

MODIFICATION OF CRUST  
AND LITHOSPHERE  
BY  
CONTINENTAL RIFTING/BREAKUP  
AND BY  
TERRANE ACCRETION

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Geological Survey of Alabama

# GROWTH OF CONTINENTAL LITHOSPHERE

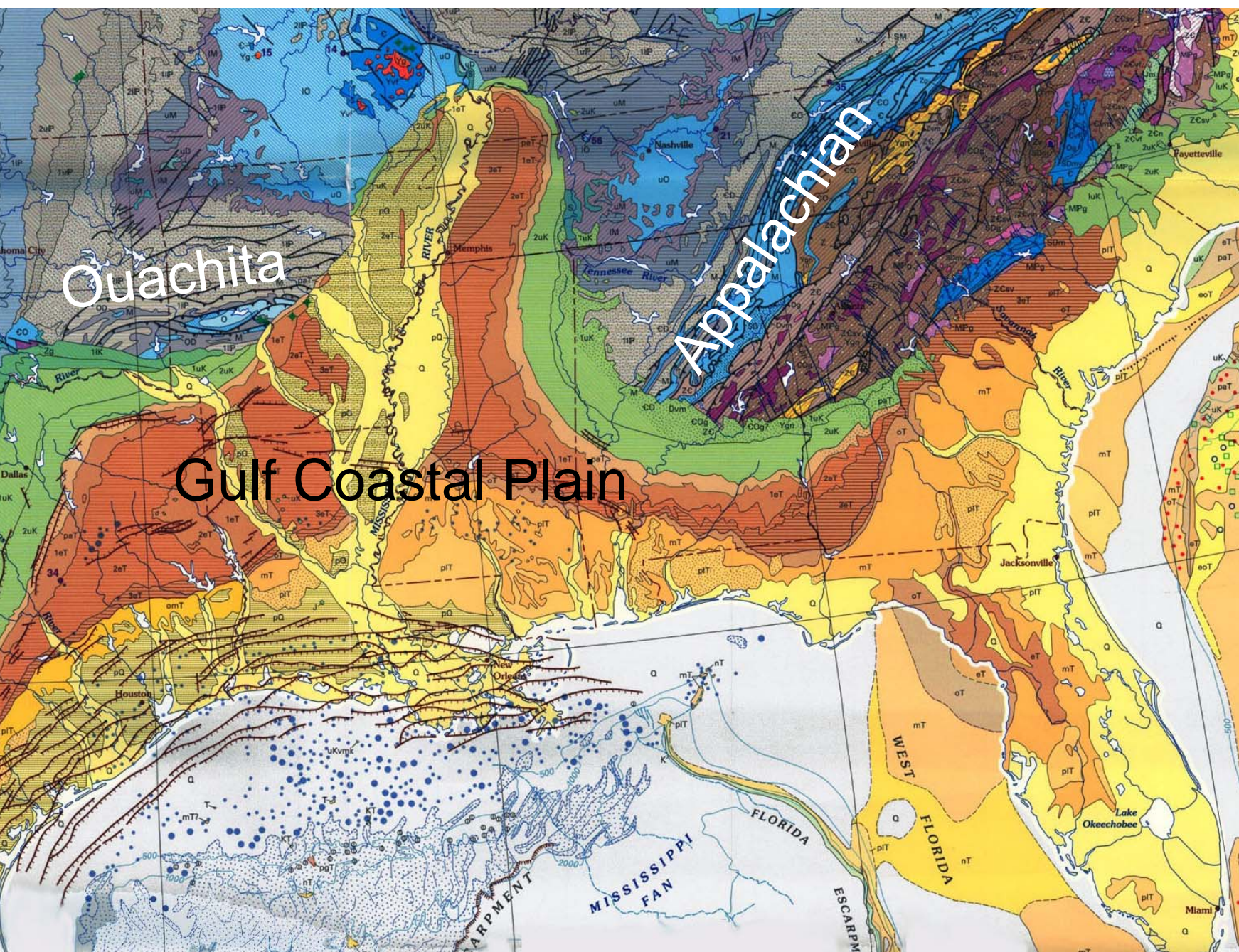
Accretion of continental  
crustal terranes

