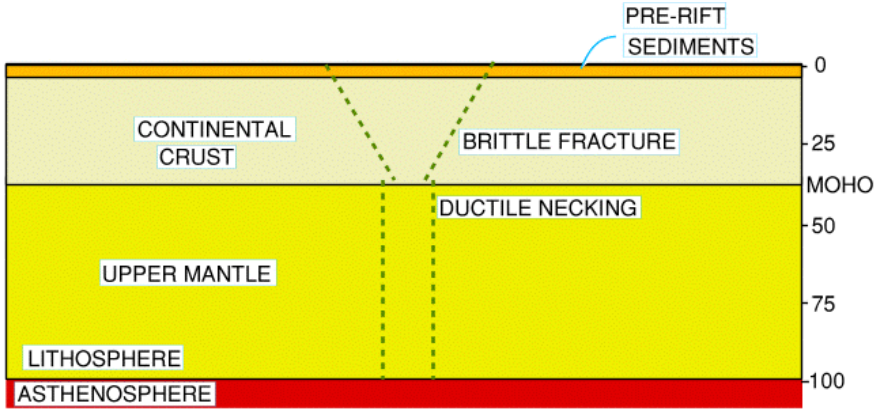
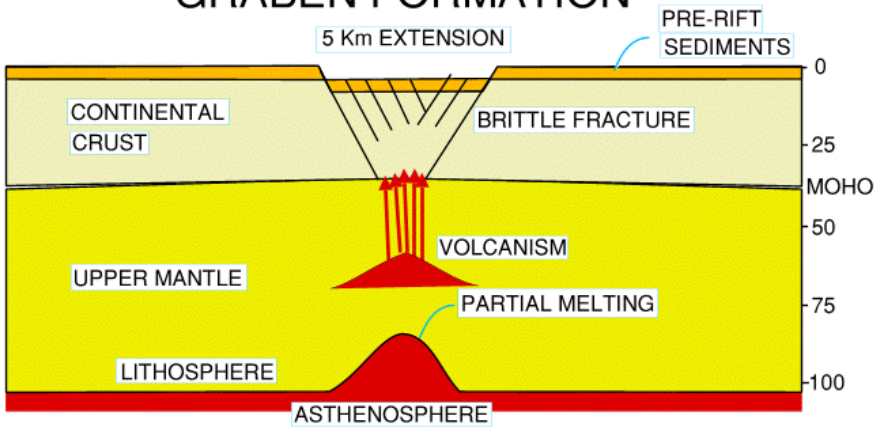
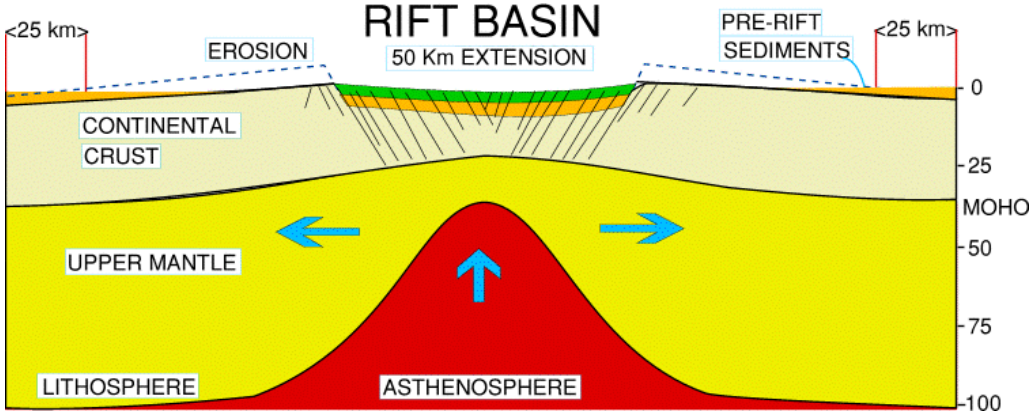
Florida Basement & Jurassic Rifting of Pangea



