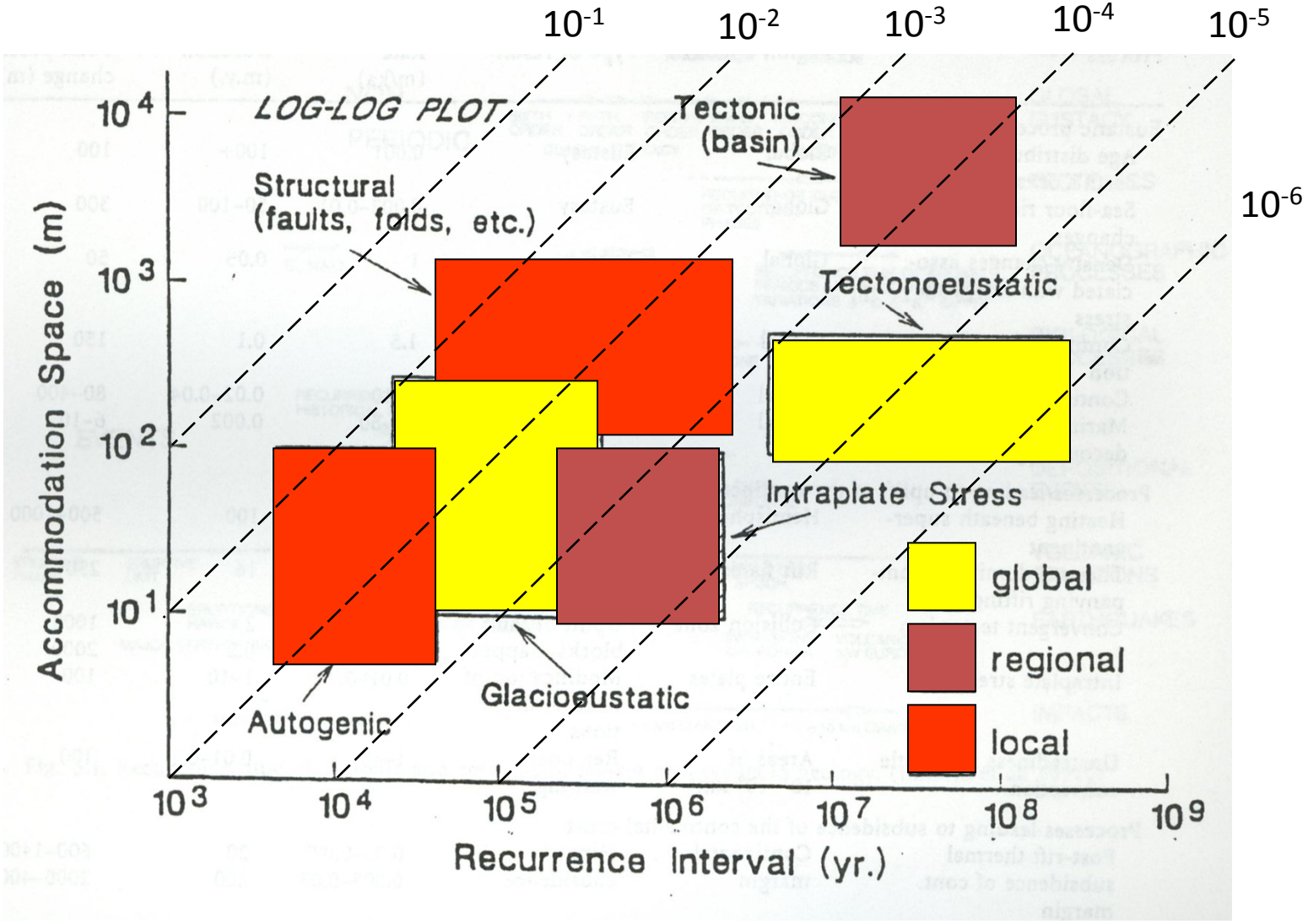
Creation of strata and their character can be essentially thought of as a competition of creating and filling space for sediment.

Accommodation **Deposition**

$$\Delta RSL = \Delta ASL + Sub - Dep$$

ΔRSL: Change in Relative Sea Level
ΔASL: Change in Absolute Sea Level (Eustasy)
***Sub*: Subsidence Rate (or uplift rate)**
***Dep*: Deposition Rate (or erosion rate)**

Time Scales of Accommodation-Creating Processes

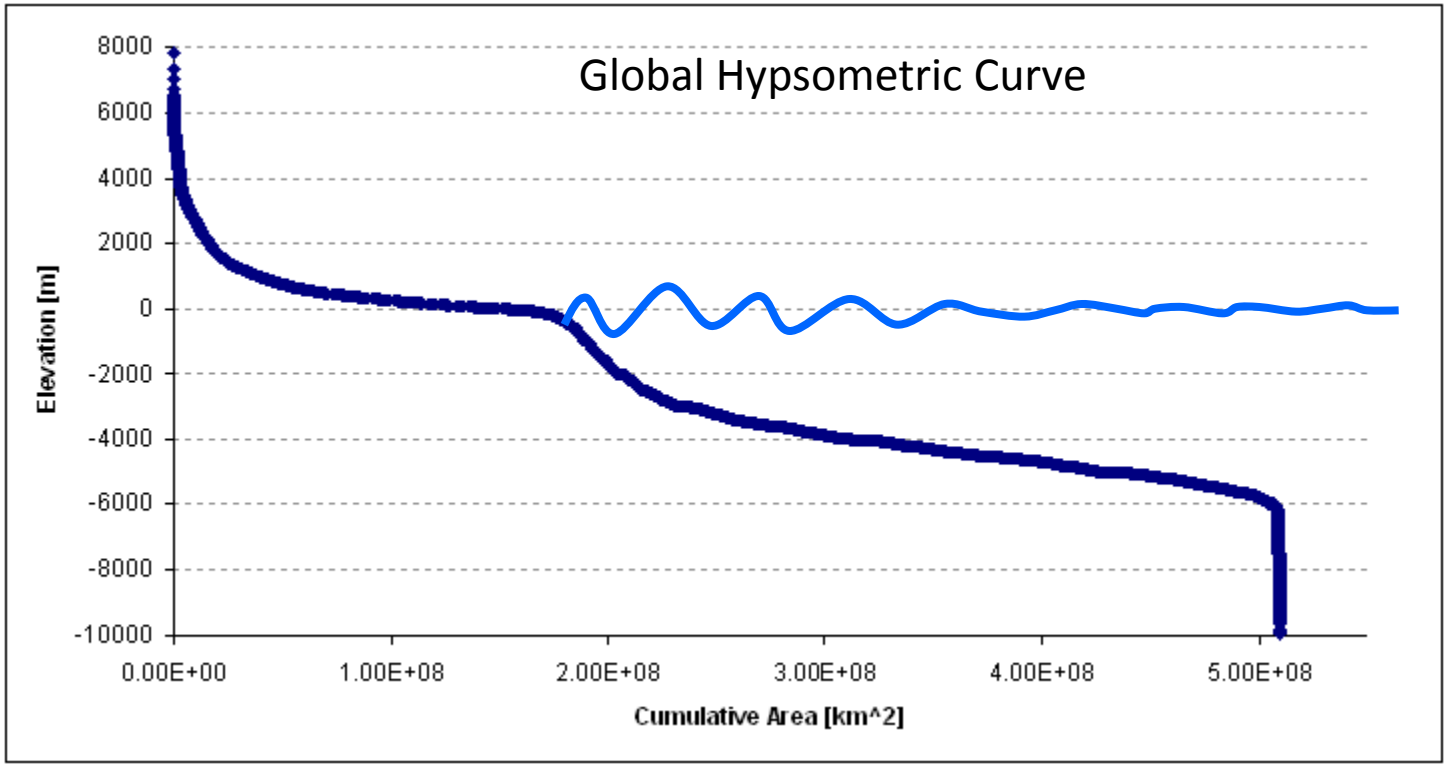


What Controls Sealevel?

Eustatic Sealevel is a function of ocean water volume and the shape of the ocean basin…