along the Iapetan rifted

southern margin of Laurentia

during assembly of Pangaea



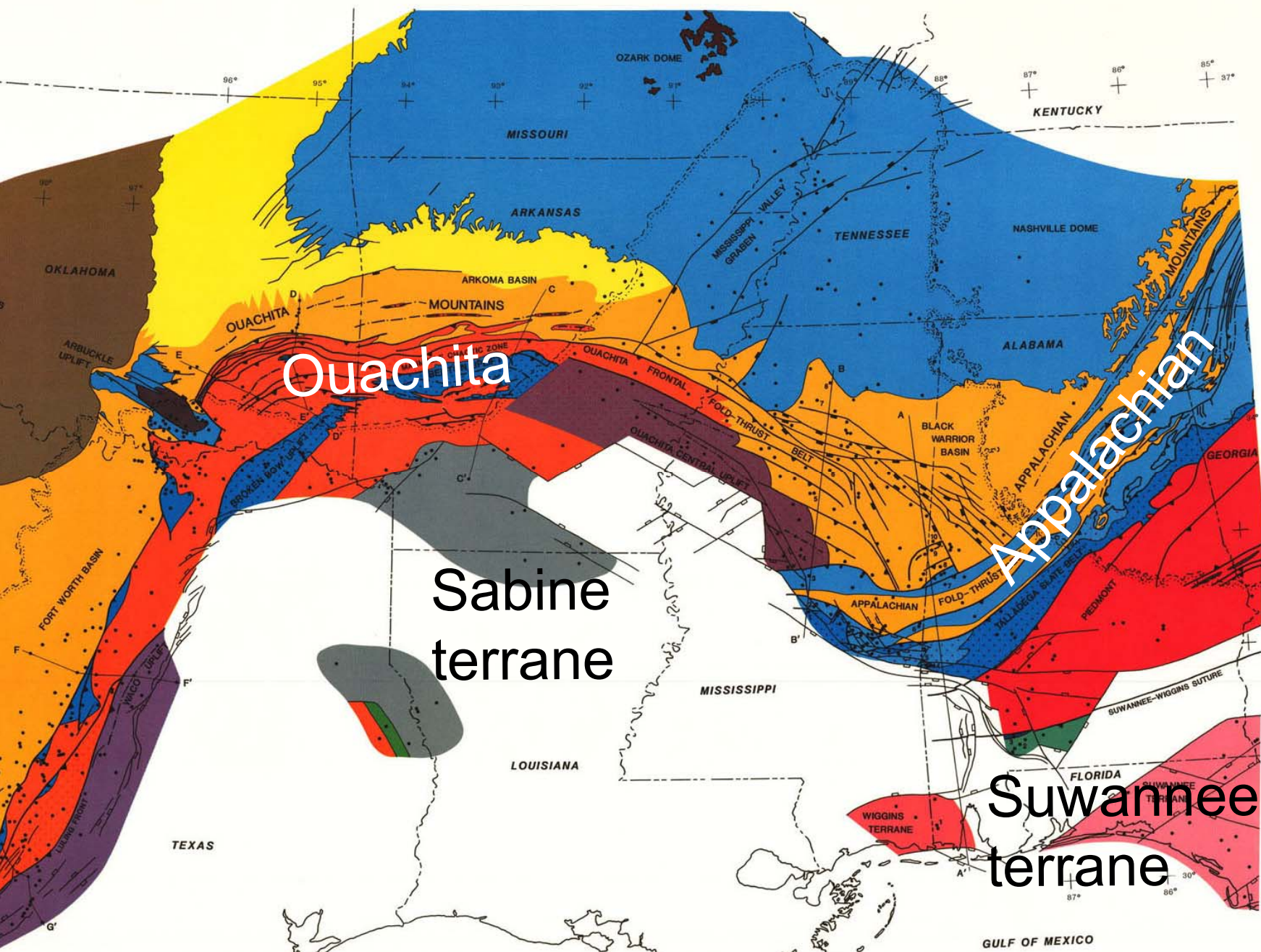


Ouachita

Appalachian

Gulf Coastal Plain



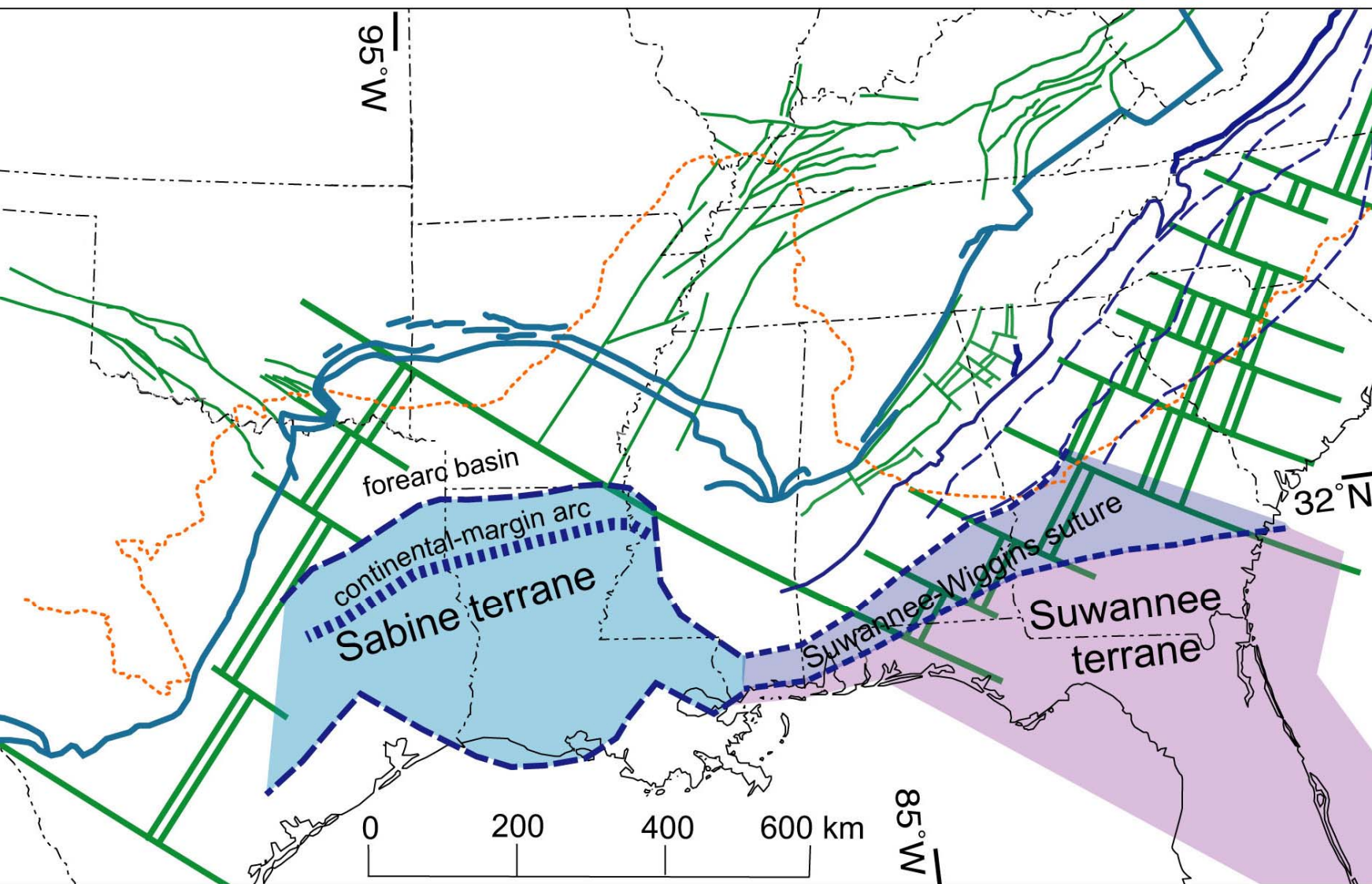


Ouachita

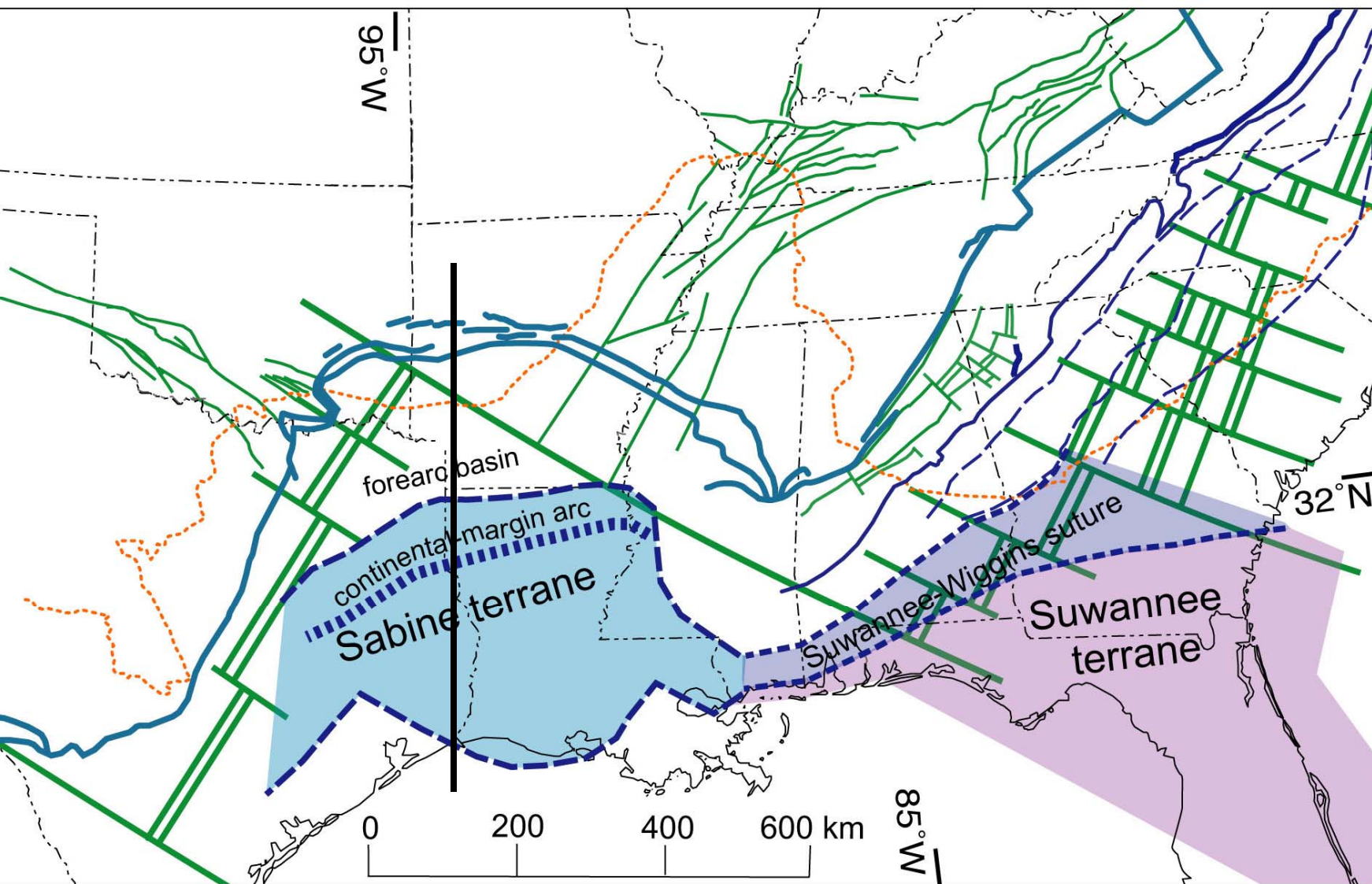