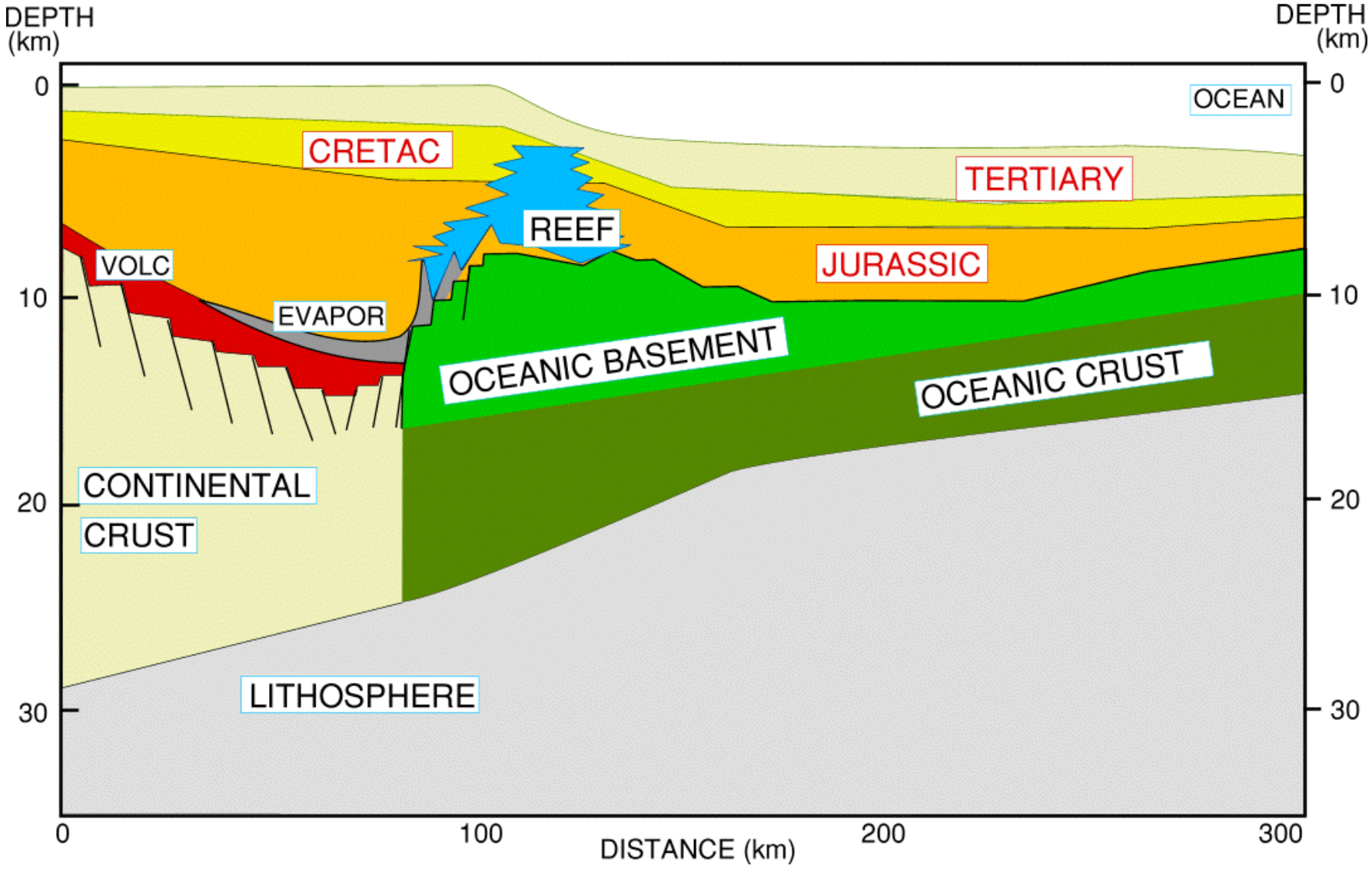
GRABEN FORMATION



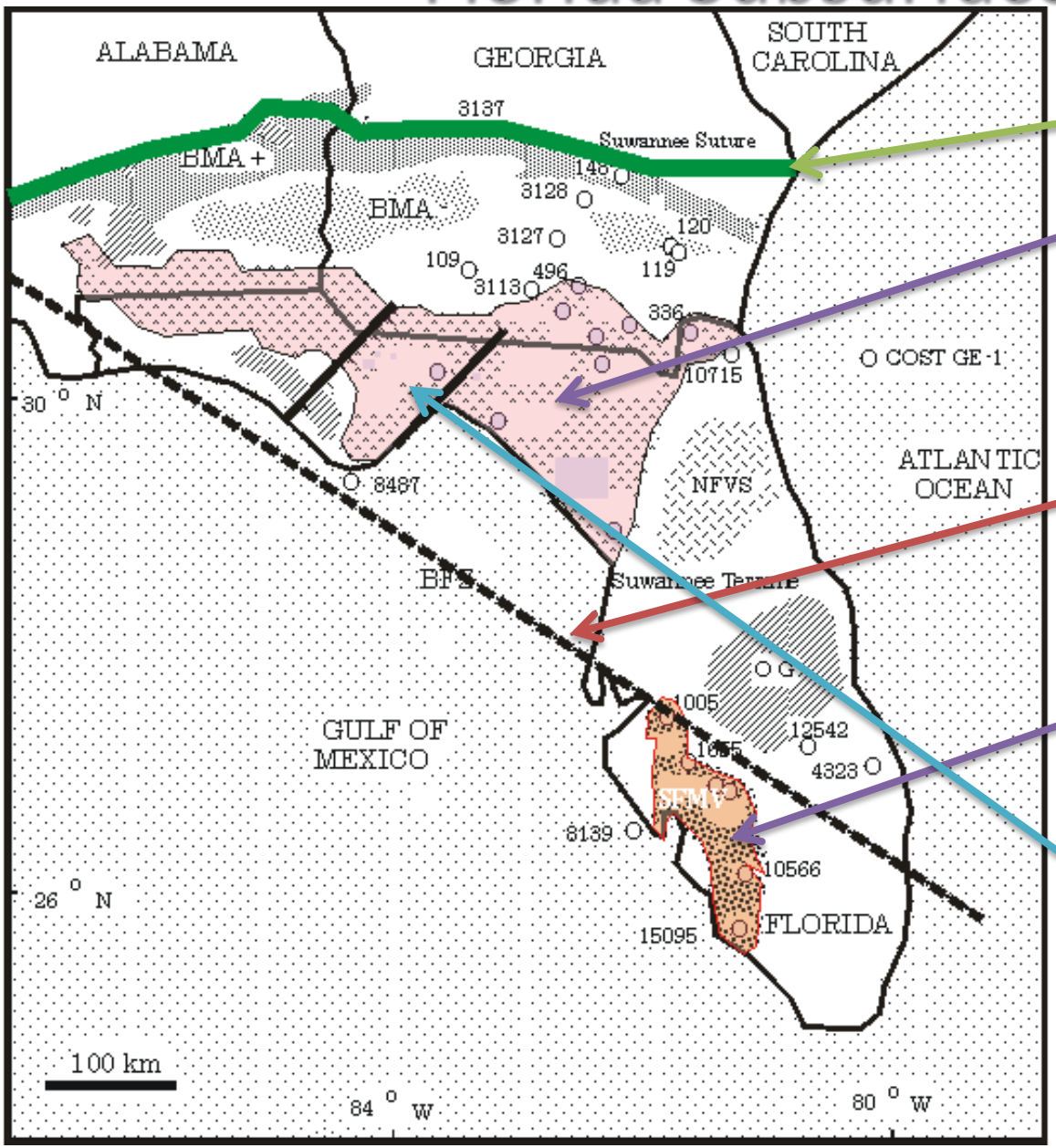
RIFT BASIN



The Rift Process



Florida Subsurface Rift Facies



Suwannee Suture