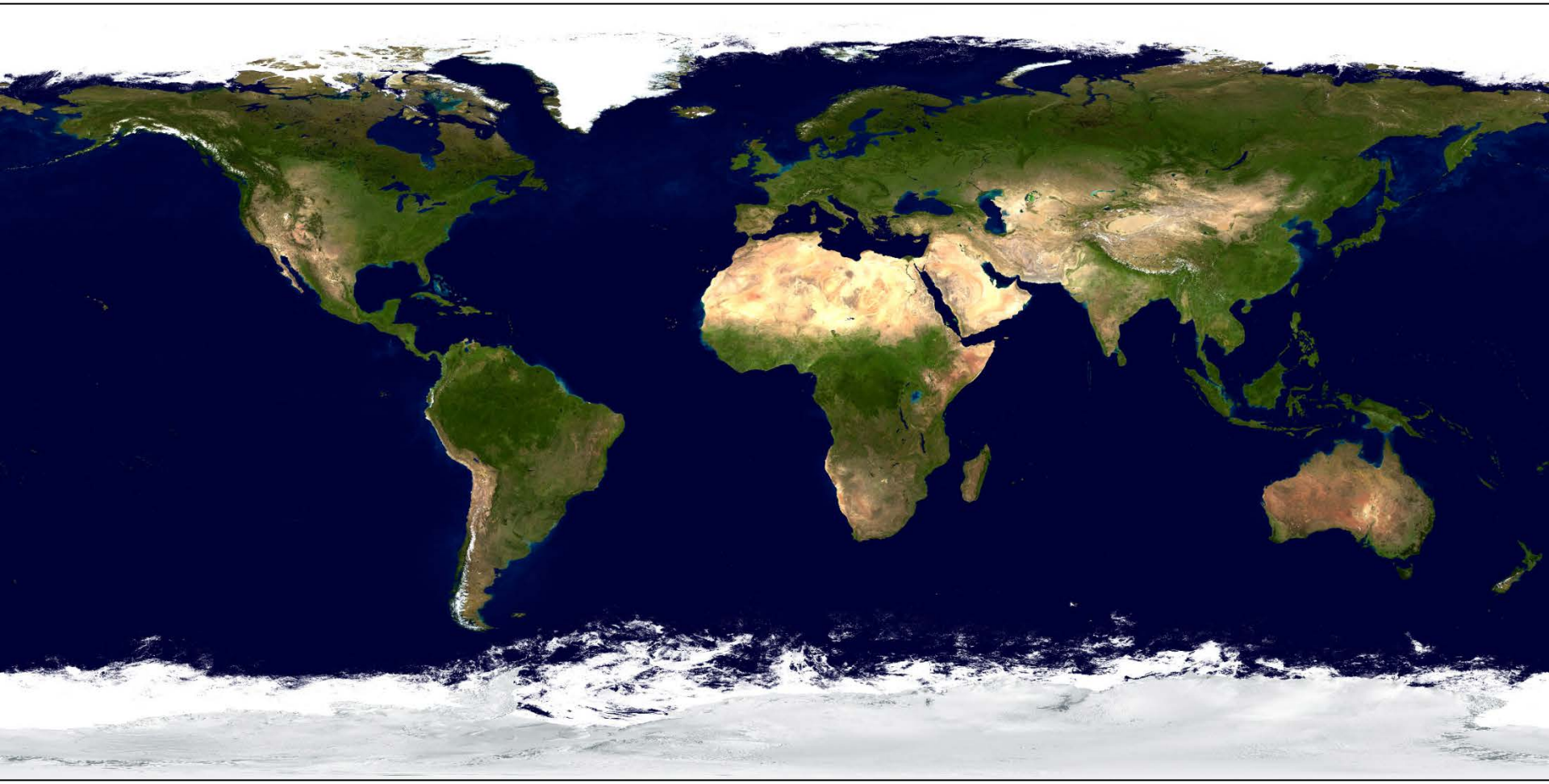
These shapes fill differently →

&

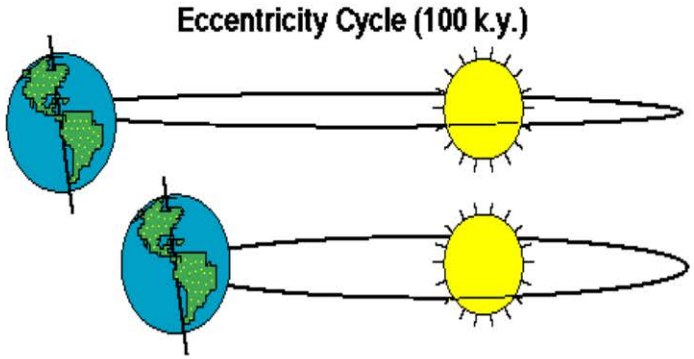


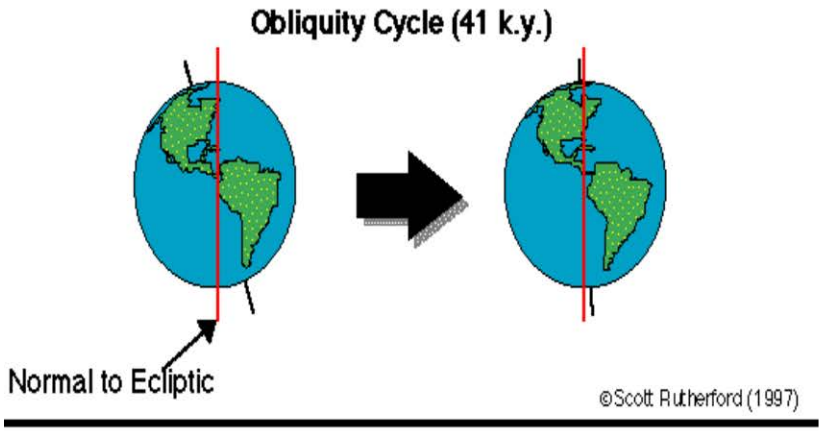
Ice Volume & Sealevel Change

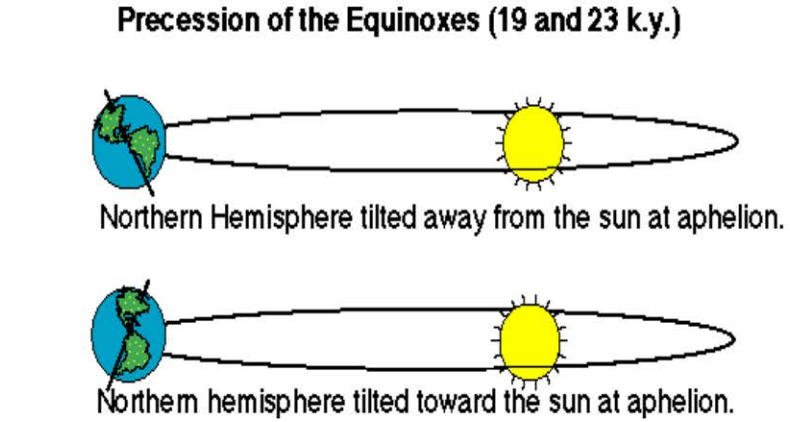
Changes in volumes of water stored as ice in Earth's great continental ice sheets (Greenland & Antarctica, today) changes global ocean water volume…