Sabine terrane

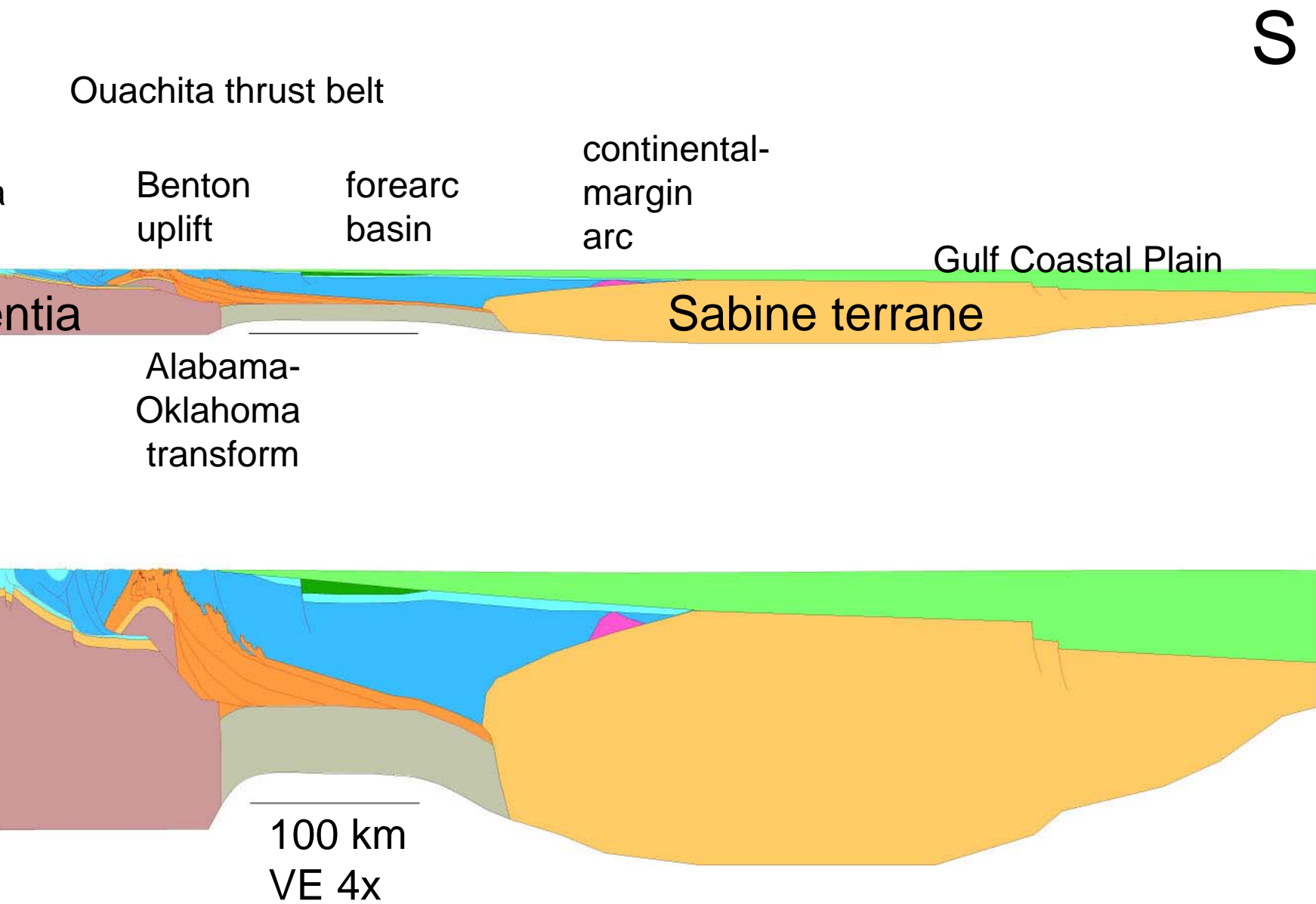
Appalachian

Suwannee terrane









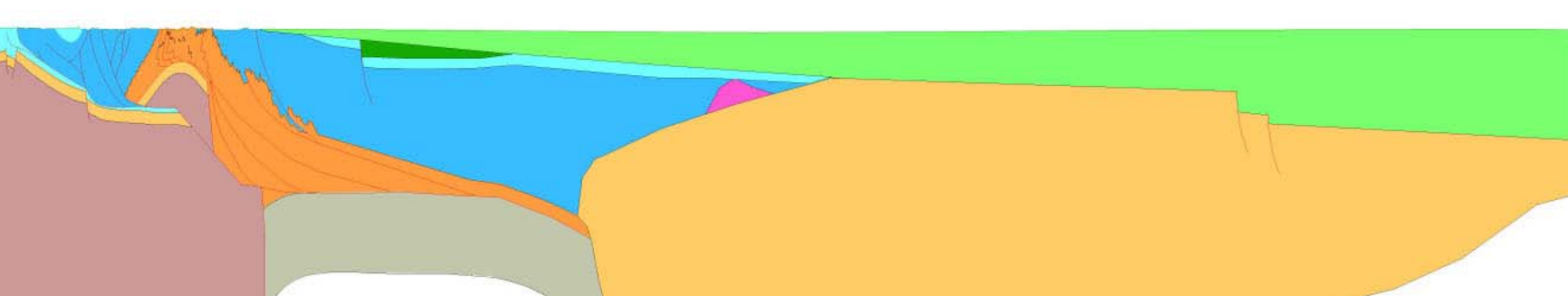
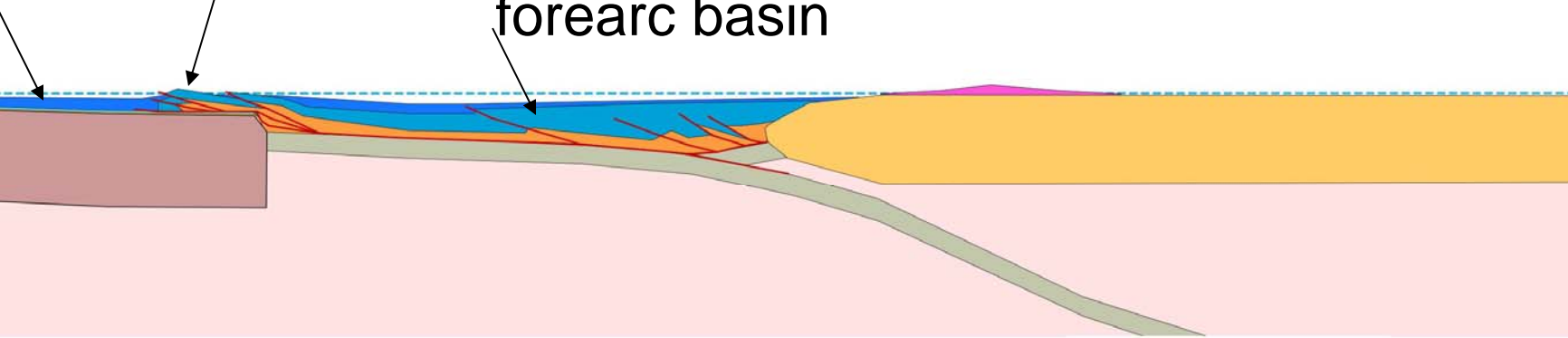
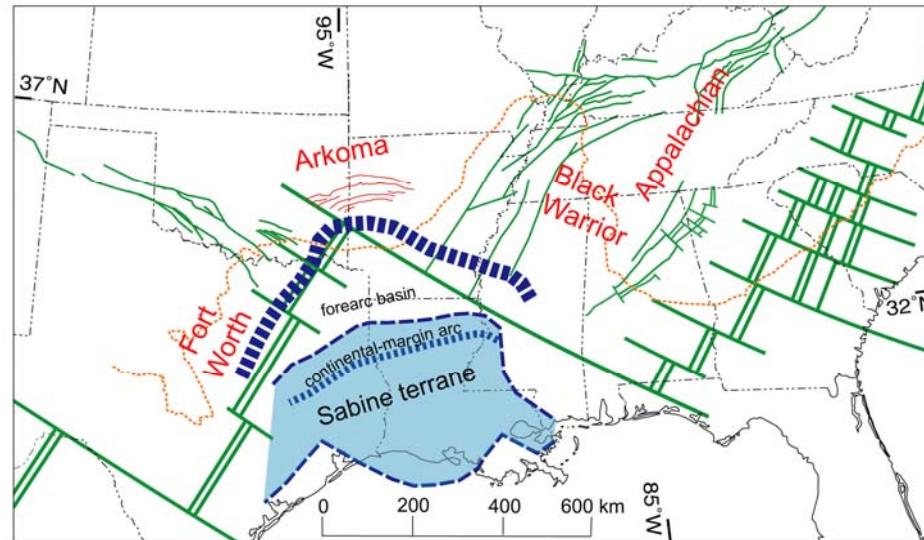
-309 Ma