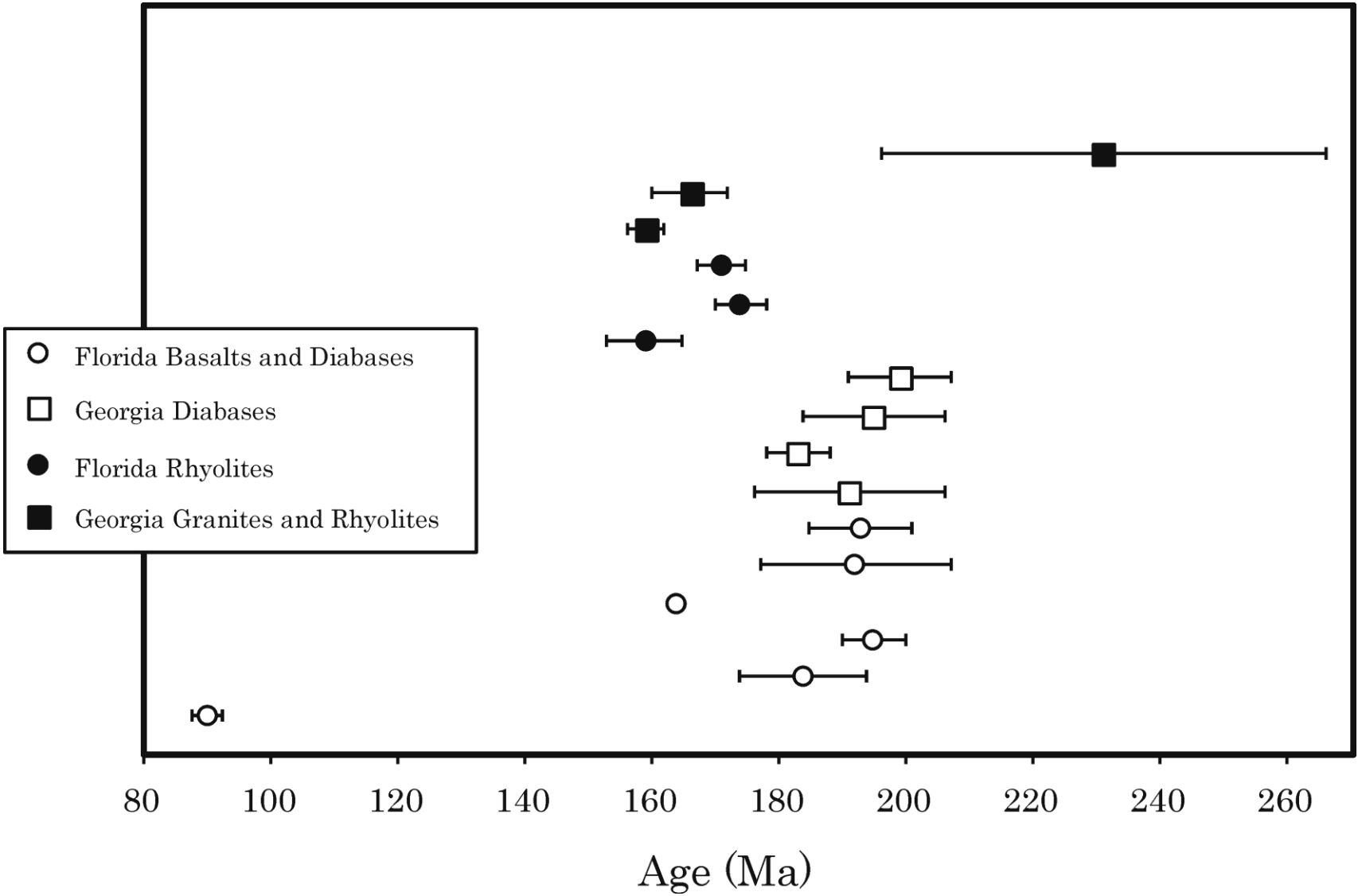
North Florida Tholeiites

Bahama Fracture Zone

South Florida Volcanics

Tallahassee Graben

Age Range of Rift Rocks

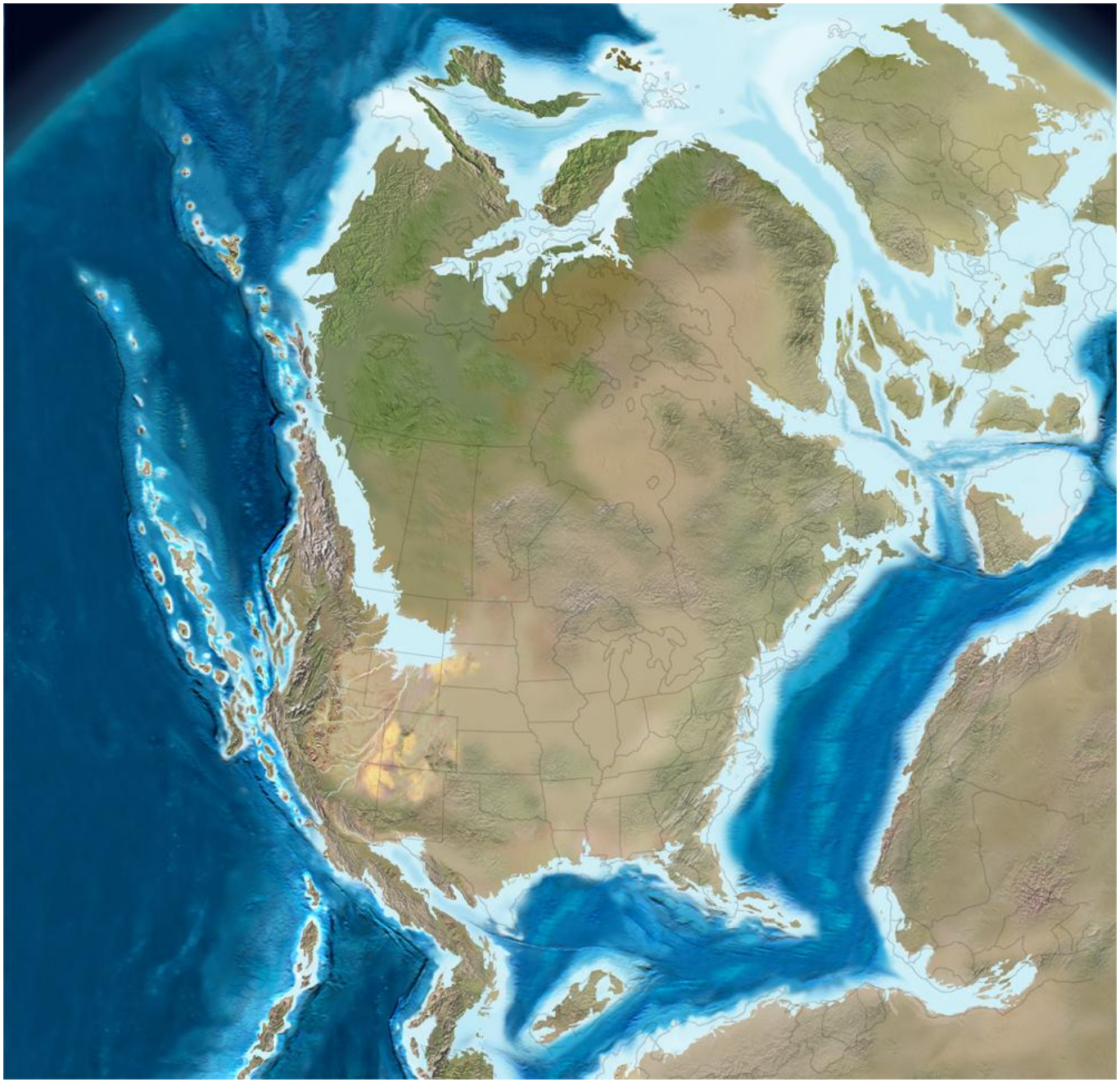


Age Ranges of Igneous Rocks

Groupings between 160-200 Ma.

Correlate well to latter stages of the CAMP event which started around 198 Ma

Summary: Florida was part of Gondwana either South America or West Africa prior to Pangea