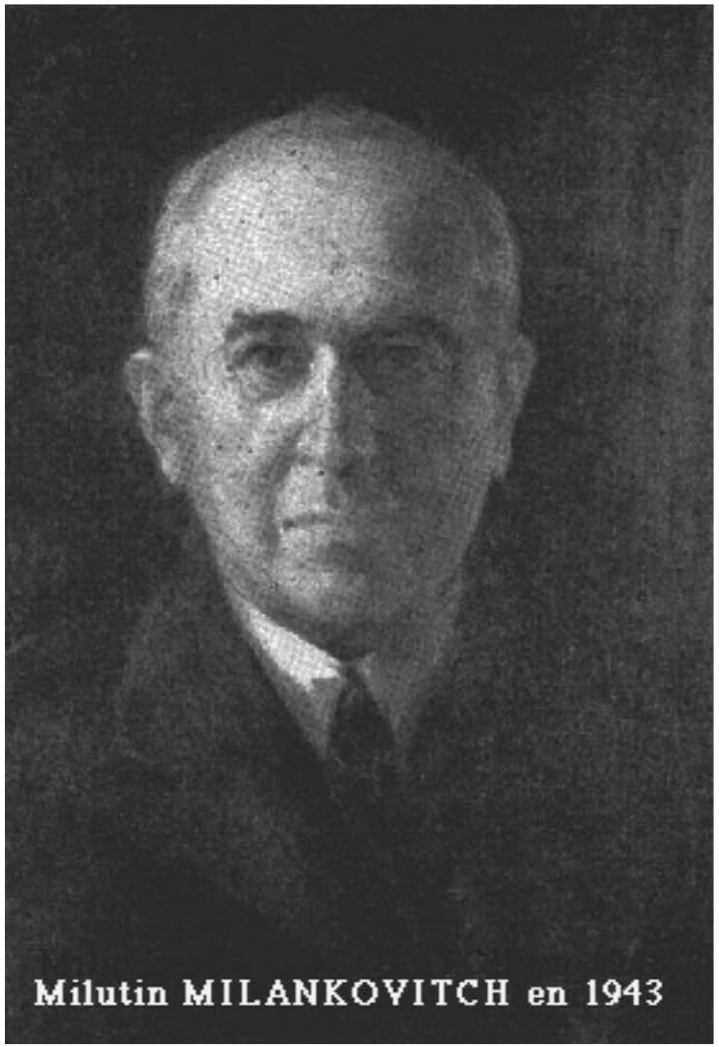


Milankovitch Cycles

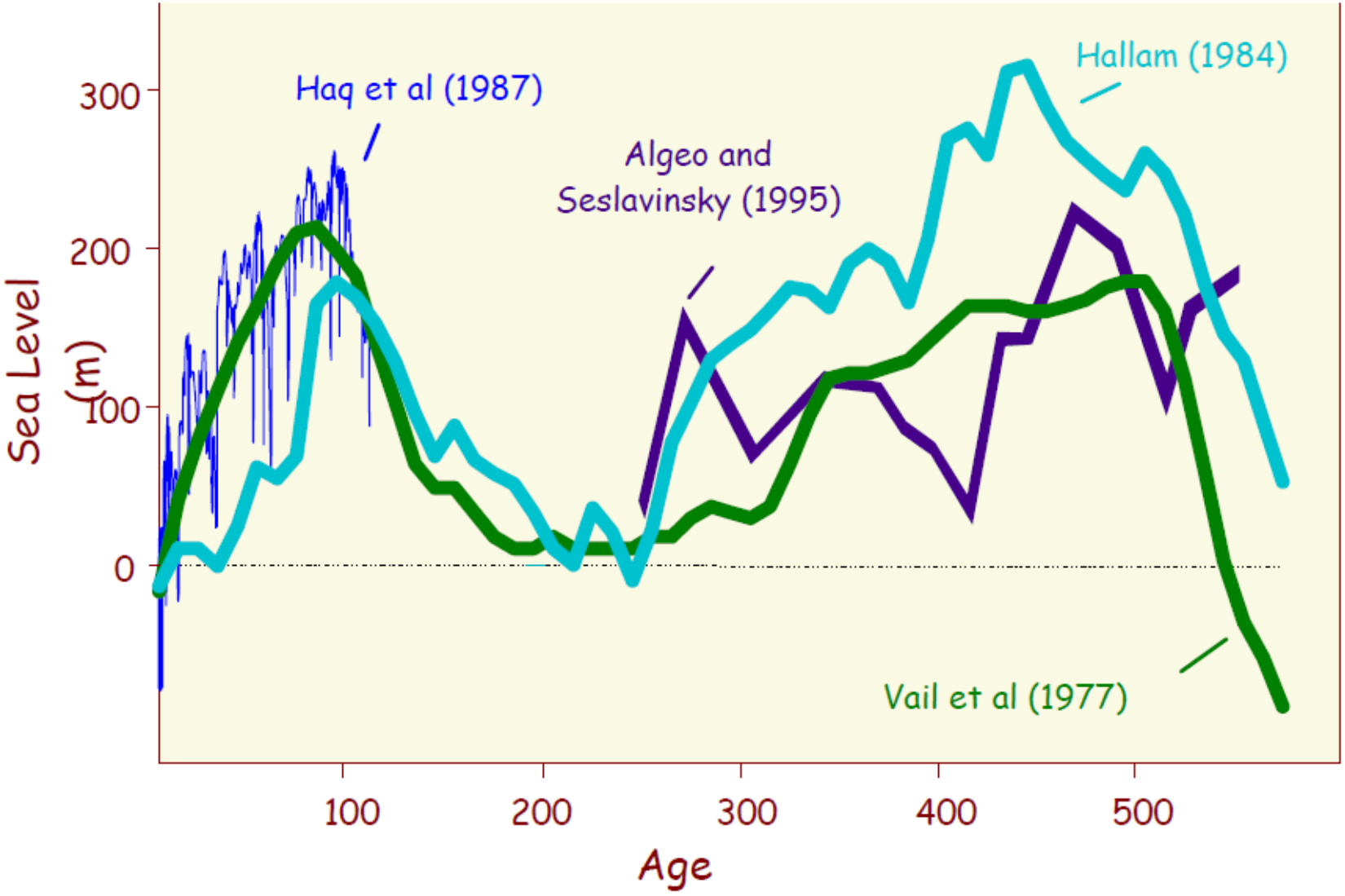








Phanerozoic Sea Level

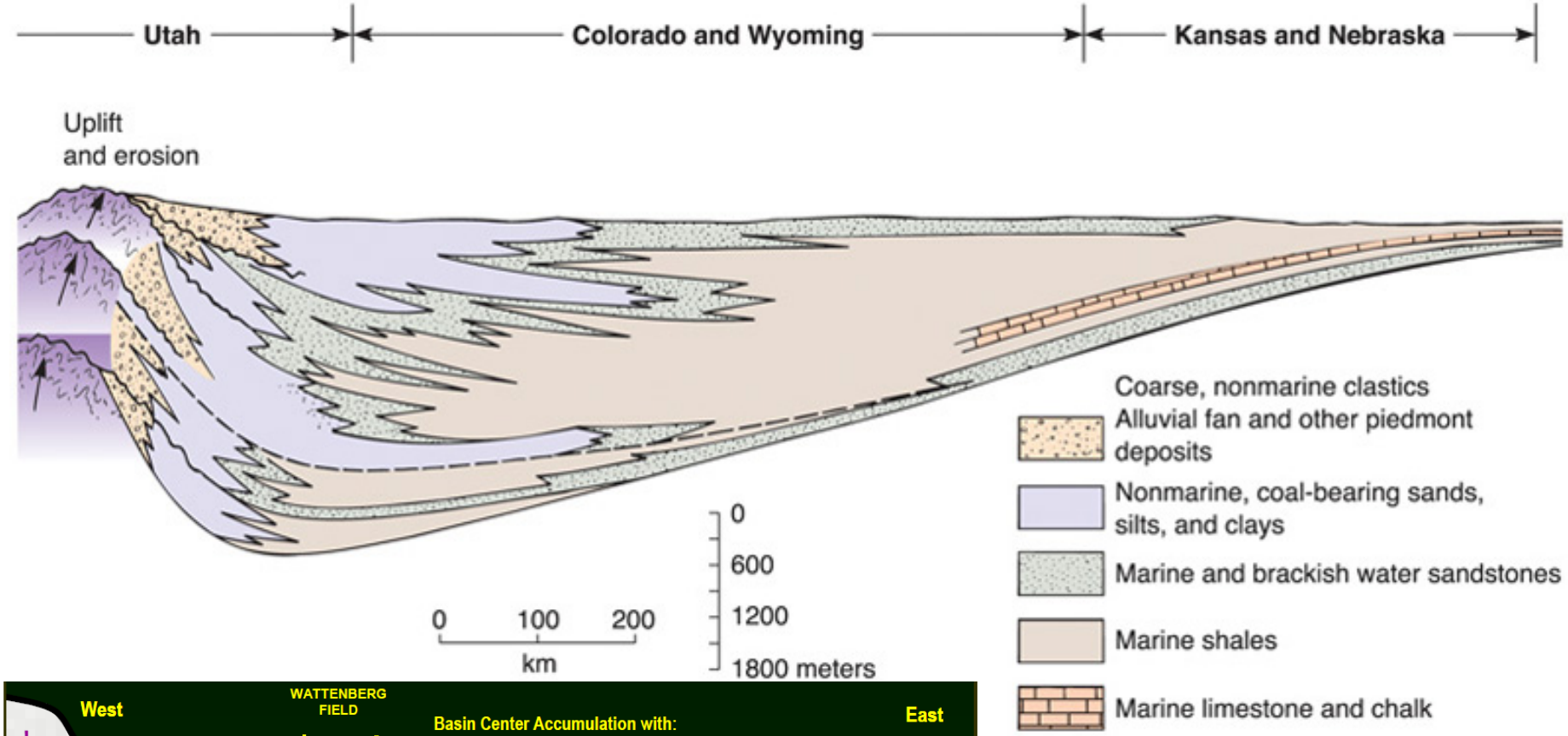


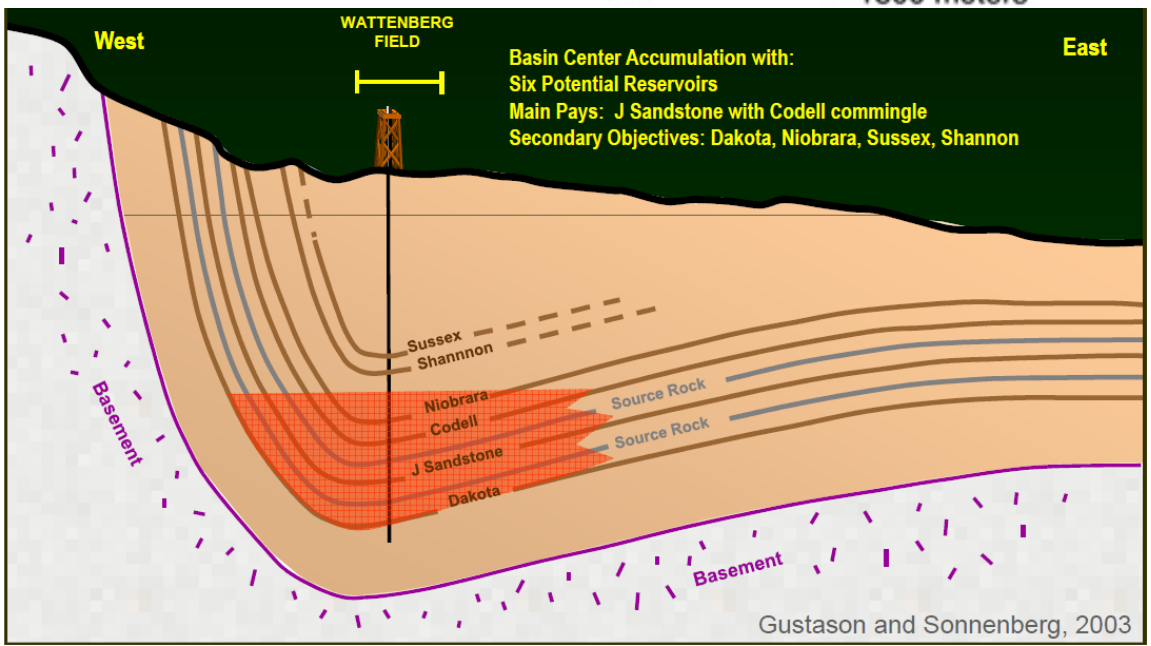
Subsidence

The downward vertical motion of Earth’s surface with respect to a global datum.

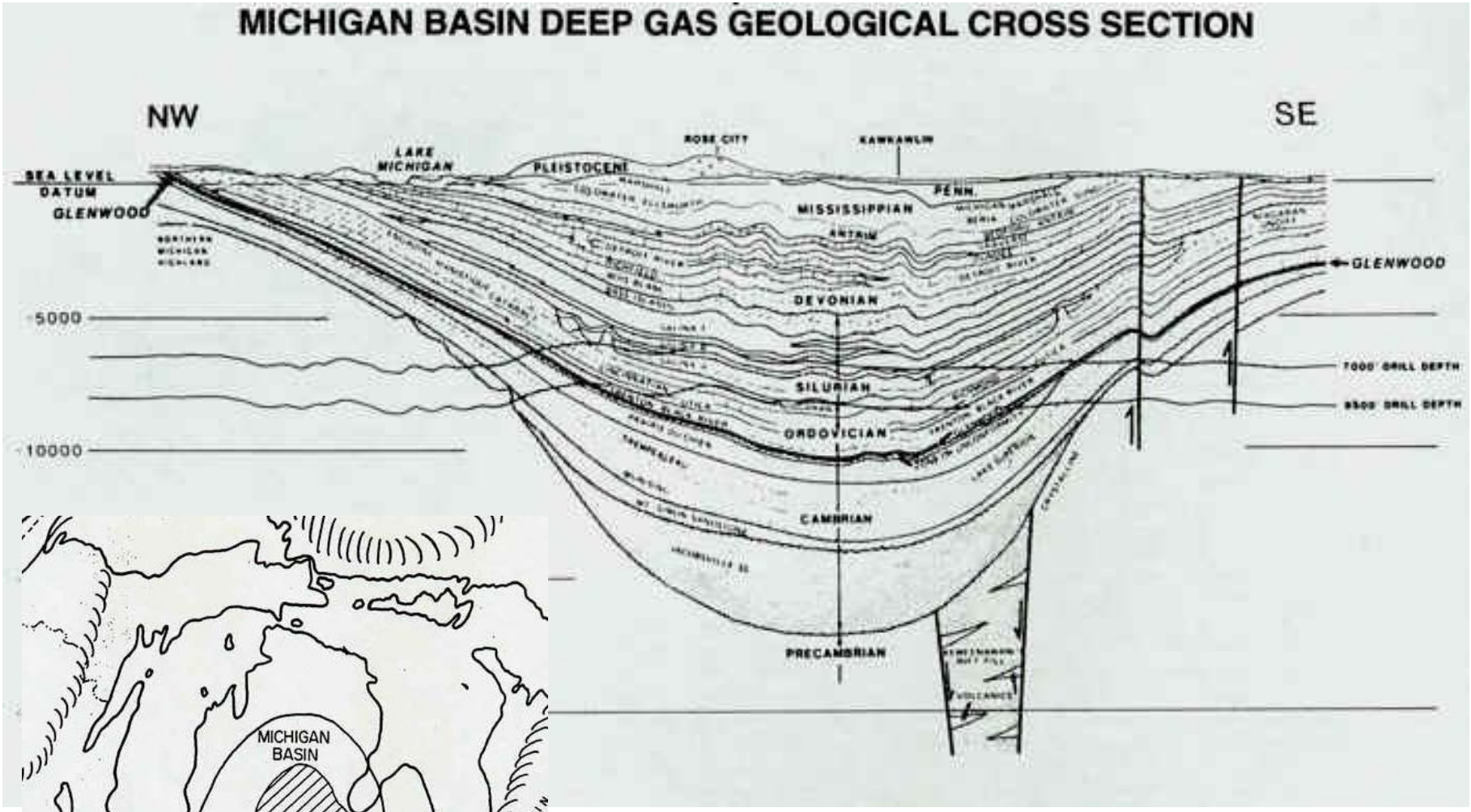
3 Types

- **Flexural Subsidence**
- **Thermal Subsidence**
- **Extensional Subsidence**

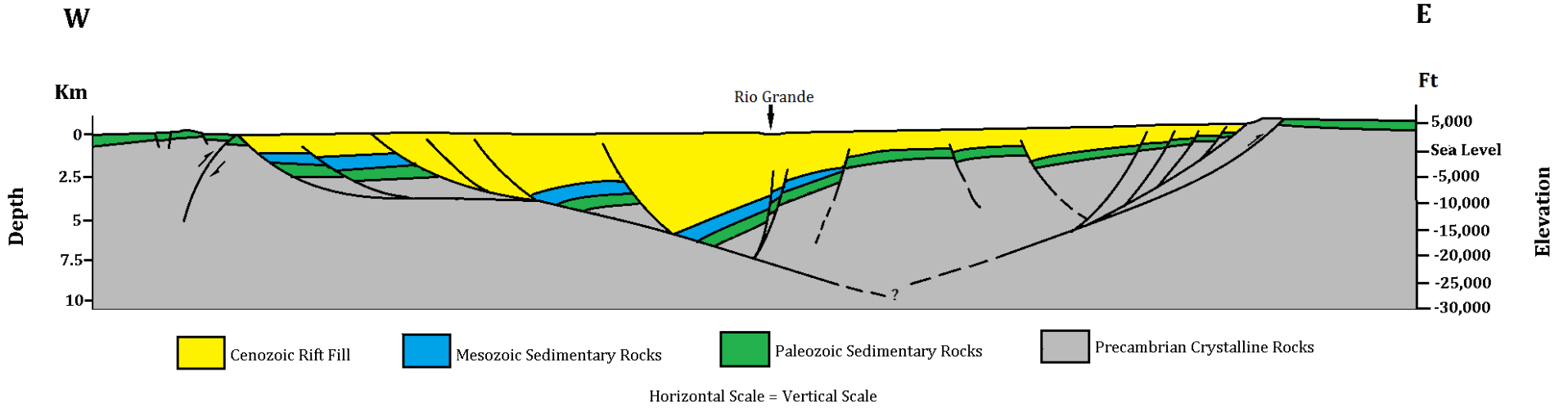

Utah
Colorado and Wyoming
Kansas and Nebraska
Uplift
and erosion
0
100
200
km
0
600
1200
1800 meters
Coarse, nonmarine clastics
Alluvial fan and other piedmont deposits
Nonmarine, coal-bearing sands, silts, and clays
Marine and brackish water sandstones
Marine shales
Marine limestone and chalk