Atoka Formation

land basin

accretionary prism

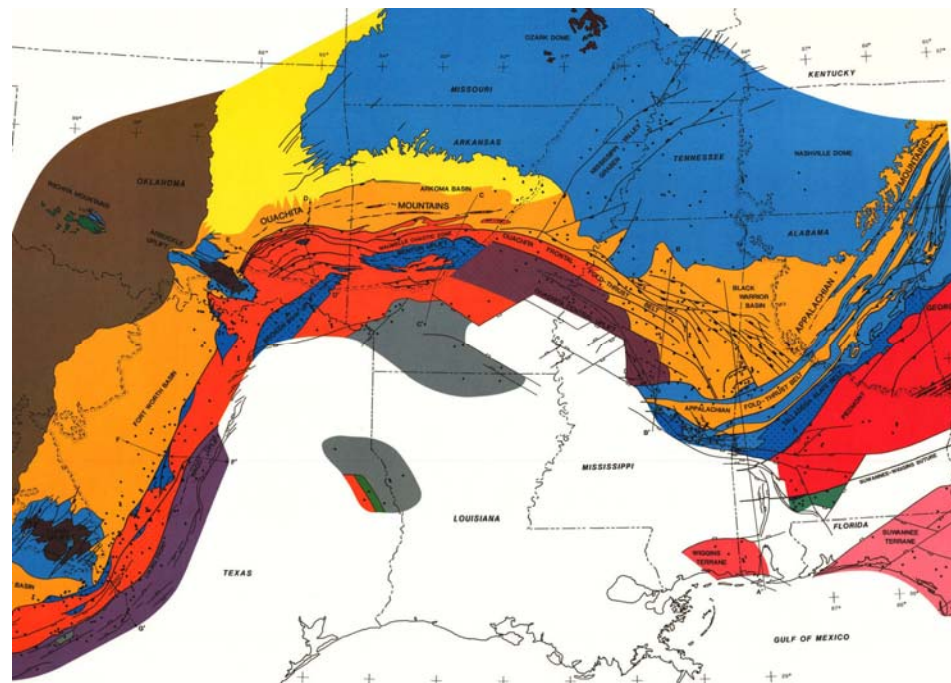
forearc basin





-260 Ma

Guadalupian  
Desmoinesian



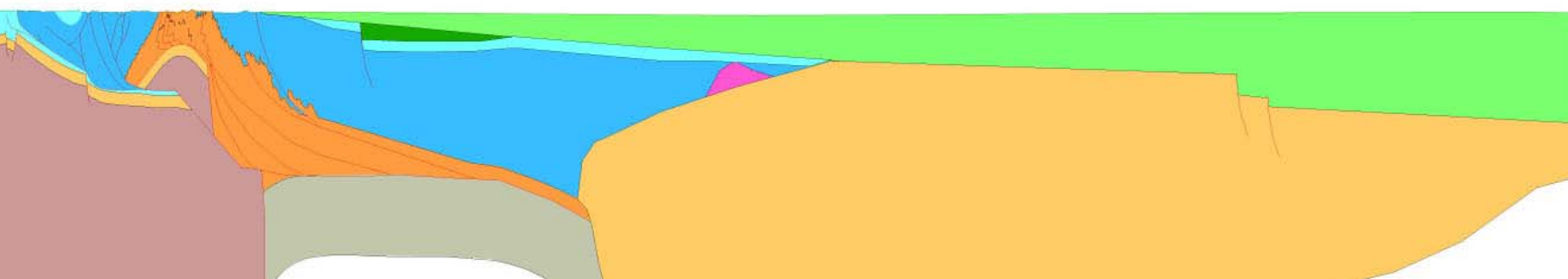
Ouachita  
thrust belt

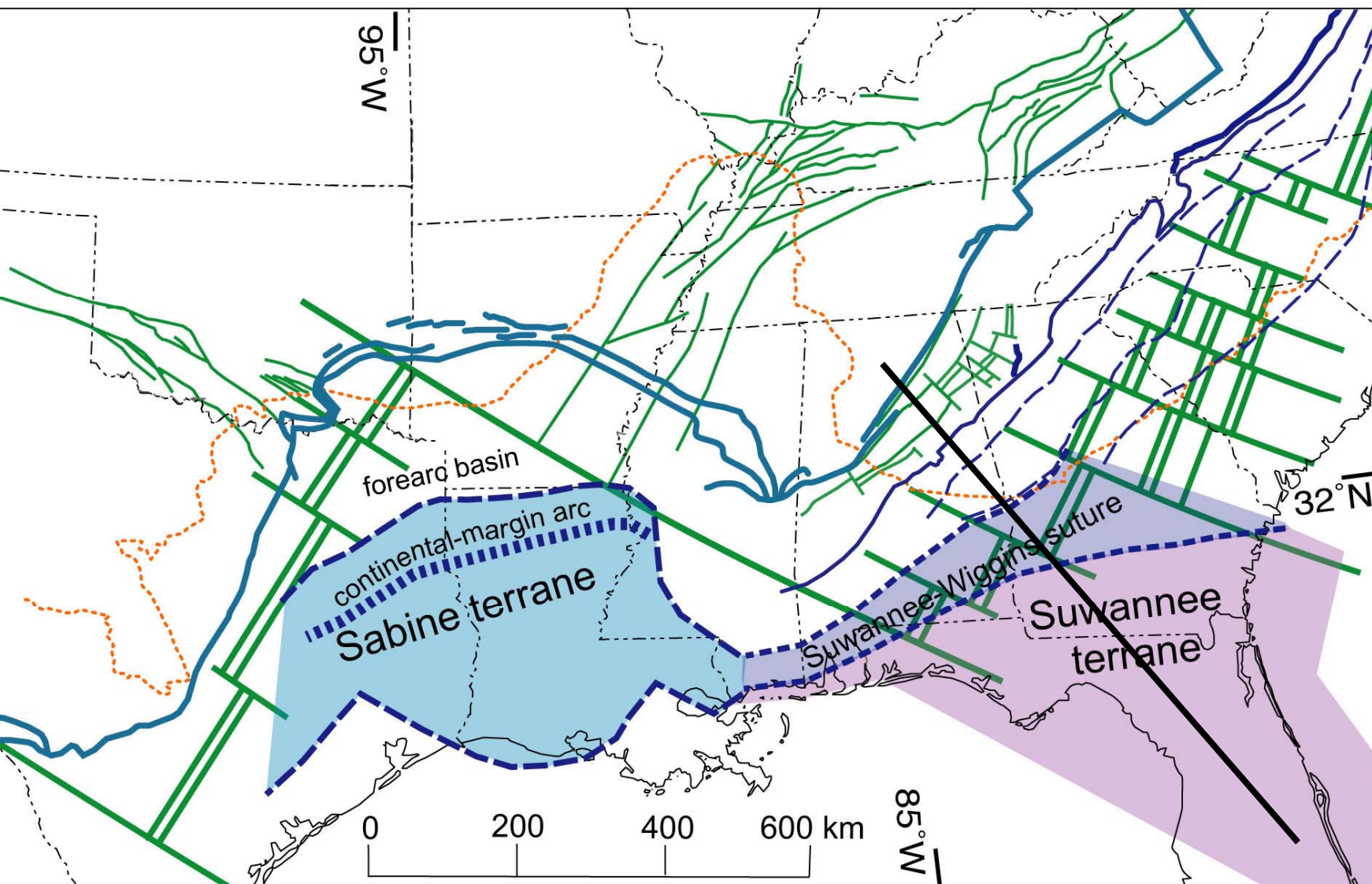
successor  
basin

na

entia

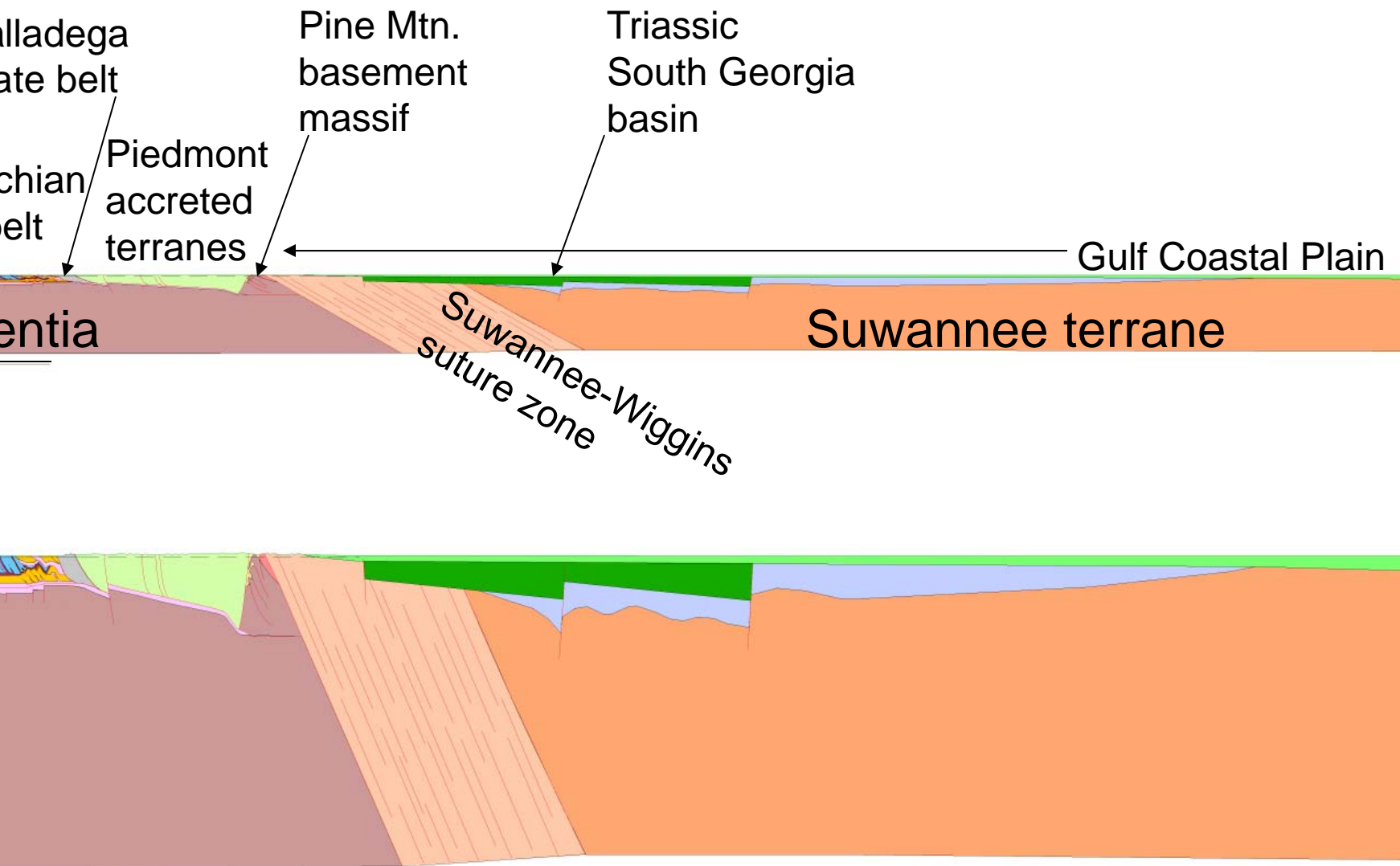
Sabine terrane







S



Alladega  
plate belt

Chian  
belt

Piedmont  
accreted  
terranes

Pine Mtn.  
basement  
massif

Triassic  
South Georgia  
basin

Gulf Coastal Plain

Crystalline  
basement

Suwannee-Wiggins  
suture zone

Suwannee terrane

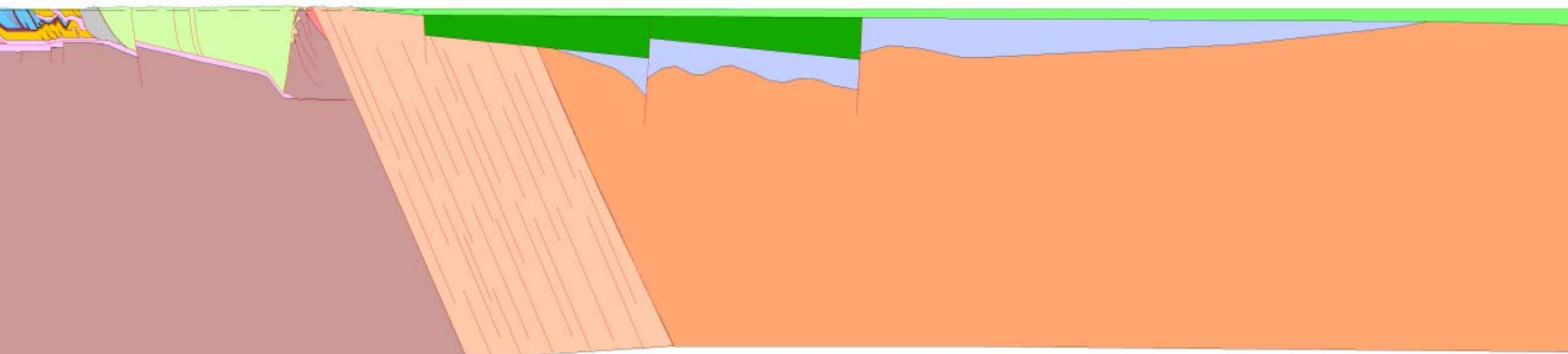
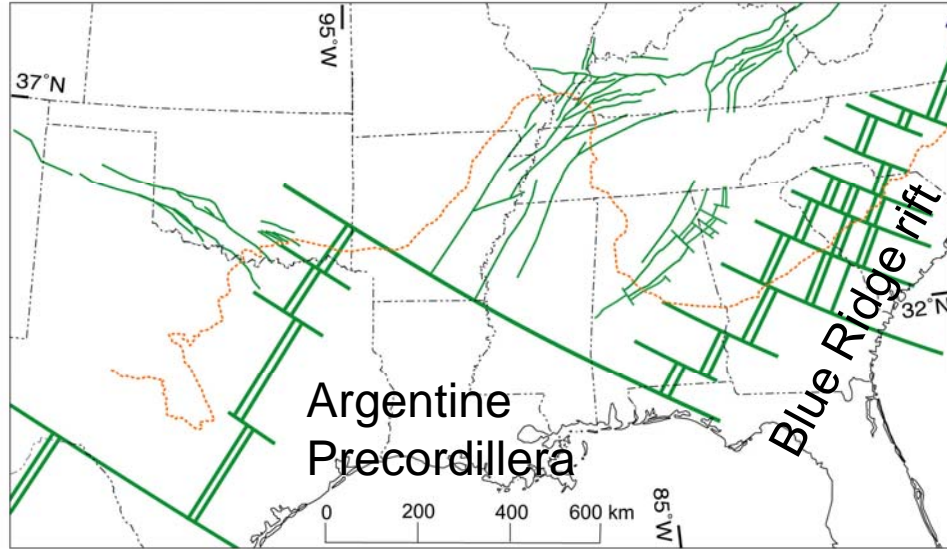
km