Late Jr

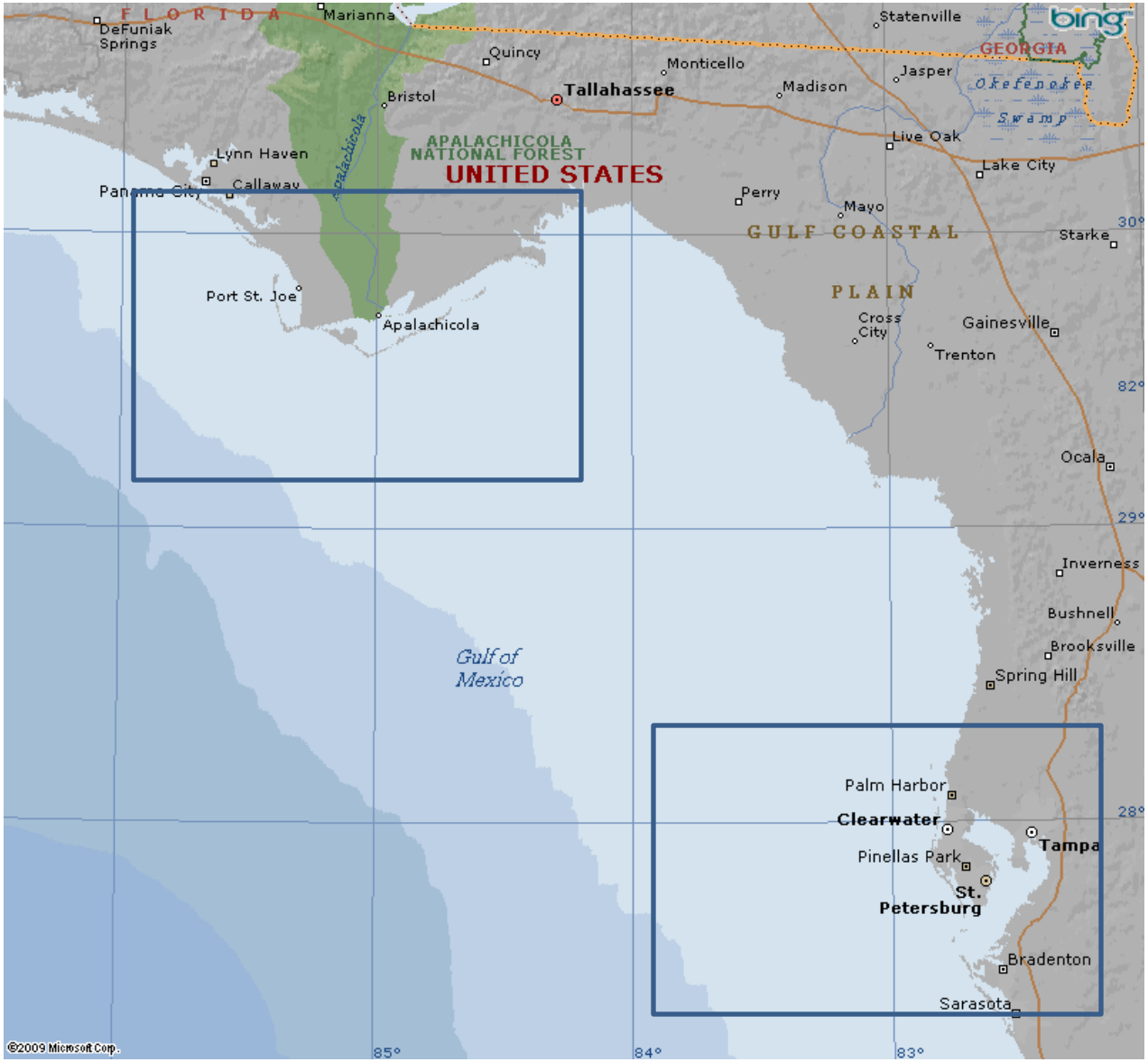
Post-Rift Sedimentary Rocks of Florida

Rifting (and associated uplift) tends to initiate with the deposition of clastic sedimentary rocks (like conglomerates).

Jurassic and Triassic clastic sedimentary rocks are found in Florida though their exact age is difficult to estimate (~235-172 Ma?).

During the drift phase and the opening of the Gulf of Mexico, carbonate and evaporitic facies were formed during the Late Jurassic and Early Cretaceous (beginning about 166 Ma).

The Apalachicola Basin and Tampa embayment contain the thickest sequences of *Louann Salt* (166-161 Ma)


FLORIDA
Marianna
DeFuniak Springs
Quincy
Monticello
Tallahassee
Madison
Statenville
GEORGIA
Jasper
Okefenokee Swamp
Bristol
Live Oak
Lake City
Lynn Haven
Callaway
Panama City
APALACHICOLA NATIONAL FOREST
UNITED STATES
Perry
Mayo
GULF COASTAL PLAIN
Starke
30°
Port St. Joe
Apalachicola
Cross City
Gainesville
Trenton
82°
Ocala
29°
Inverness
Bushnell
Brooksville
Spring Hill
Gulf of Mexico
Palm Harbor
Clearwater
Tampa
Pinellas Park
St. Petersburg
28°
Bradenton
Sarasota
©2009 Microsoft Corp.
85°
84°
83°

Post-Rift Sedimentary Rocks (Jr-Early Cretaceous

Evaporite deposition was replaced by clastic, fluvial, eolian and marine sediments in the northern/western parts of the platform (Norphlet sandstone)

Sea-level rise resulted in deposition of the Jurassic Smackover limestone (~ 160 Ma)

Sea level fluctuations during the early Cretaceous caused alternating fluvial clastic, deltaic and carbonate sedimentation throughout the platform.

These units play an important role in oil/gas resources in the Gulf Coast (more later in Florida economic geology).

Early K (120 Ma)