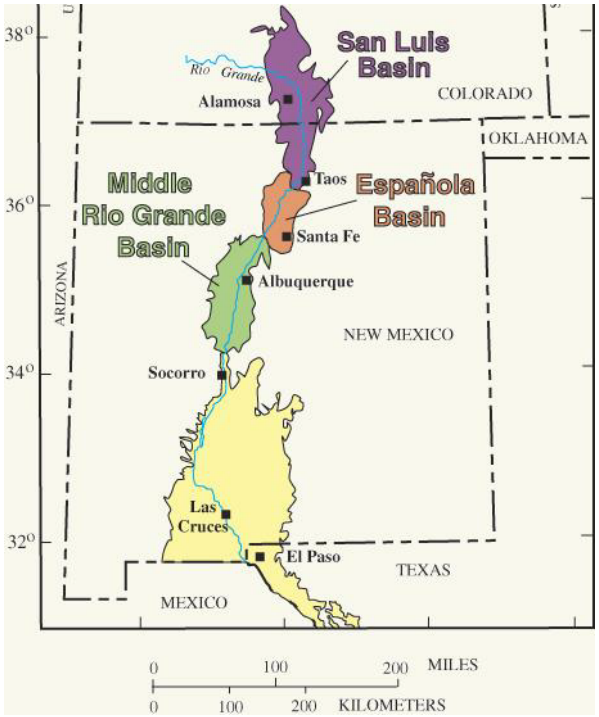

West
WATTENBERG FIELD
East
Basin Center Accumulation with:
Six Potential Reservoirs
Main Pays: J Sandstone with Codell commingle
Secondary Objectives: Dakota, Niobrara, Sussex, Shannon
Sussex
Shannnon
Niobrara
Codell
J Sandstone
Dakota
Source Rock
Source Rock
Basement
Basement
Gustason and Sonnenberg, 2003

MICHIGAN BASIN DEEP GAS GEOLOGICAL CROSS SECTION

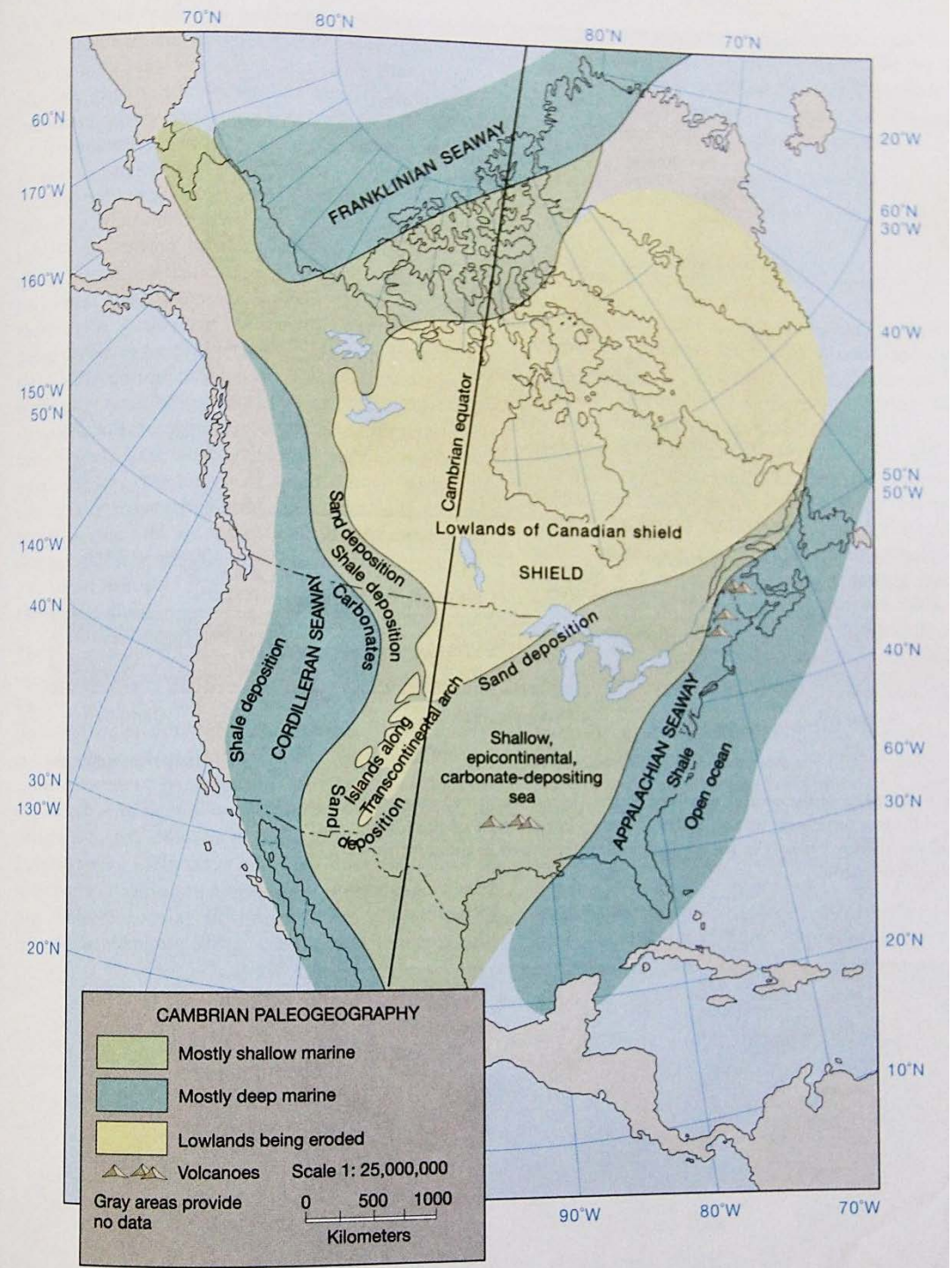


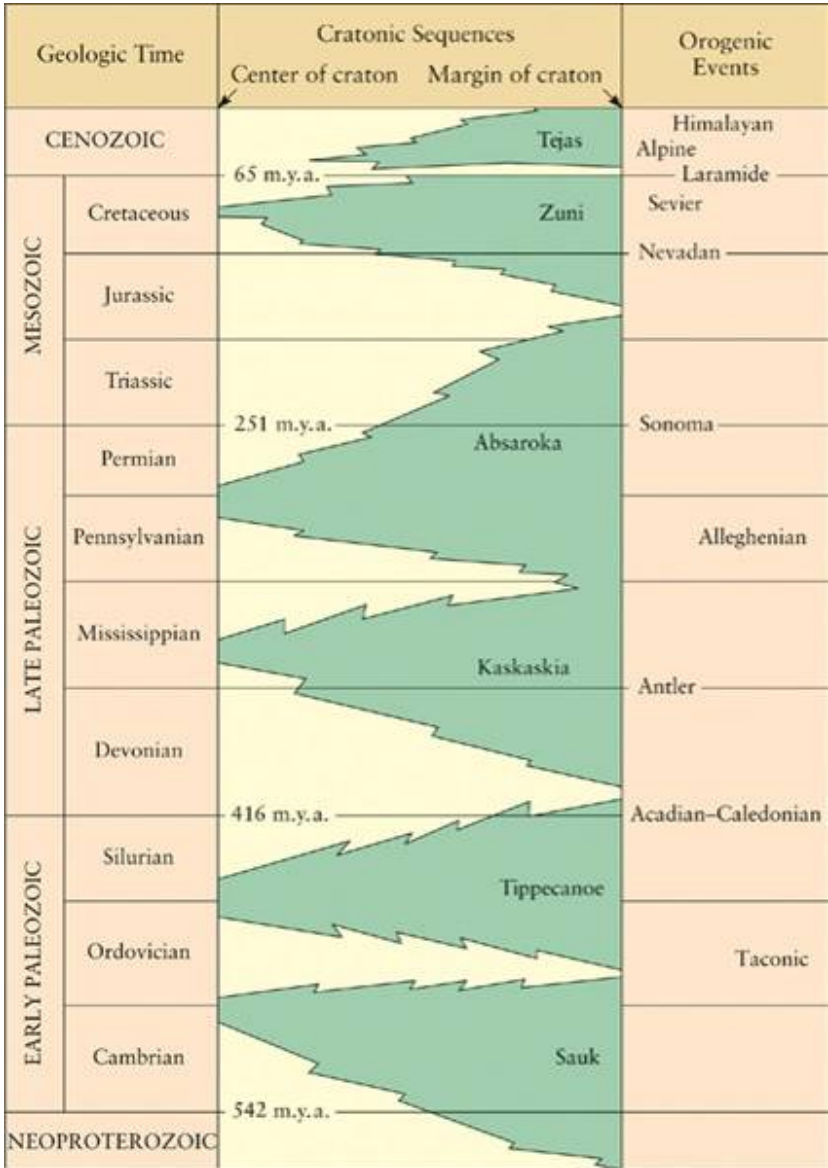
Generalized Cross Section of the Albuquerque Basin