3/530 Ma

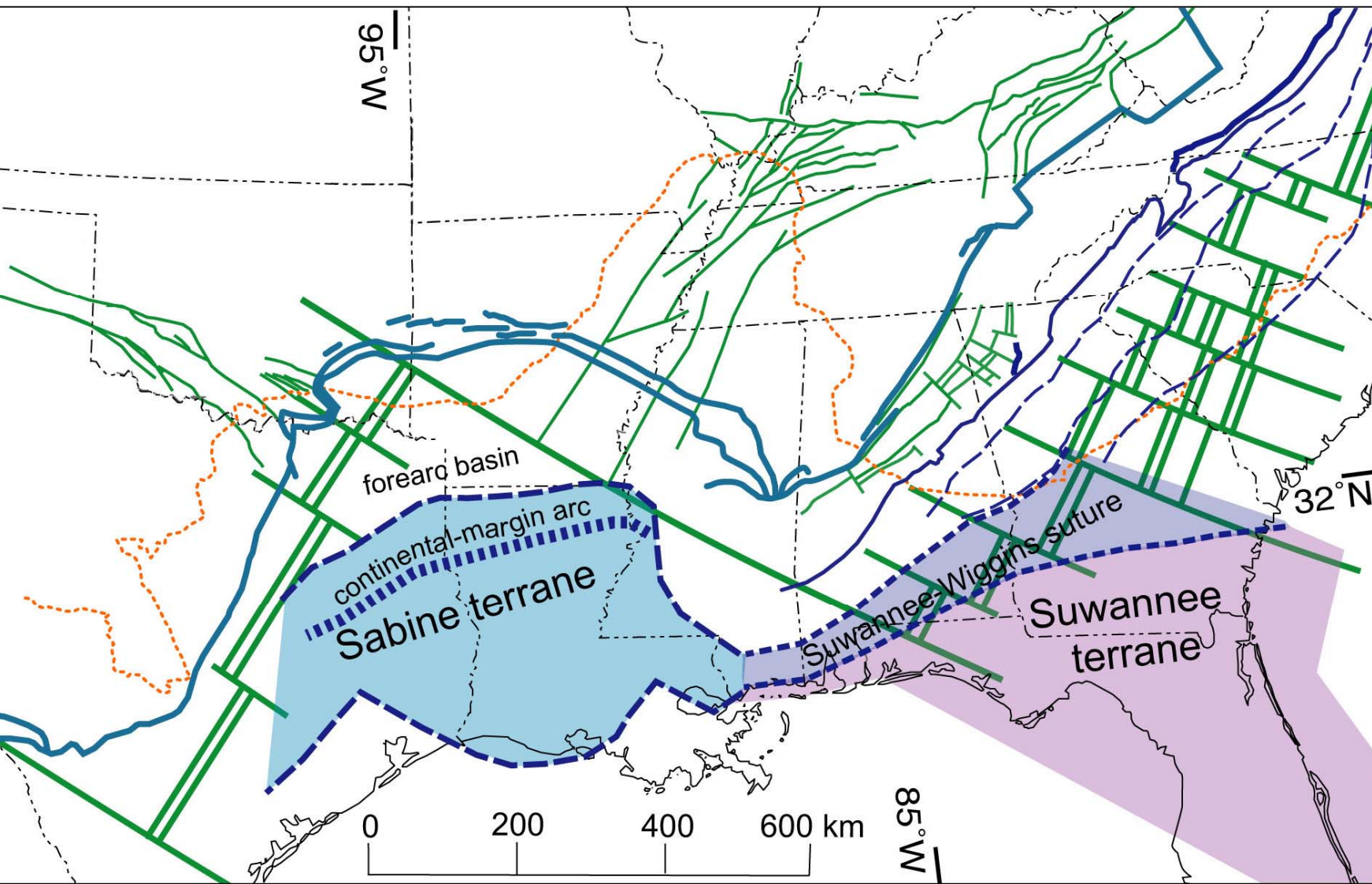
restored minimum  
of  
margin shelf

restored  
Talladega  
slate belt

restored  
Pine Mtn.  
basement  
massif

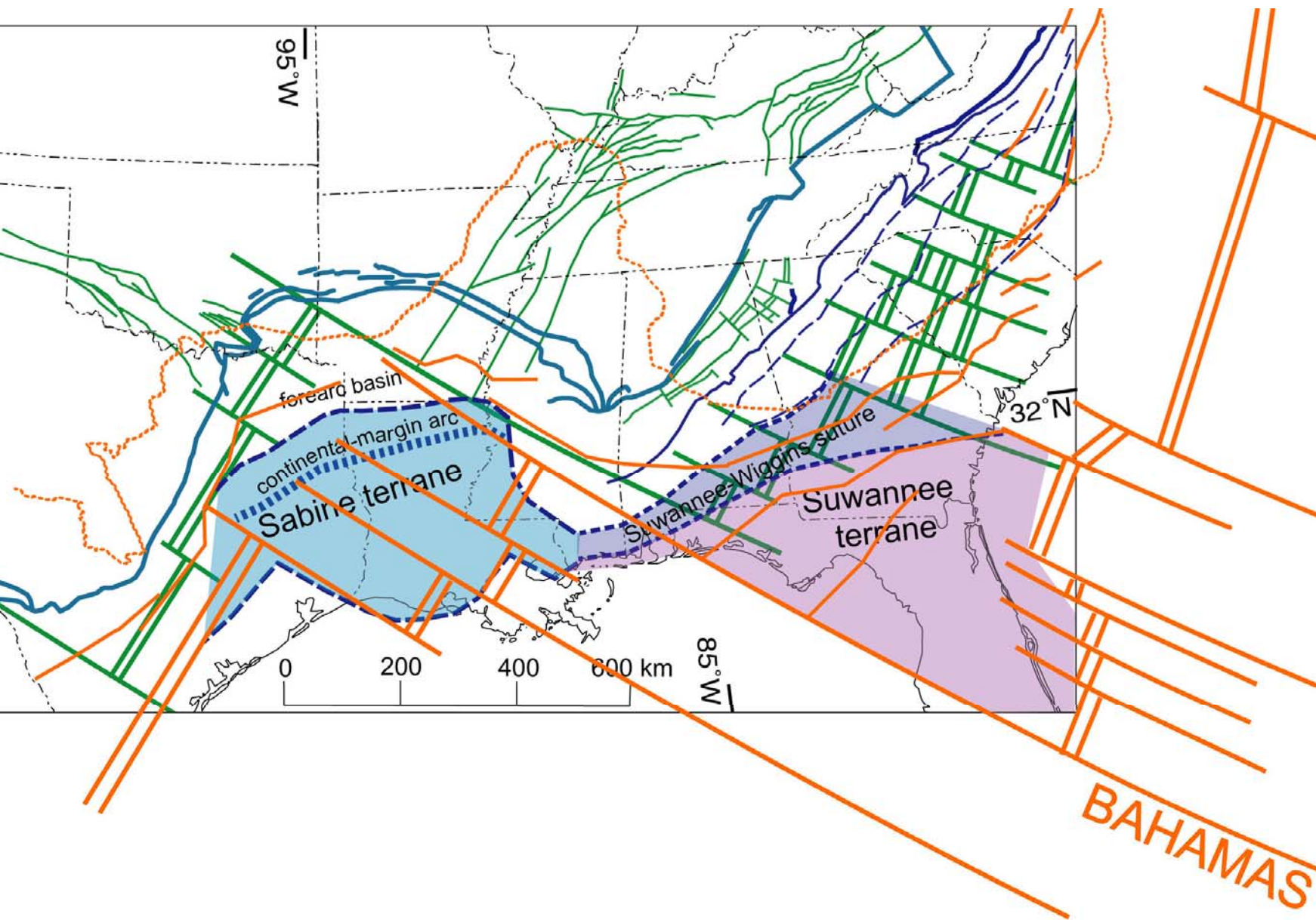






accretionary prism,  
arc-continent collision

continent-  
continent





# MODIFICATION OF CONTINENTAL LITHOSPHERE

through two Wilson cycles:

assembly of Rodinia

continental rifting and breakup of Rodinia,

and opening of Iapetus

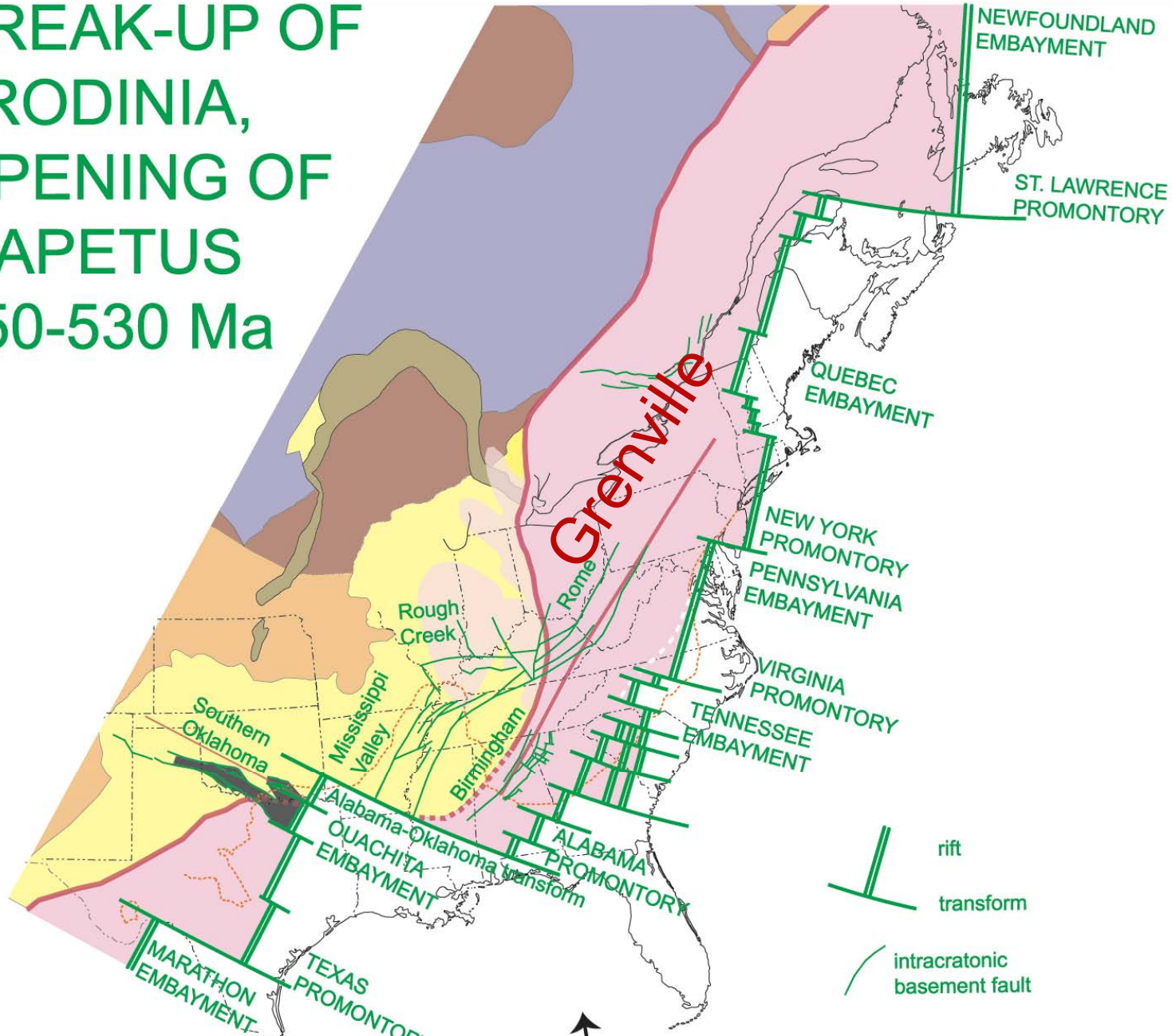
assembly of Pangaea, and

the Appalachian-Ouachita orogen




continental rifting and breakup of Pangaea,

and opening of the Atlantic Ocean


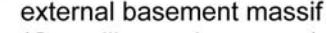

# BREAK-UP OF RODINIA, OPENING OF IAPETUS 750-530 Ma

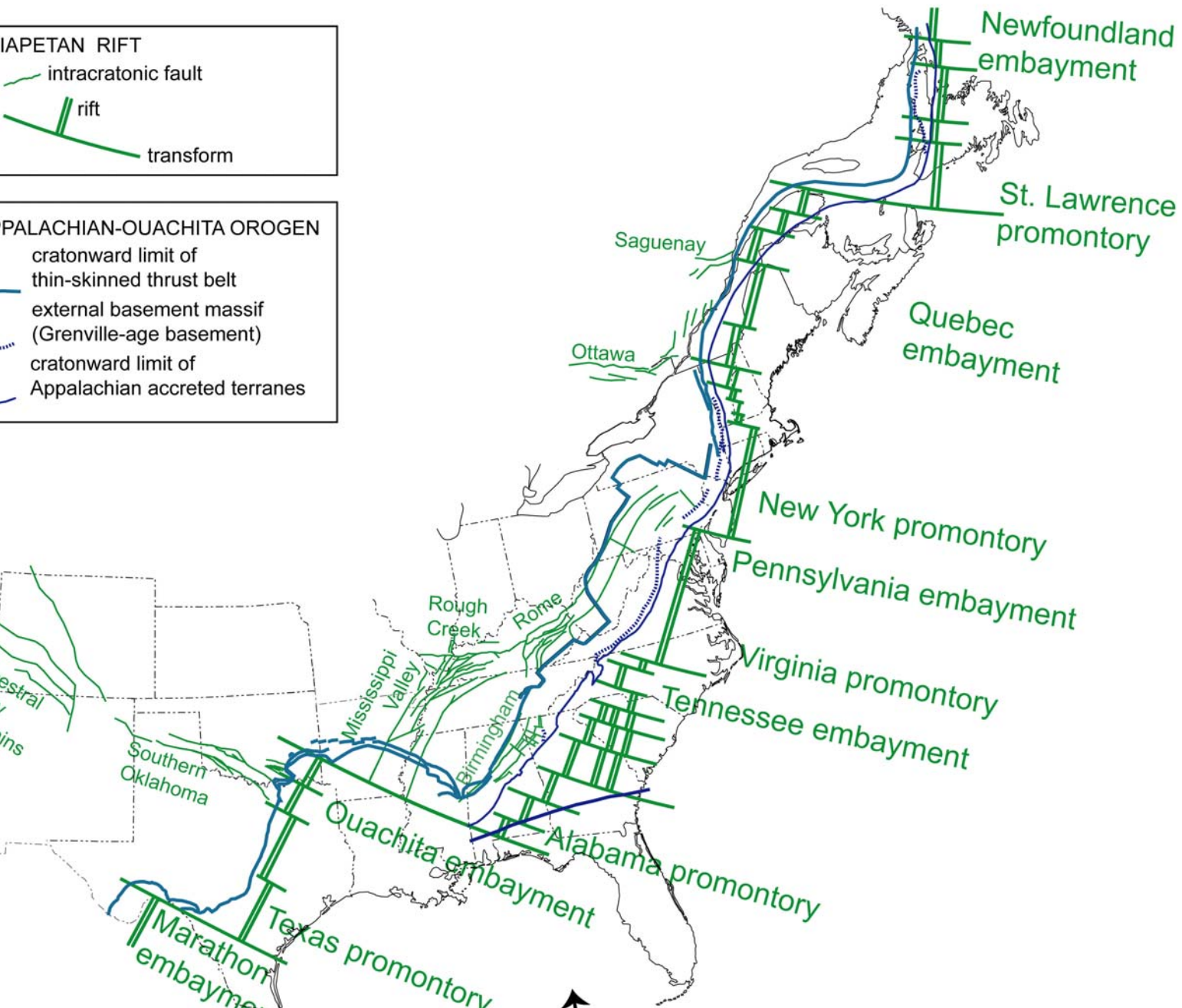


**IAPE TAN RIFT**

-  intracratonic fault
-  rift
-  transform

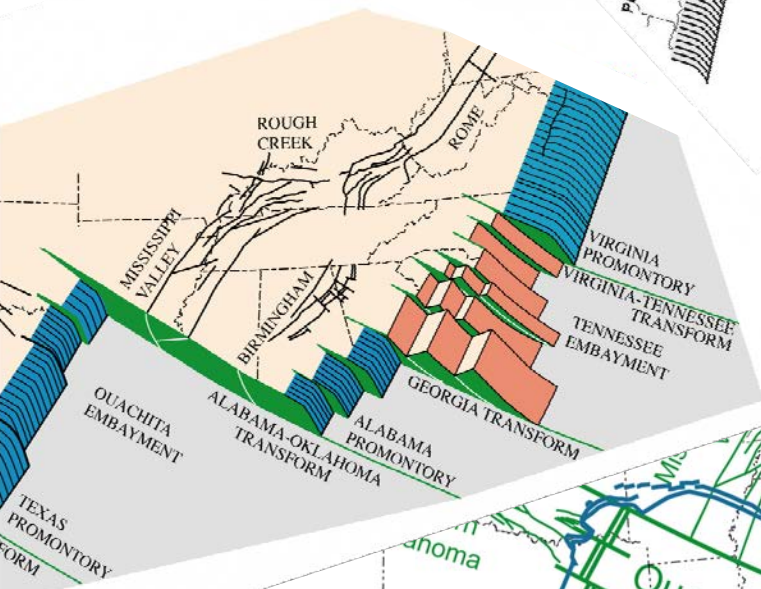
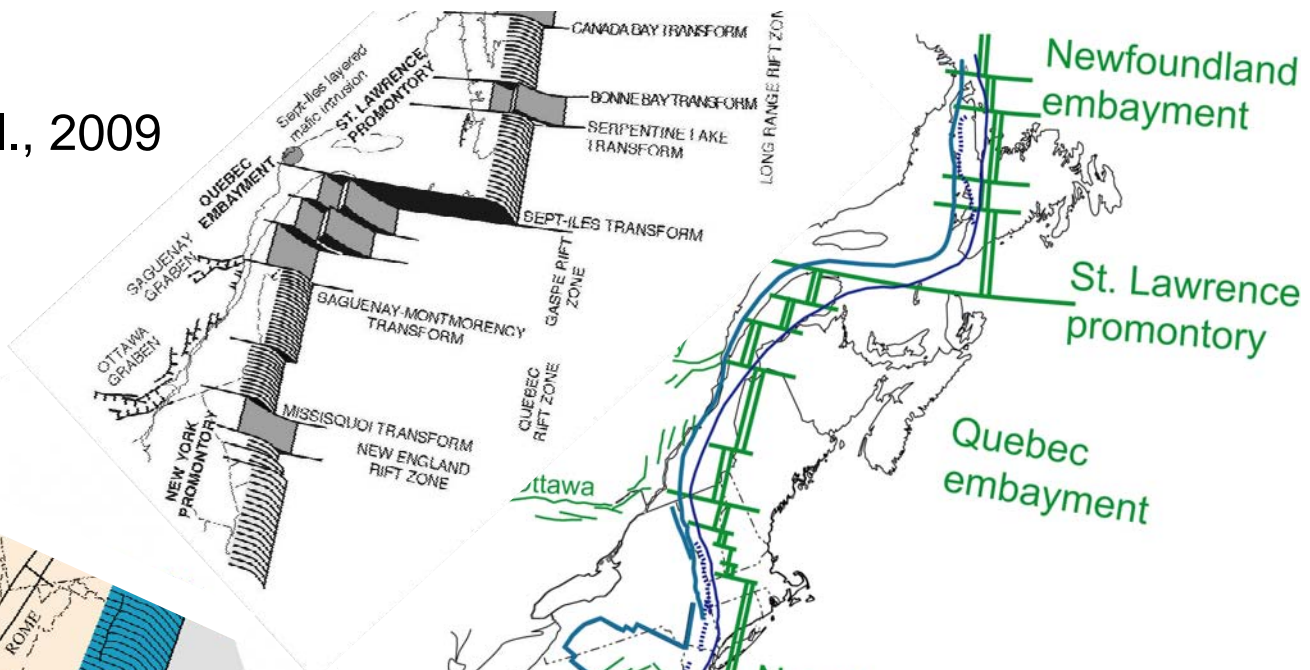
**PALACHIAN-OUACHITA OROGEN**

-  cratonward limit of thin-skinned thrust belt
-  external basement massif (Grenville-age basement)
-  cratonward limit of Appalachian accreted terranes