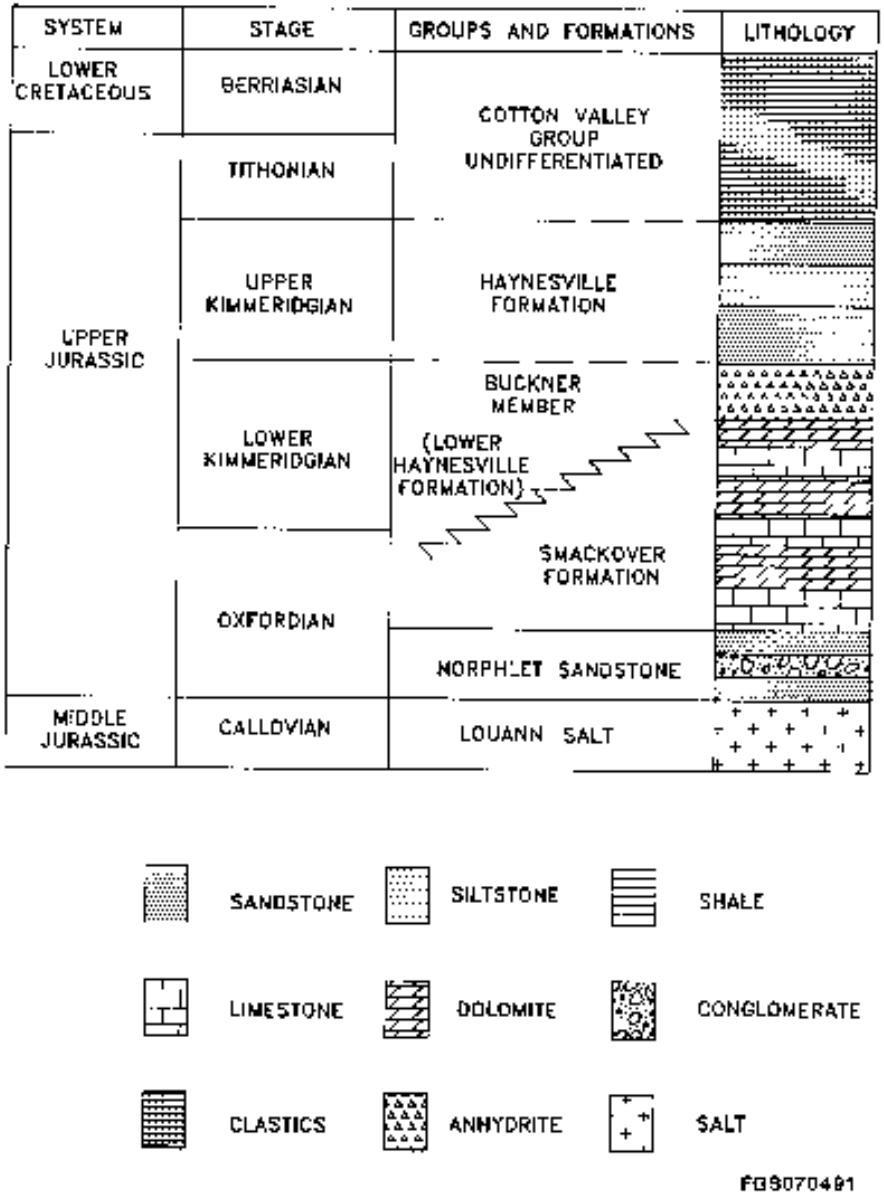


Figure 27b. Generalized stratigraphic column for north Florida, Middle Jurassic to Lower Cretaceous. Oil production is from intervals in the Smackover Formation and the Norphlet Sandstone, (after Lloyd, 1993).

Late K (85 Ma)

Geophysics of Florida

Earthquake History of Florida

Tectonic deformation of Florida (easy)

Isostatic Uplift of Florida

Earthquake History

-Generally a seismically stable region of the country.

-Earthquakes are reported from time to time, but most have other causes (jet planes, sinkhole collapse, explosions).

-The total number of historical (and possibly tectonic) earthquakes is only 5

13 Jan 1879- Felt throughout North Florida and Georgia---unknown epicenter

14 Nov 1935- Palatka, Florida

22 December 1945- Offshore Miami

27 October 1973- Merritt Island

4 December 1975- Daytona

Earthquake History

Florida was not instrumented until ~1975 when station GAI was built inside Turlington Hall.

Since 1975 no confirmed earthquakes have occurred in Florida

We do record touchdowns, interceptions and generally positive football events in the fall!

Potential for Earthquake activity is real because of the pre-existing zones of weakness, but large events unlikely.

Tsunami- The potential for significant tsunami damage to Florida is very real

Tsunami

What is a Tsunami and how do they form?

What is the risk in Florida?

Tsunami-Big Wave

Uplift (or drop) of a piece of ocean crust sets up a long wavelength disturbance

Normal ocean wavelengths are ~100 m. Tsunami wavelengths are measured in 10's to 100's of kilometers