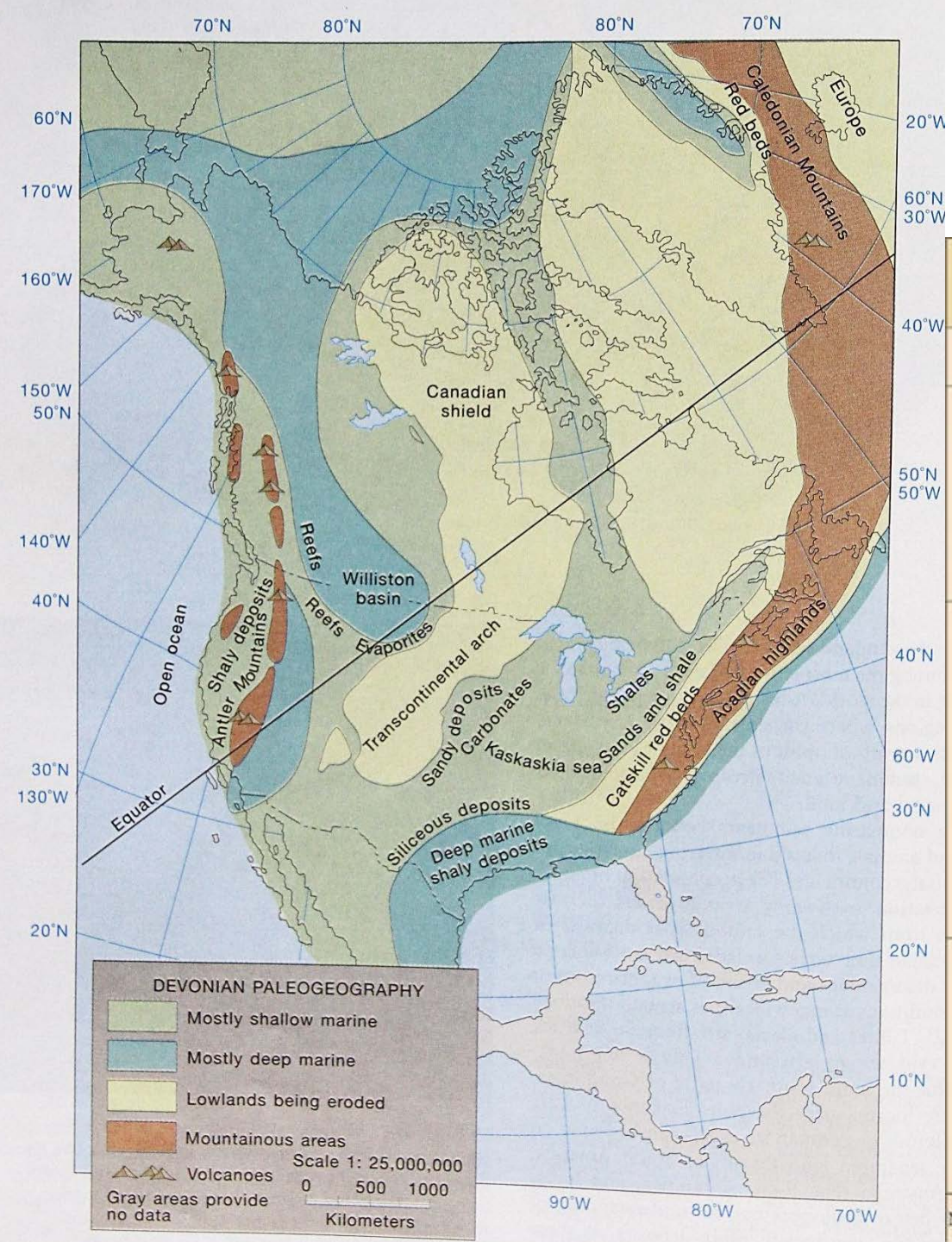


Cambrian


FRANKLINIAN SEAWAY
Cambrian equator
Lowlands of Canadian shield
SHIELD
Sand deposition
Shale deposition
Carbonates
CORDILLERAN SEAWAY
Shale deposition
Islands along Transcontinental arch
Sand deposition
Shallow, epicontinental, carbonate-depositing sea
APPALACHIAN SEAWAY
Shale
Open ocean
Sand deposition
CAMBRIAN PALEOGEOGRAPHY
Mostly shallow marine
Mostly deep marine
Lowlands being eroded
Volcanoes
Scale 1: 25,000,000
Gray areas provide no data
0 500 1000
Kilometers


Geologic Time
Cratonic Sequences
Center of craton
Margin of craton
Orogenic Events
CENOZOIC
Tejas
Himalayan
Alpine
65 m.y.a.
Laramide
MESOZOIC
Cretaceous
Zuni
Sevier
Jurassic
Nevadan
Triassic
251 m.y.a.
Sonoma
LATE PALEOZOIC
Permian
Absaroka
Pennsylvanian
Alleghenian
Mississippian
Kaskaskia
Antler
Devonian
416 m.y.a.
Acadian–Caledonian
EARLY PALEOZOIC
Silurian
Tippecanoe
Ordovician
Taconic
Cambrian
Sauk
542 m.y.a.
NEOPROTEROZOIC

Devonian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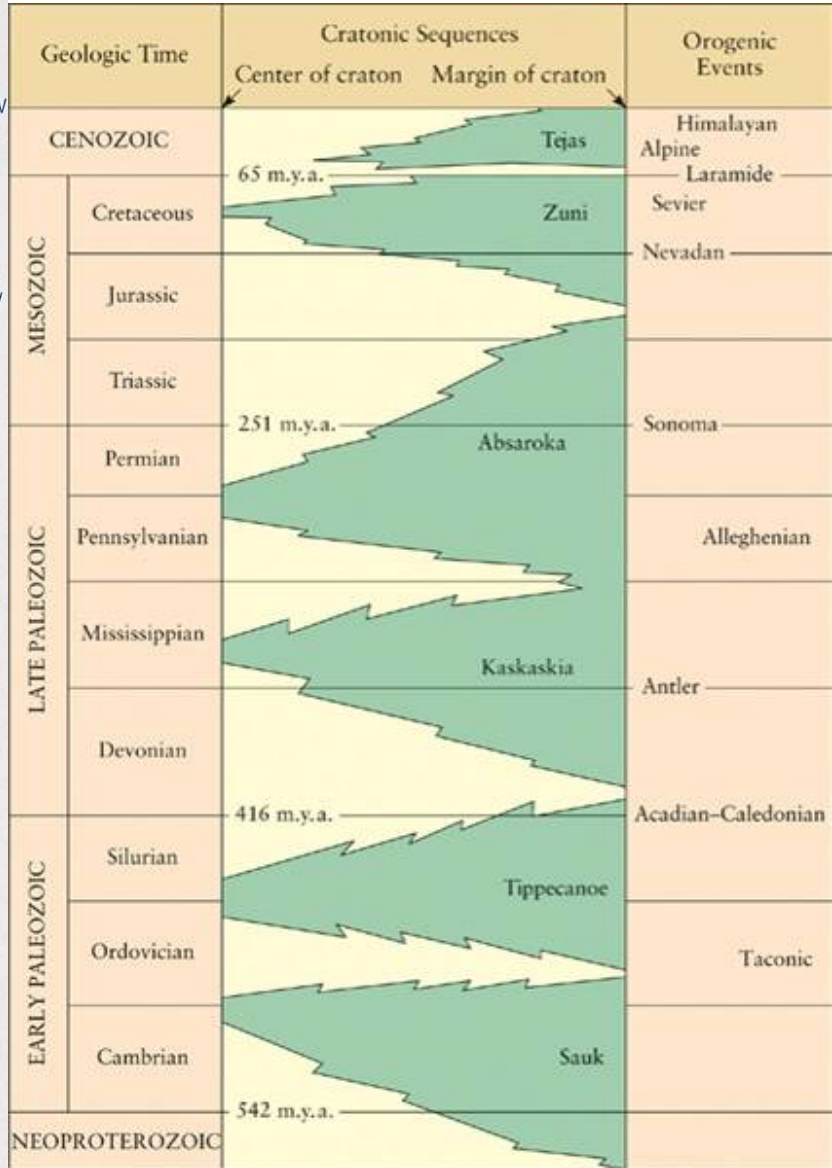
40°W
50°N
50°W
40°N
60°W
30°N
20°N
10°N
90°W
80°W
70°W
Europe
Caledonian Mountains
Red beds
Canadian shield
Reefs
Williston basin
Reefs
Evaporites
Open ocean
Shaly deposits
Antler Mountains
Transcontinental arch
Sandy deposits
Carbonates
Kaskaskia sea
Shales
Sands and shale
Catskill red beds
Acadian highlands
Equator
Siliceous deposits
Deep marine shaly deposits
DEVONIAN PALEOGEOGRAPHY
Mostly shallow marine
Mostly deep marine
Lowlands being eroded
Mountainous areas
Volcanoes
Gray areas provide no data
Scale 1: 25,000,000
0 500 1000
Kilometers