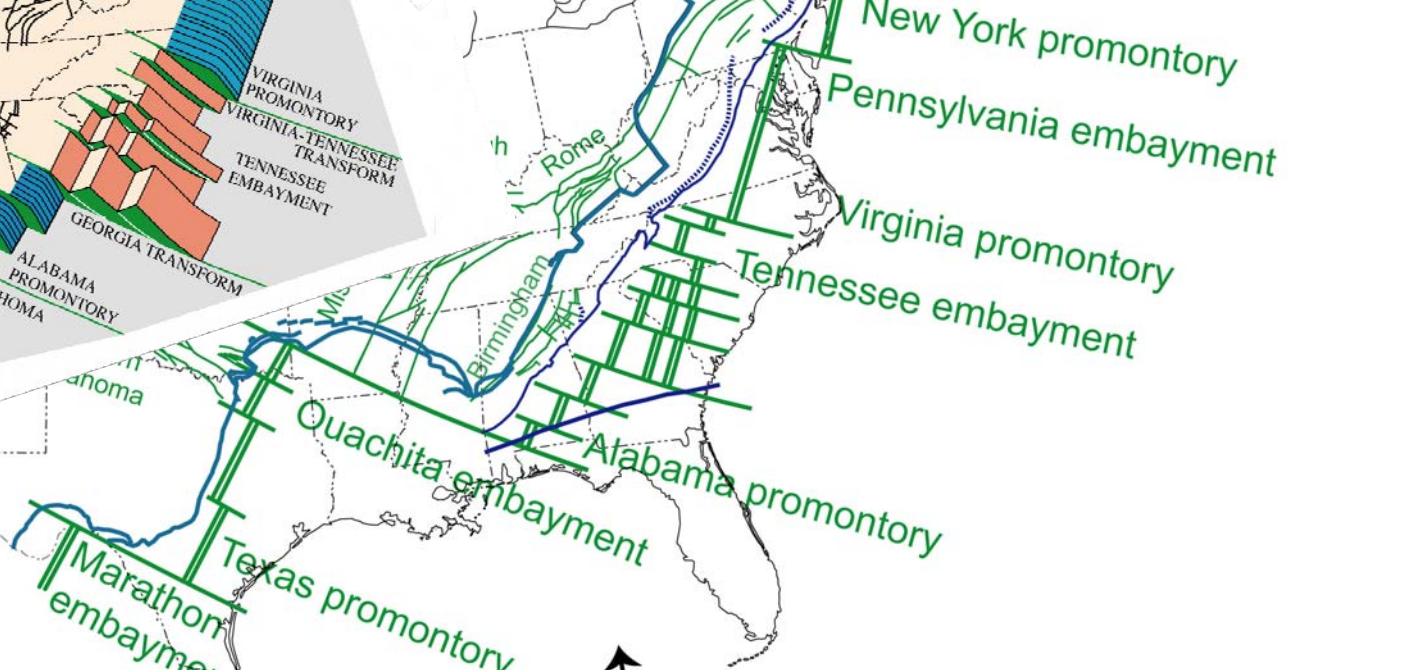


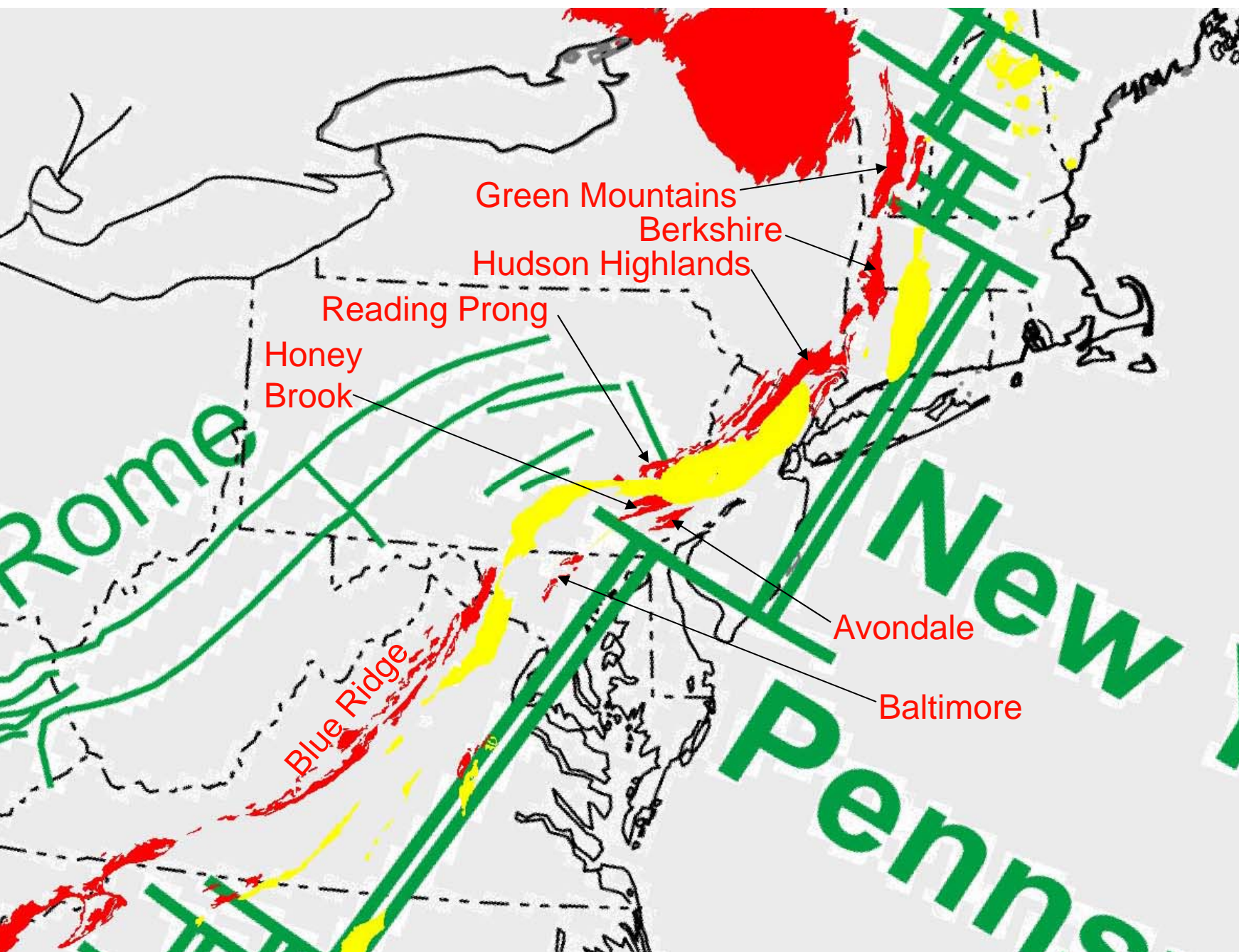


Allen et al., 2009

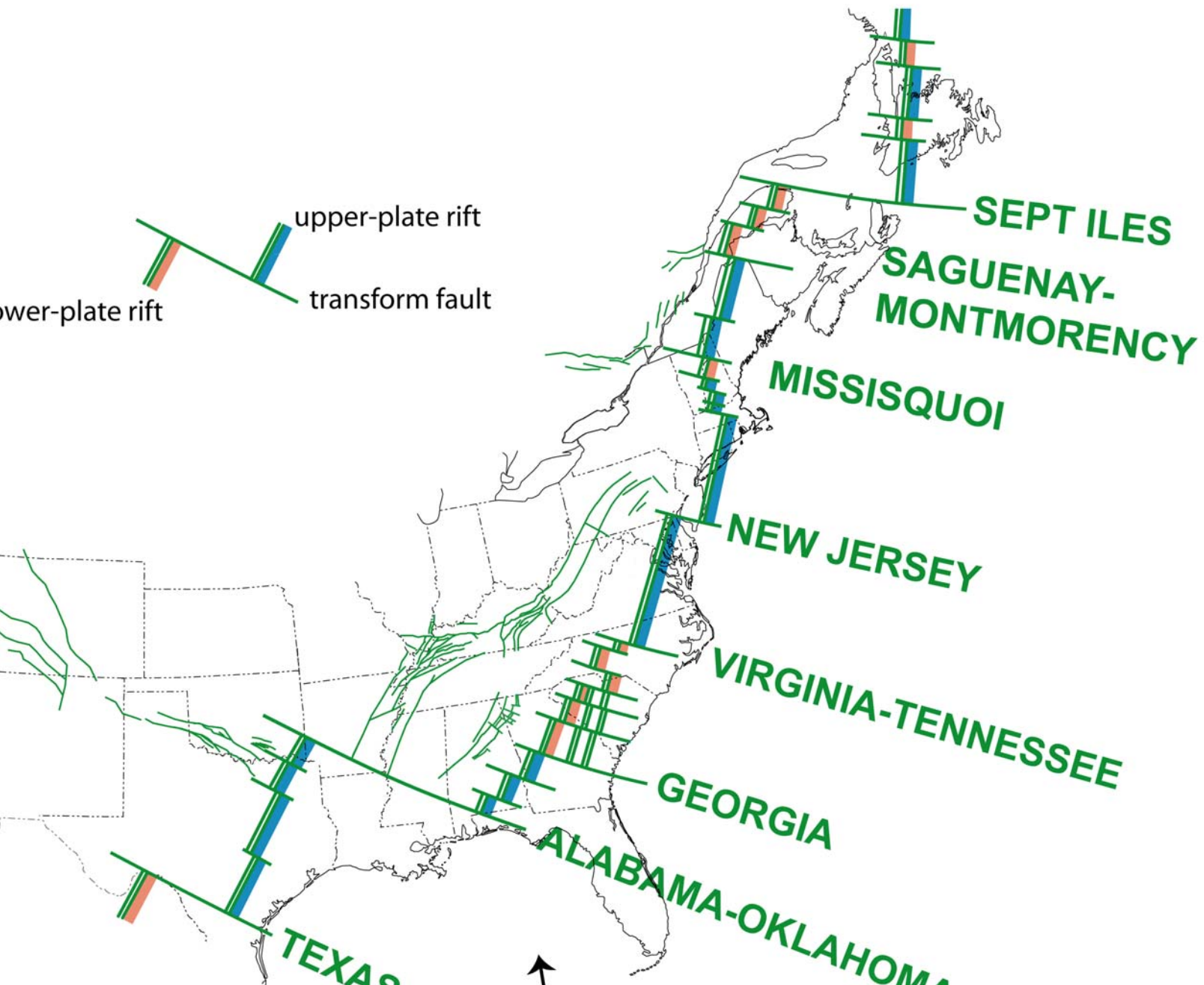


Thomas, 1993












RYNRIFT ROCKS

 sedimentary rift fill,  
anomalously thick (>2x regional)