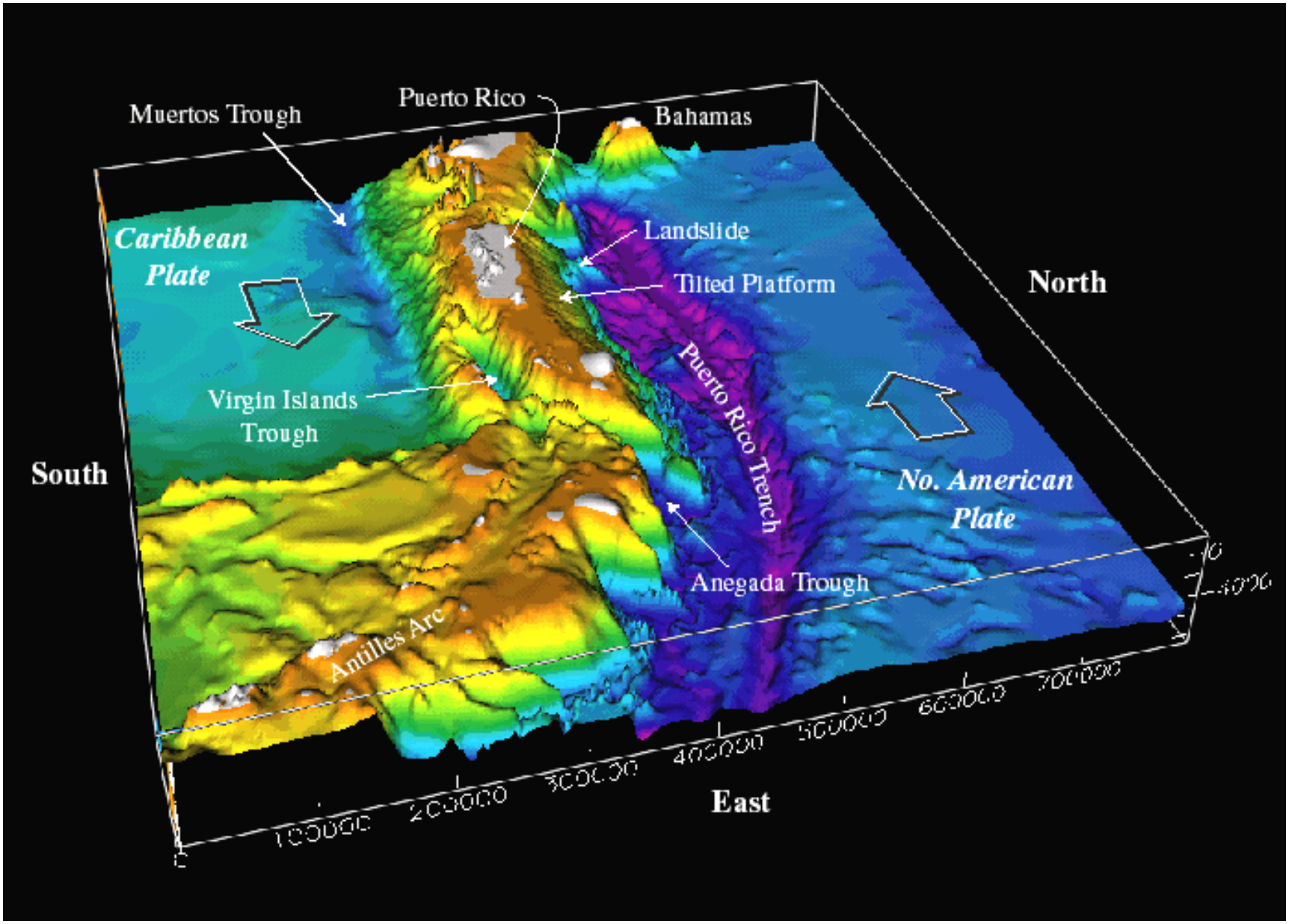
In the open ocean, a tsunami may pass beneath you without notice

As the front part of the wave approaches the shore line, it begins to slow. The 'back' part of the wave continues to rush forward at hundreds of kilometers per hour.

This causes the wave height to increase and the momentum of the back part of the wave causes a tremendous surge inland.


Orlando
Tampa
Florida
Sarasota
Cape Coral
Naples
Miami
H
E
B
The Bahamas
La Habana
Pinar L Rio
Santa Clara
Cienfuegos
Morón
Trinidad
Cuba
Camaguey
Holguin
Las Tunas
Bayamo
Santiago de Cuba
Cayman Islands
Jamaica
Turks and Caicos Islands
Cap-Haitien
Haiti
Dominican Republic
Bavaro
Port-au-Prince
G
Puerto Rico
British Virgin islands
Virgin Islands
Anguilla
Antigua and Barbuda
Montserrat
Guadeloupe
Dominica
Martinique
St. Lucia
I
Atlantic Ocean

Florida Threat?