Geologic Time
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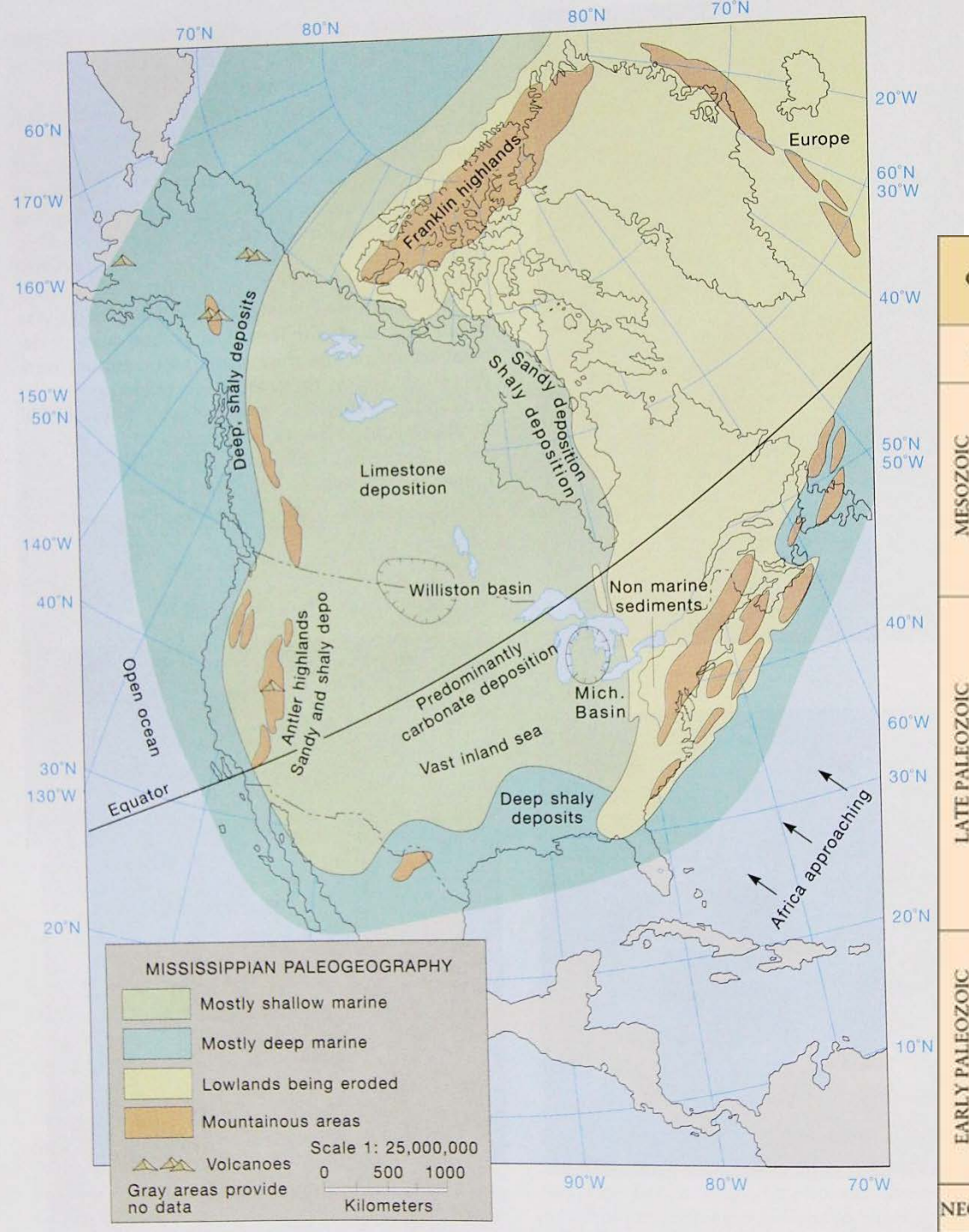
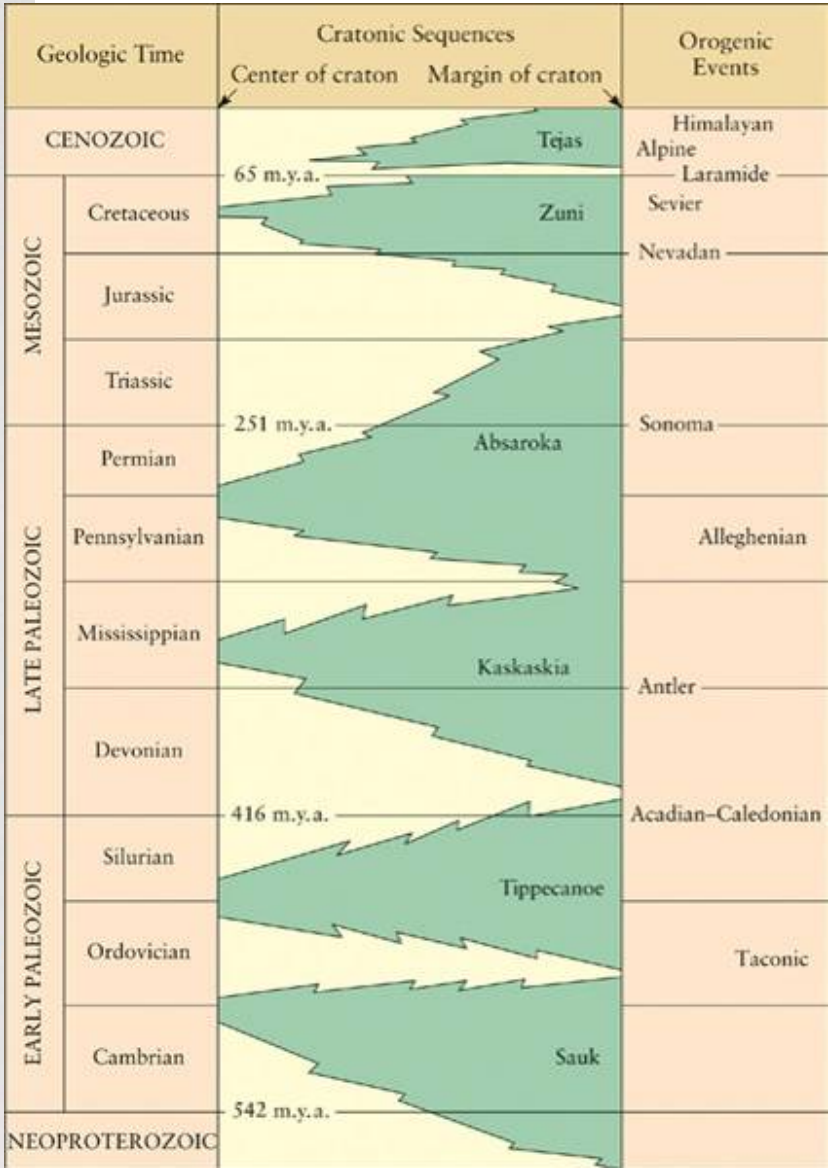
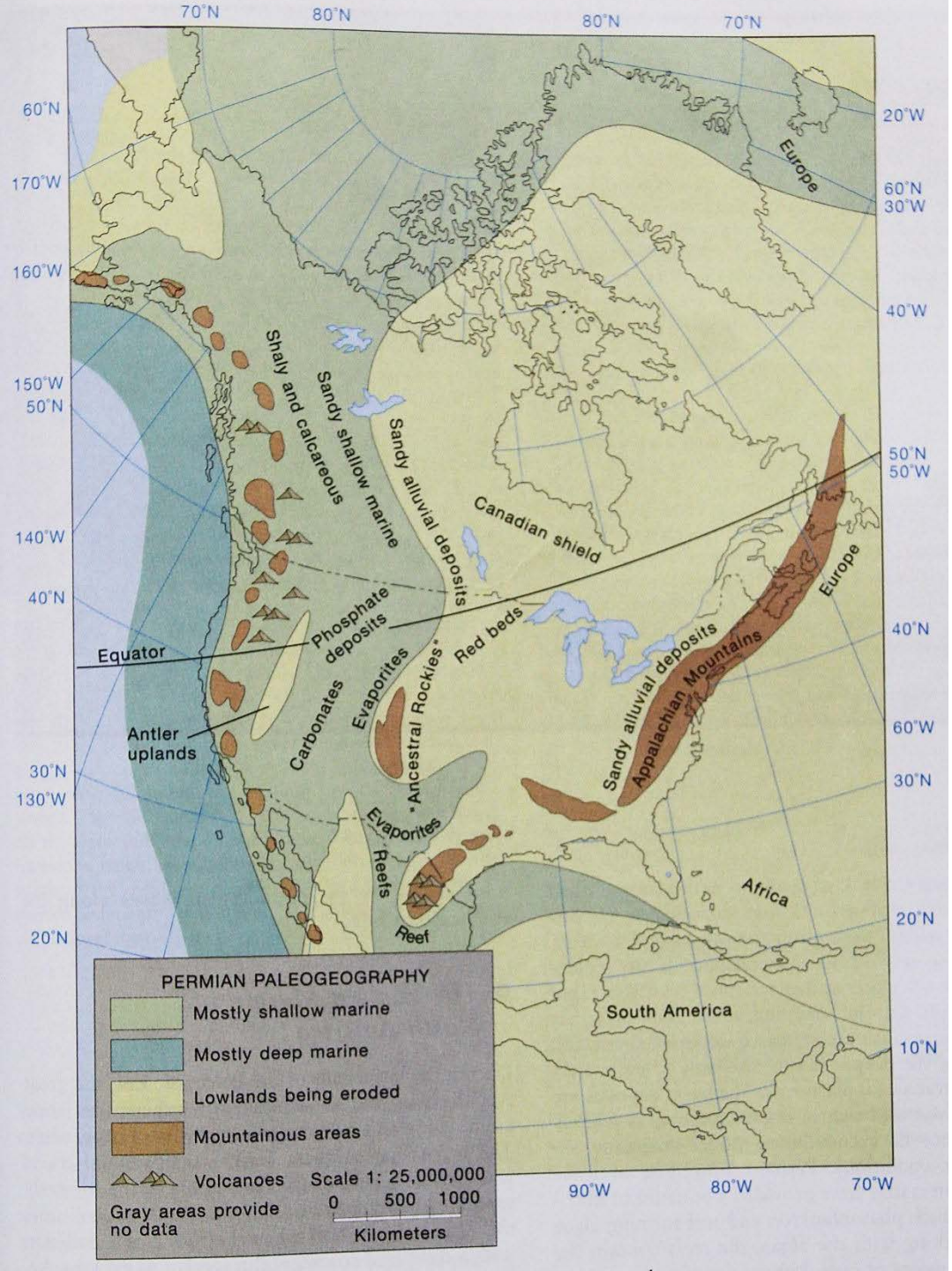
Tippecanoe
Ordovician
Taconic
Cambrian
Sauk
542 m.y.a.
NEOPROTEROZOIC

Mississippian





Permian


70°N
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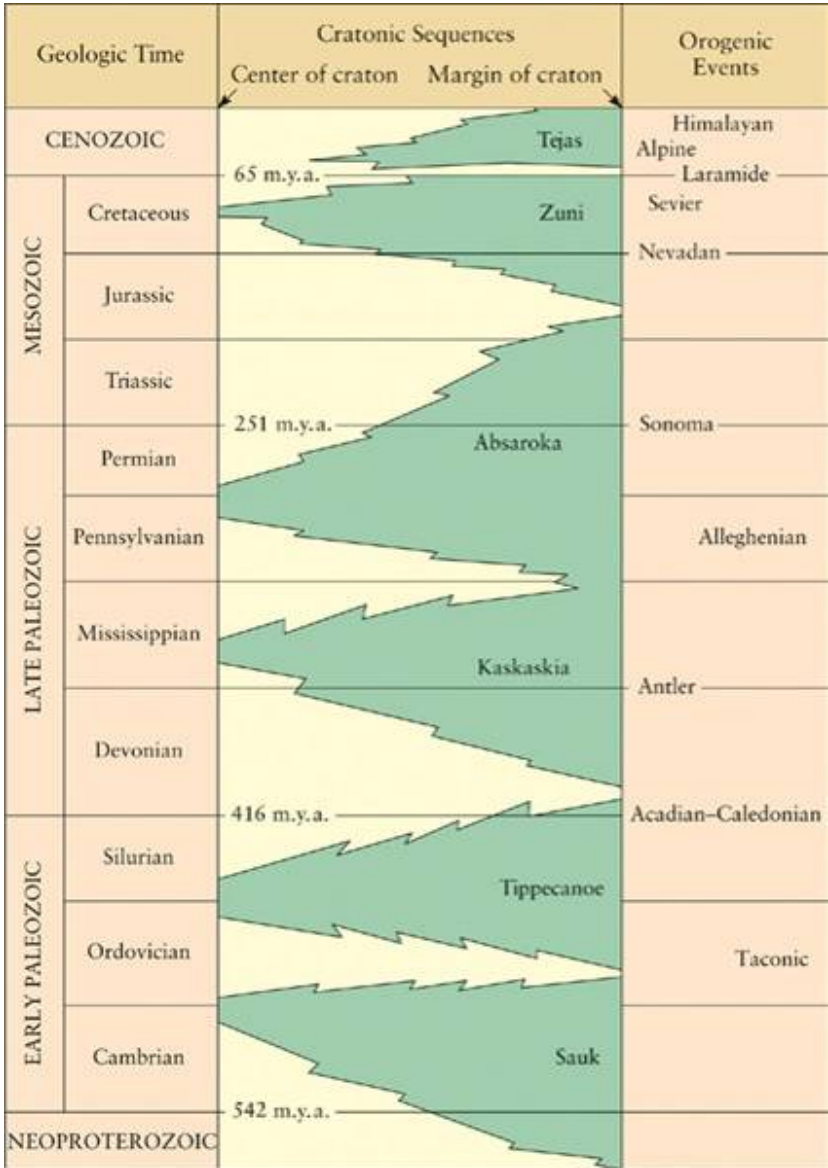
30°N
20°N
10°N
90°W
80°W
70°W
Europe
Shaly and calcareous
Sandy shallow marine
Sandy alluvial deposits
Canadian shield
Europe
Phosphate deposits
Equator
Red beds
Evaporites
Carbonates
Ancestral Rockies
Sandy alluvial deposits
Appalachian Mountains
Antler uplands
Evaporites
Reefs
Reef
Africa
South America
PERMIAN PALEOGEOGRAPHY
Mostly shallow marine
Mostly deep marine
Lowlands being eroded
Mountainous areas
Volcanoes
Scale 1: 25,000,000
0 500 1000
Kilometers
Gray areas provide no data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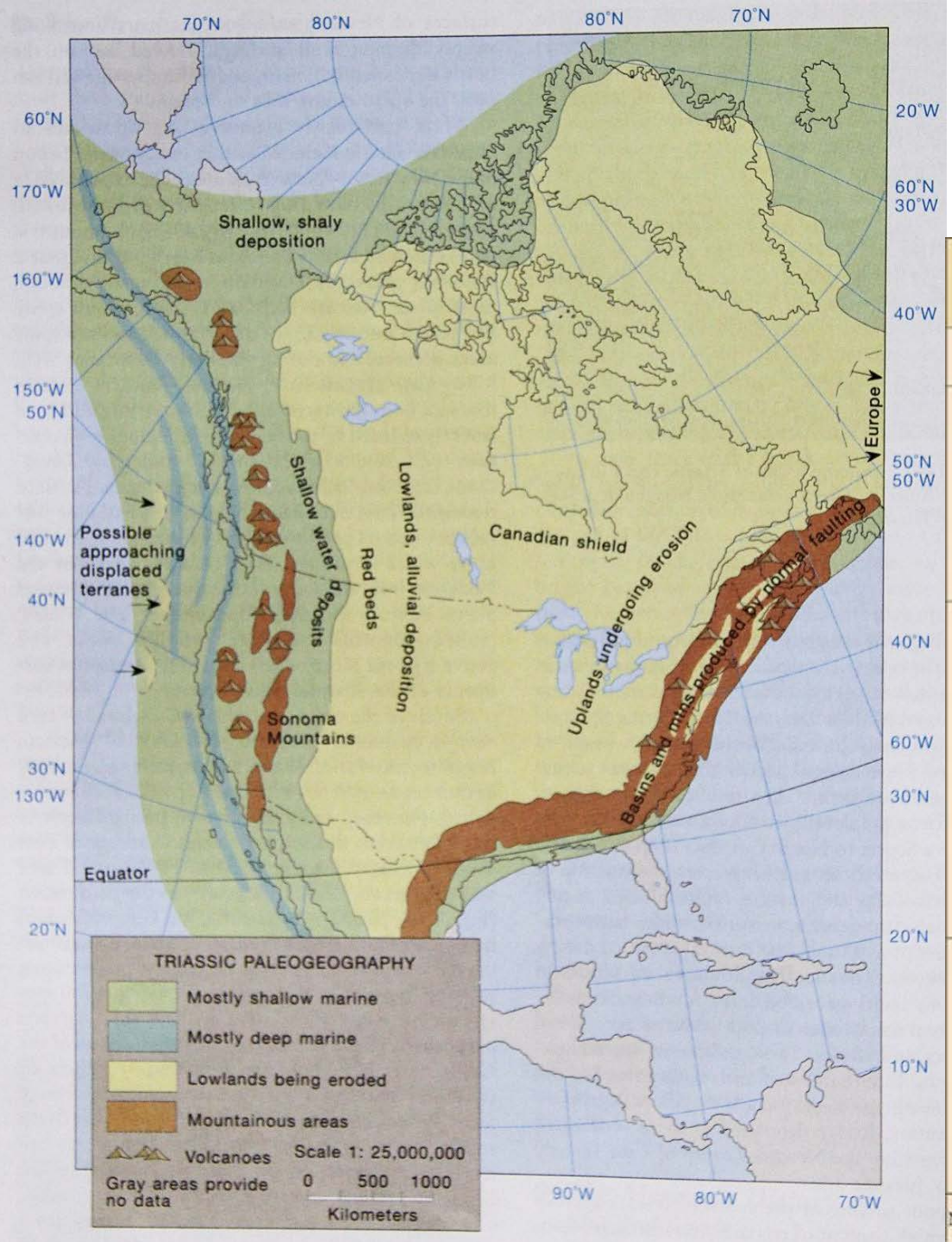
Tippecanoe
Ordovician
Taconic
Cambrian
Sauk
542 m.y.a.
NEOPROTEROZOIC

Triassic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30°N
20°N
10°N
90°W
80°W
70°W
Europe
Equator
Shallow, shaly deposition
Possible approaching displaced terranes
Shallow water deposits
Red beds
Lowlands, alluvial deposition
Canadian shield
Uplands undergoing erosion
Basins and mtns produced by normal faulting
Sonoma Mountains
TRIASSIC PALEOGEOGRAPHY
Mostly shallow marine
Mostly deep marine
Lowlands being eroded
Mountainous areas
Volcanoes
Gray areas provide no data
Scale 1: 25,000,000
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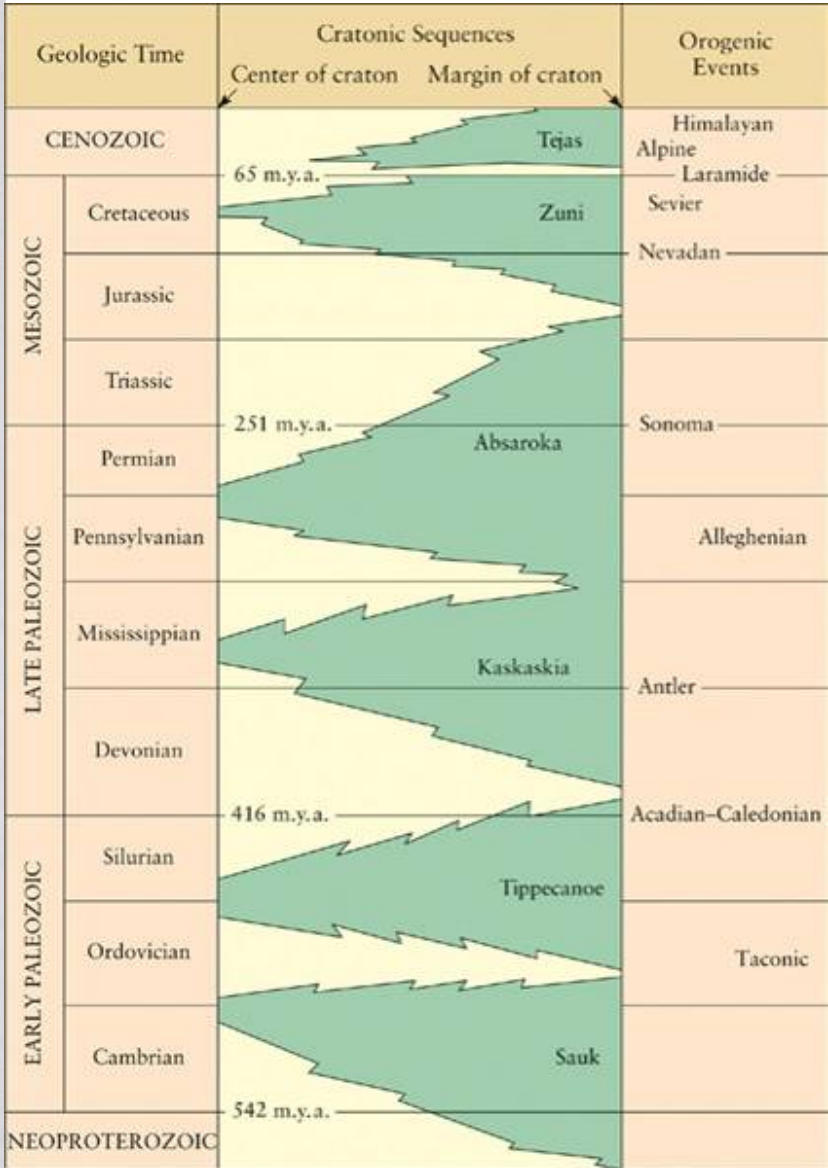
Kilometers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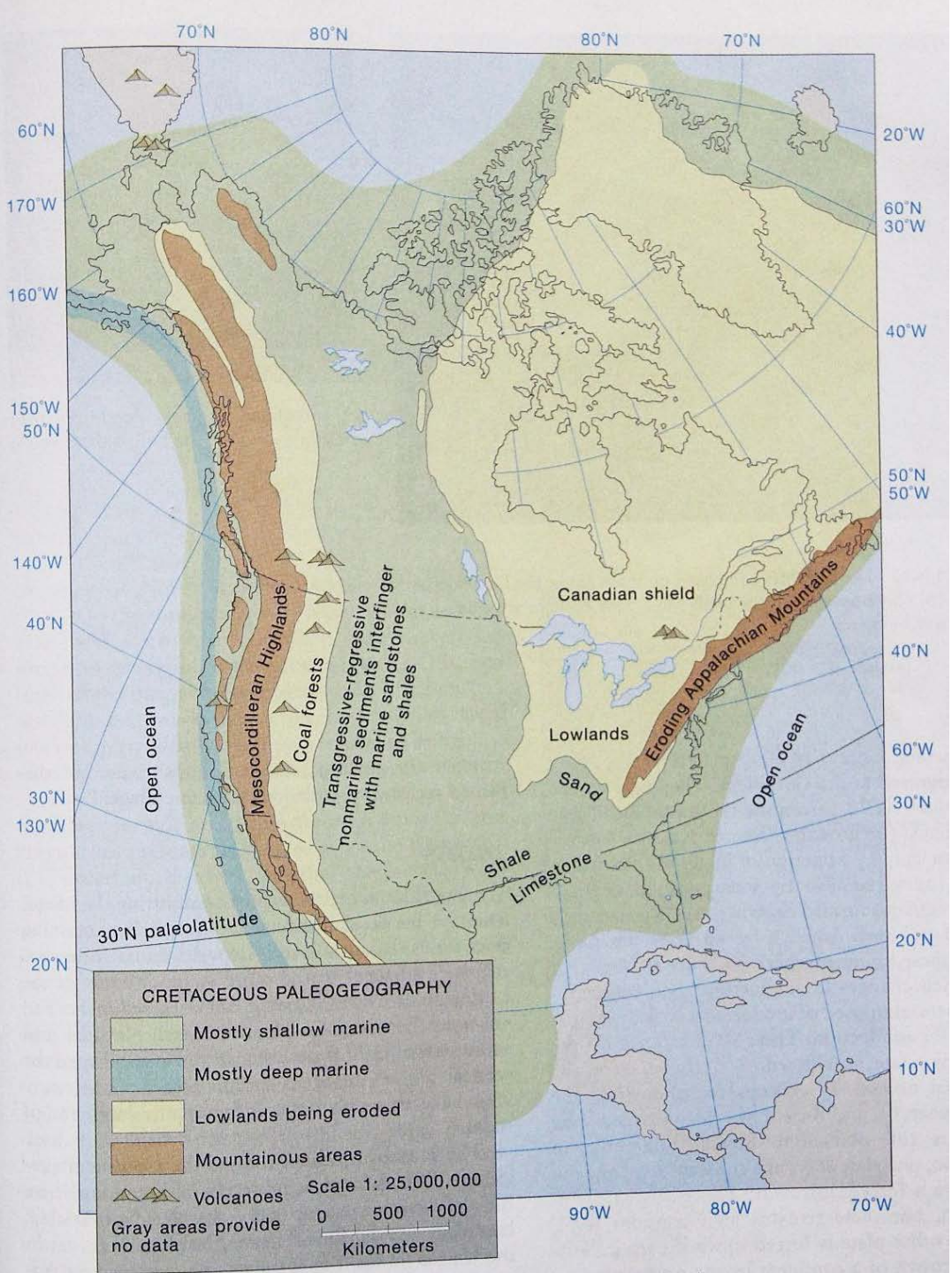
Alpine
Laramide
Sevier
Nevadan
Sonoma
Allegheny
Antler
Acadian–Caledonian
Taconic