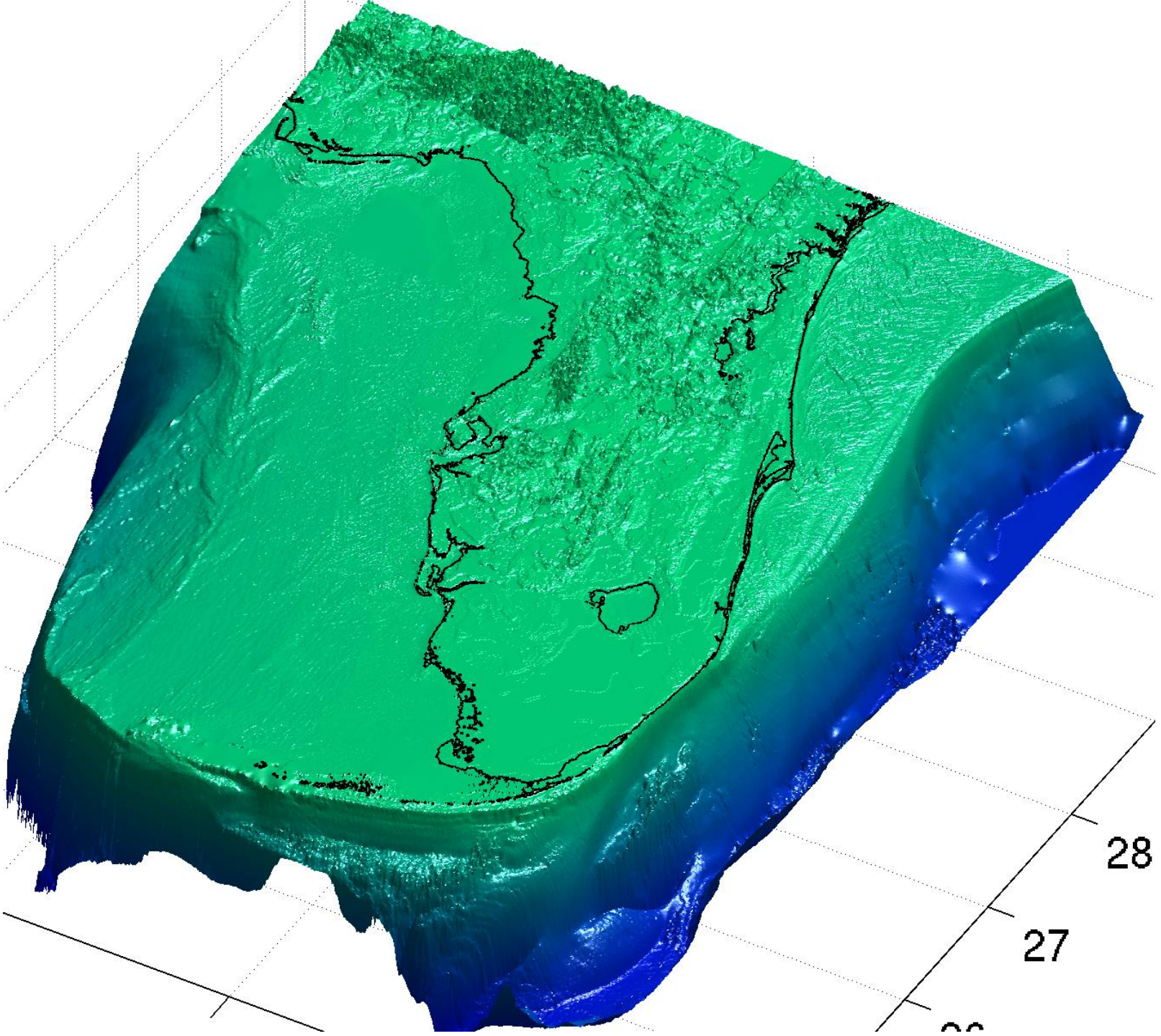


Florida Threat

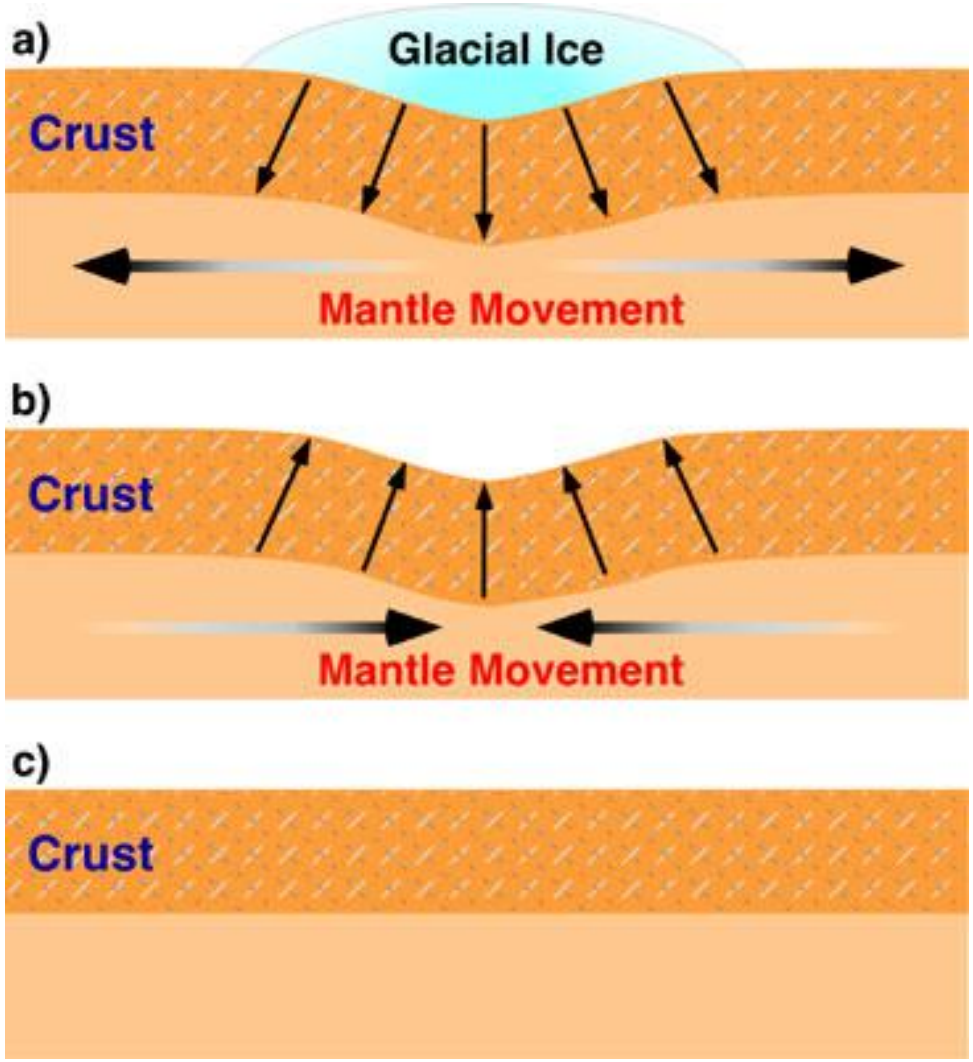
We are distant from the regions that have generated tsunami's, but……

We have large populated regions that are at, or near sea level and could be heavily damaged by a large tsunami.

There is currently NO warning system in place for the Florida coastline to protect us from a tsunami.


28
27

Uplift of Florida



Normal isostatic adjustments are due to sub-lithospheric erosion or glacial melting…..

Florida's uplift may be due to karst driven unloading!

Karstification

Dissolution of Carbonate on the Florida Platform likely has resulted in slow isostatic uplift of the Platform during the last 1.5 million years.

~50 m of uplift which corresponds to a rate of 0.04 mm/year of uplift due to dissolution