Cretaceous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130°W
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20°N
10°N
90°W
80°W
70°W
Canadian shield
Mesocordilleran Highlands
Coal forests
Transgressive-regressive nonmarine sediments interfinger with marine sandstones and shales
Eroding Appalachian Mountains
Lowlands
Sand
Open ocean
Open ocean
Shale
Limestone
30°N paleolatitude
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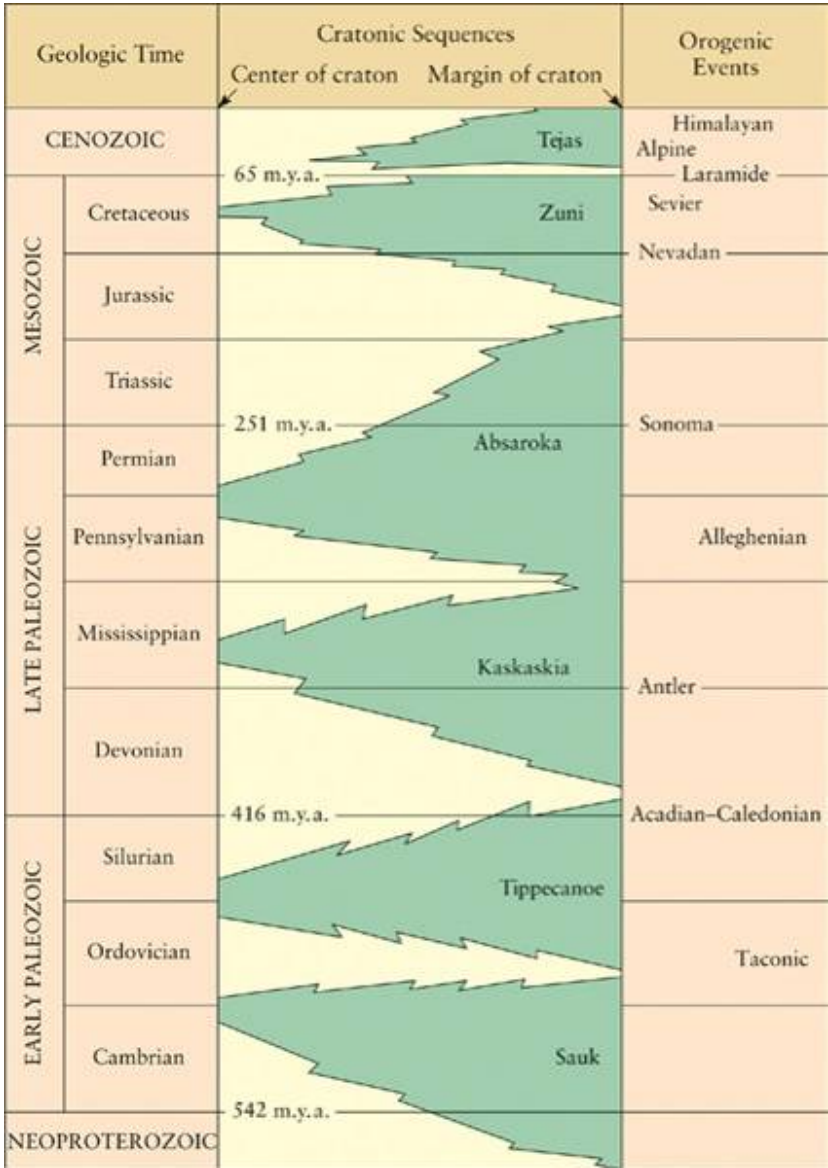
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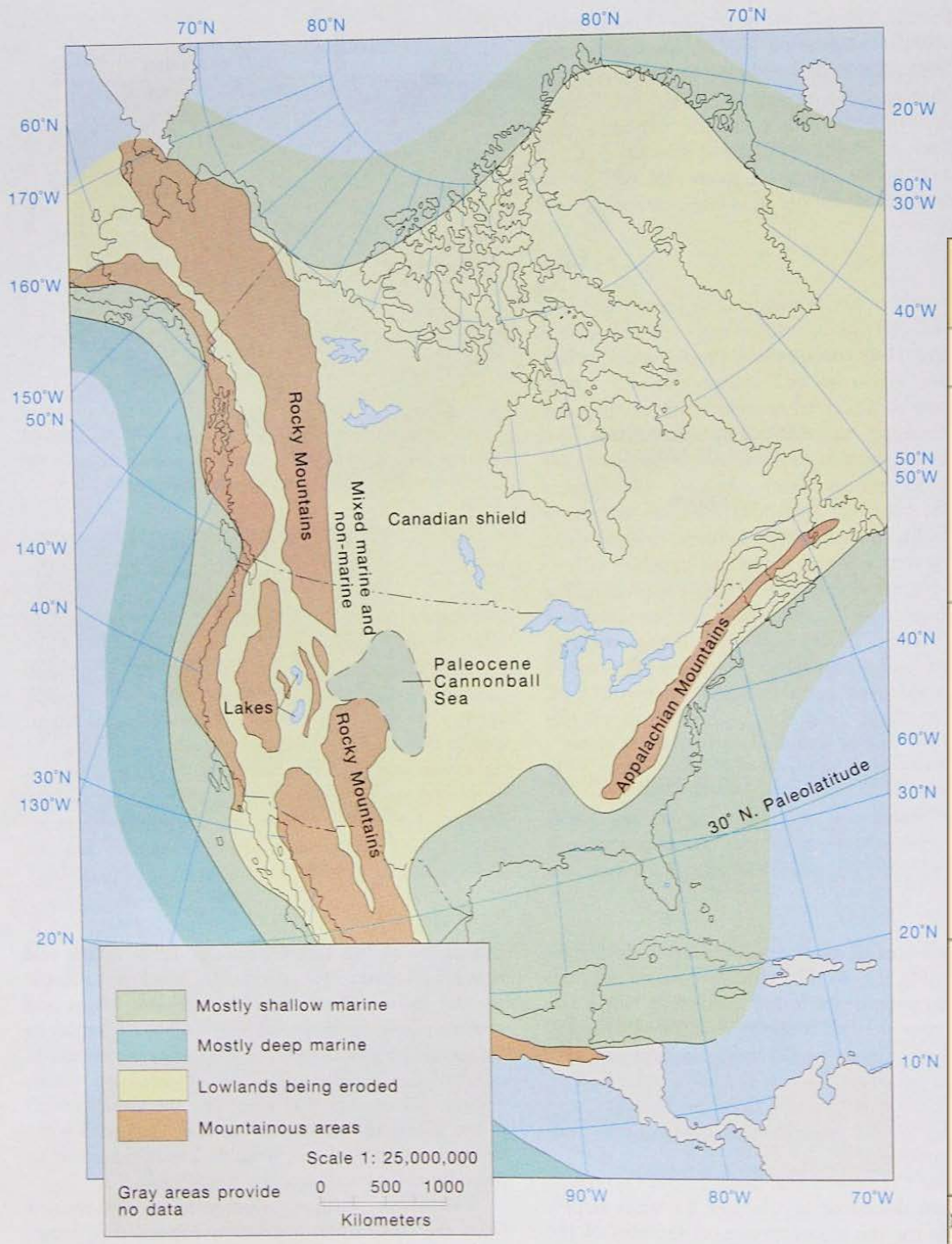
Tertiary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60°W
30°N
20°N
10°N
90°W
80°W
70°W
Rocky Mountains
Mixed marine and non-marine
Canadian shield
Paleocene Cannonball Sea
Lakes
Rocky Mountains
Appalachian Mountains
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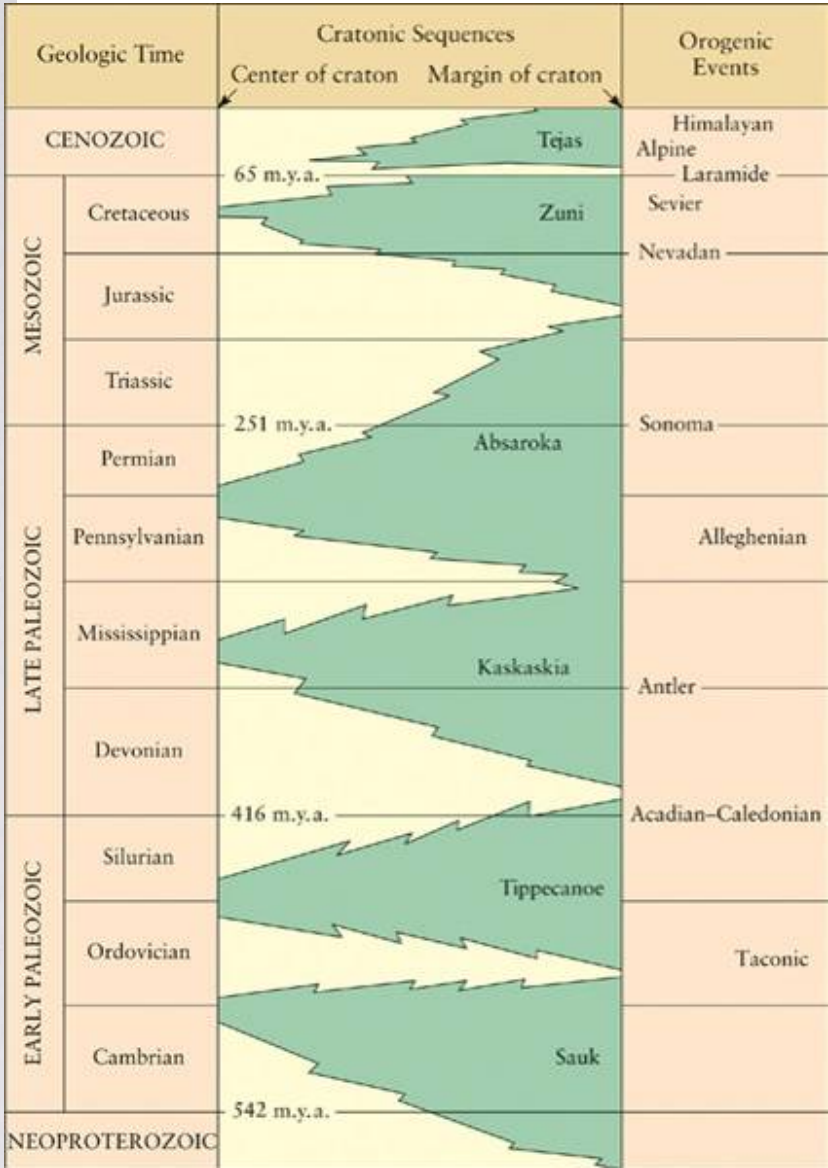
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NEOPROTEROZOIC