 volcanic and intrusive rocks

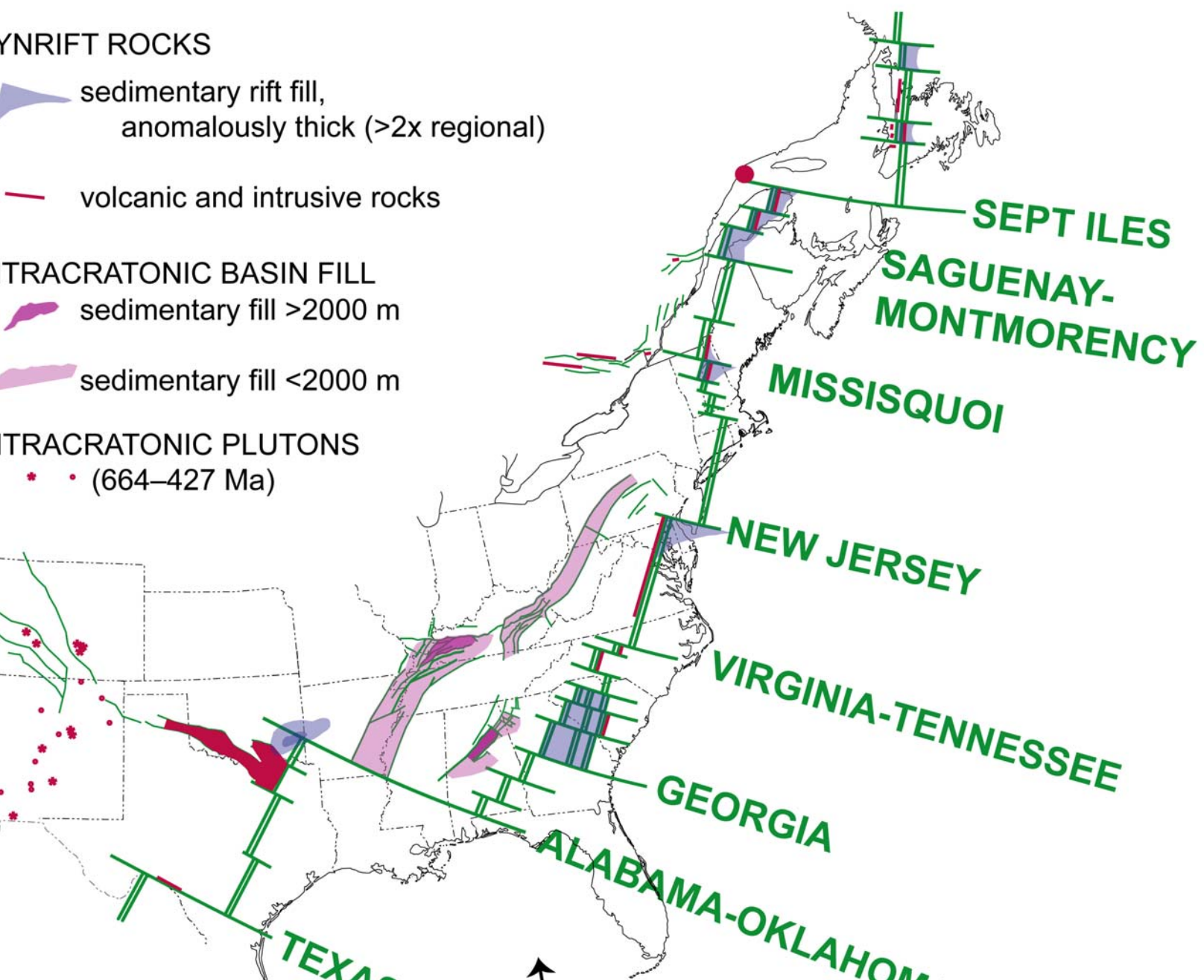
TRACRATONIC BASIN FILL

 sedimentary fill >2000 m

 sedimentary fill <2000 m

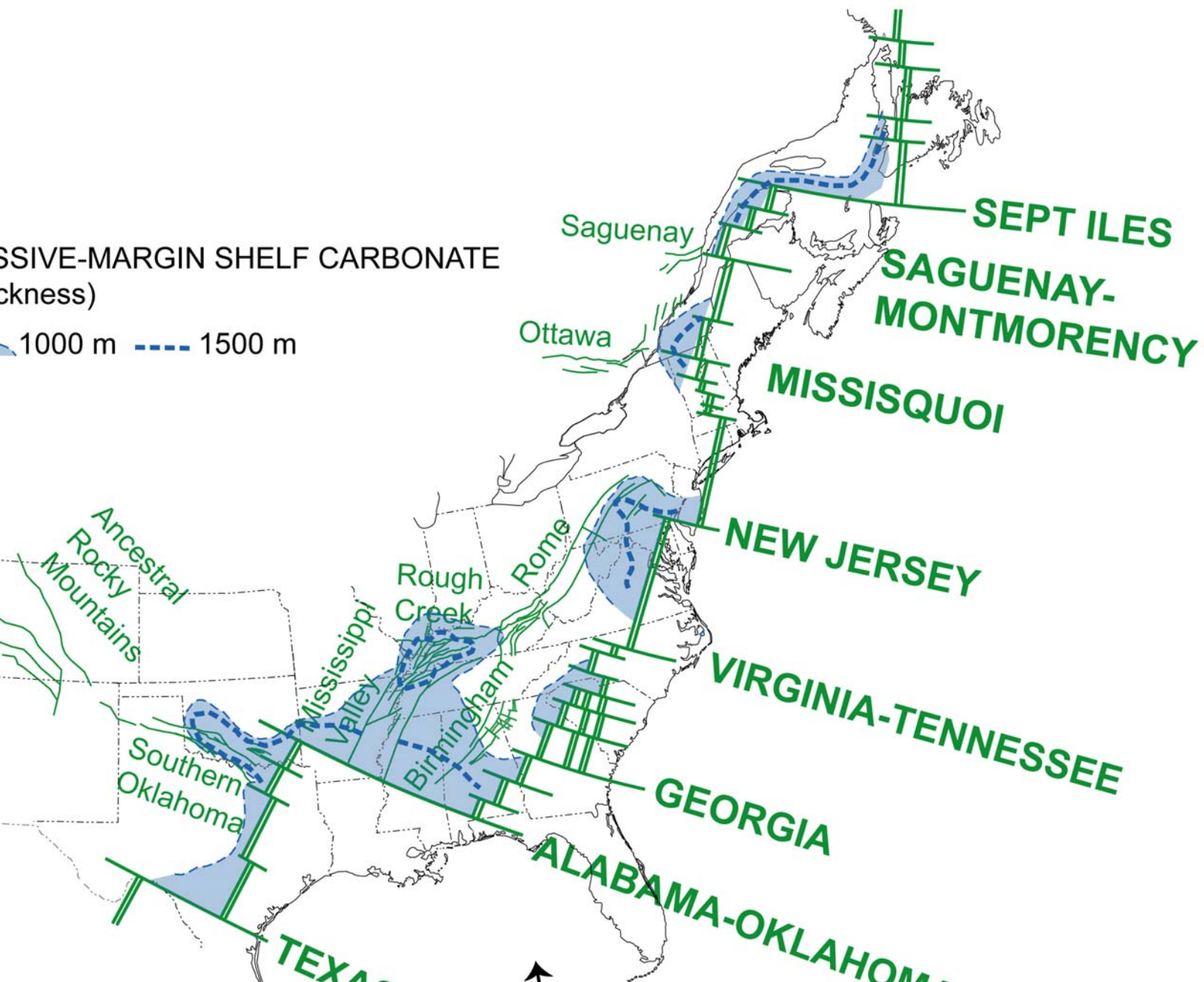
TRACRATONIC PLUTONS

 (664–427 Ma)



MASSIVE-MARGIN SHELF CARBONATE  
(thickness)

1000 m 1500 m



OROGENIC CLASTIC WEDGES (subsidence rates)

LATE PALEOZOIC: Alleghanian-Ouachita

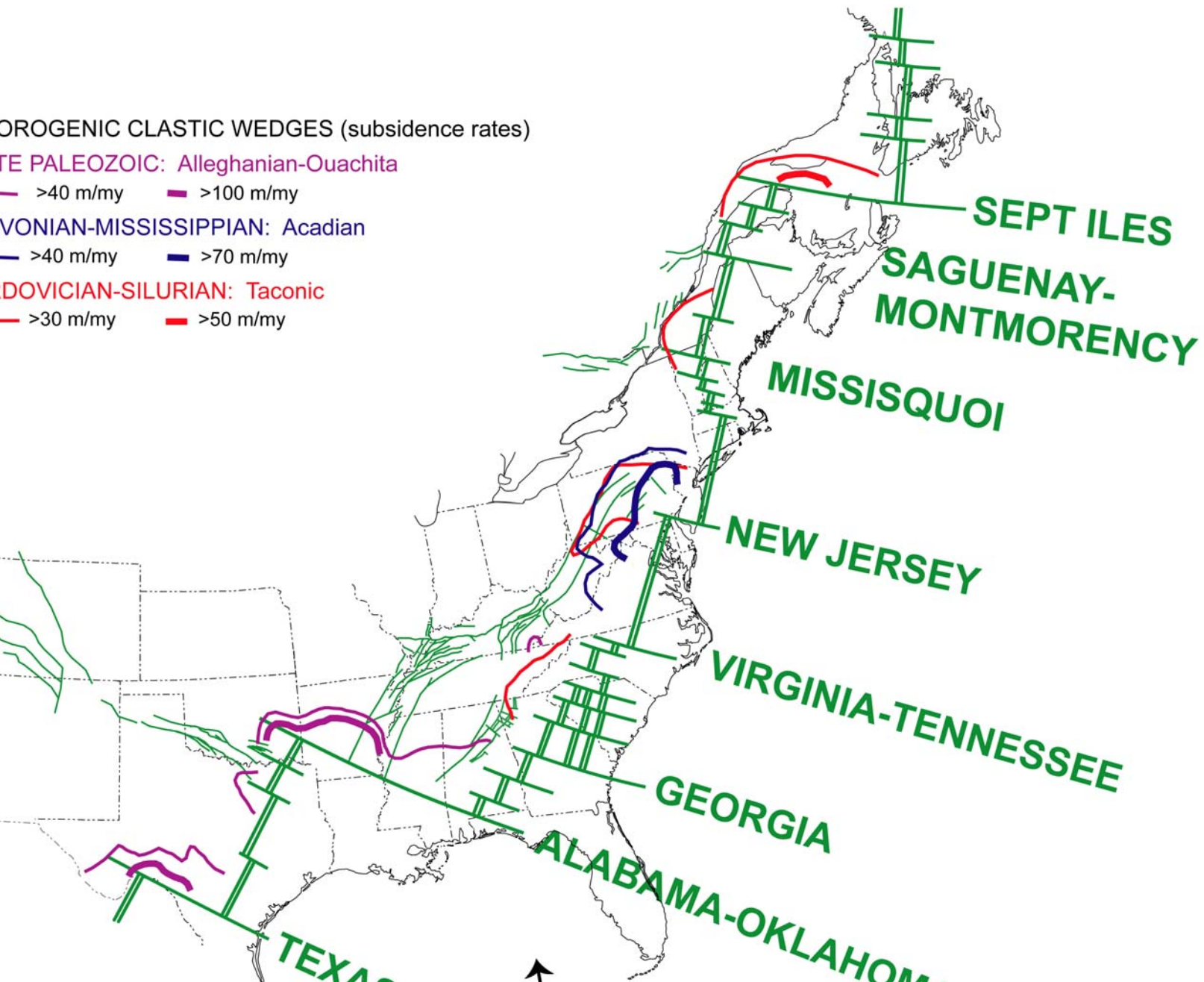
— >40 m/my    — >100 m/my

DEVONIAN-MISSISSIPPIAN: Acadian

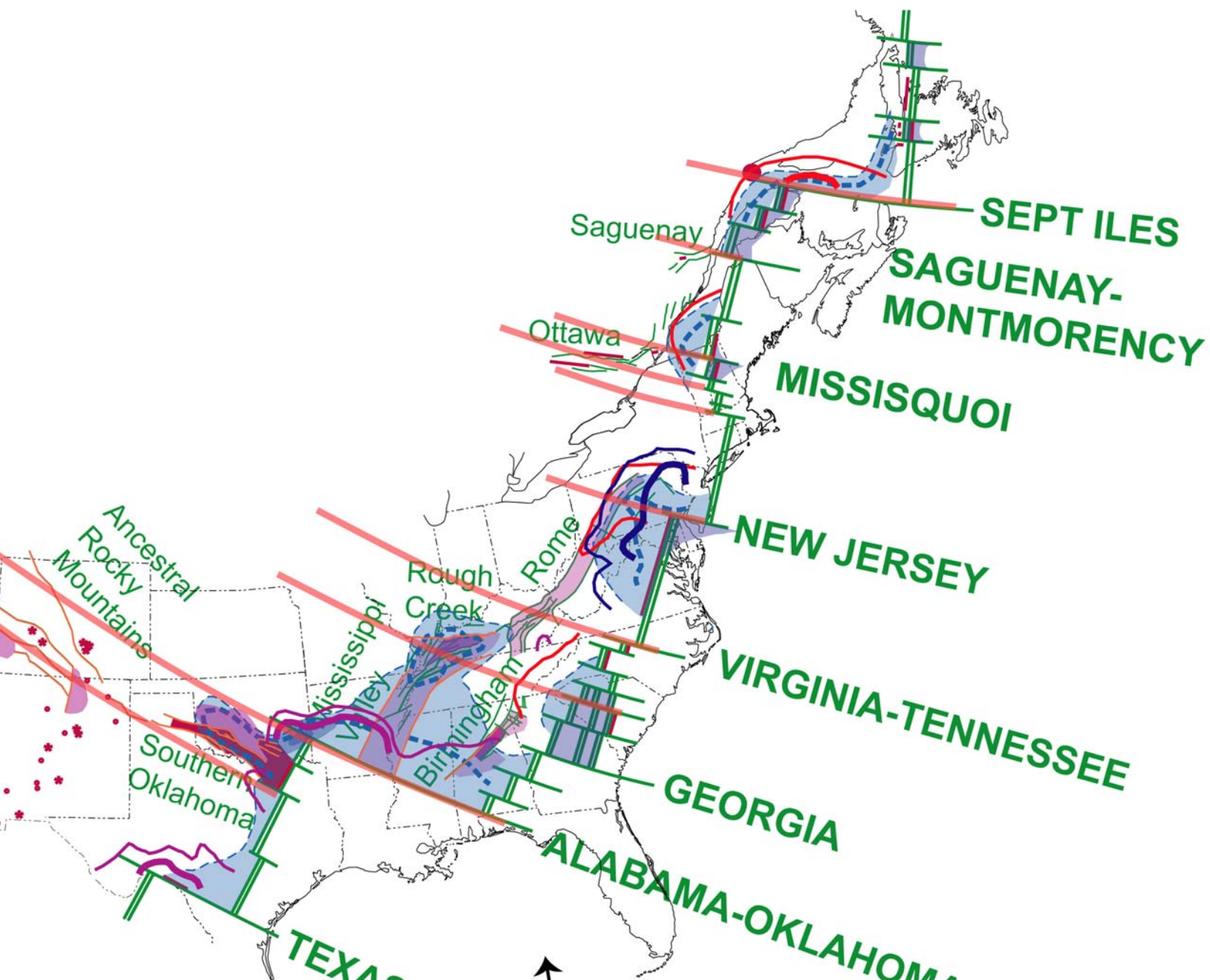
— >40 m/my    — >70 m/my

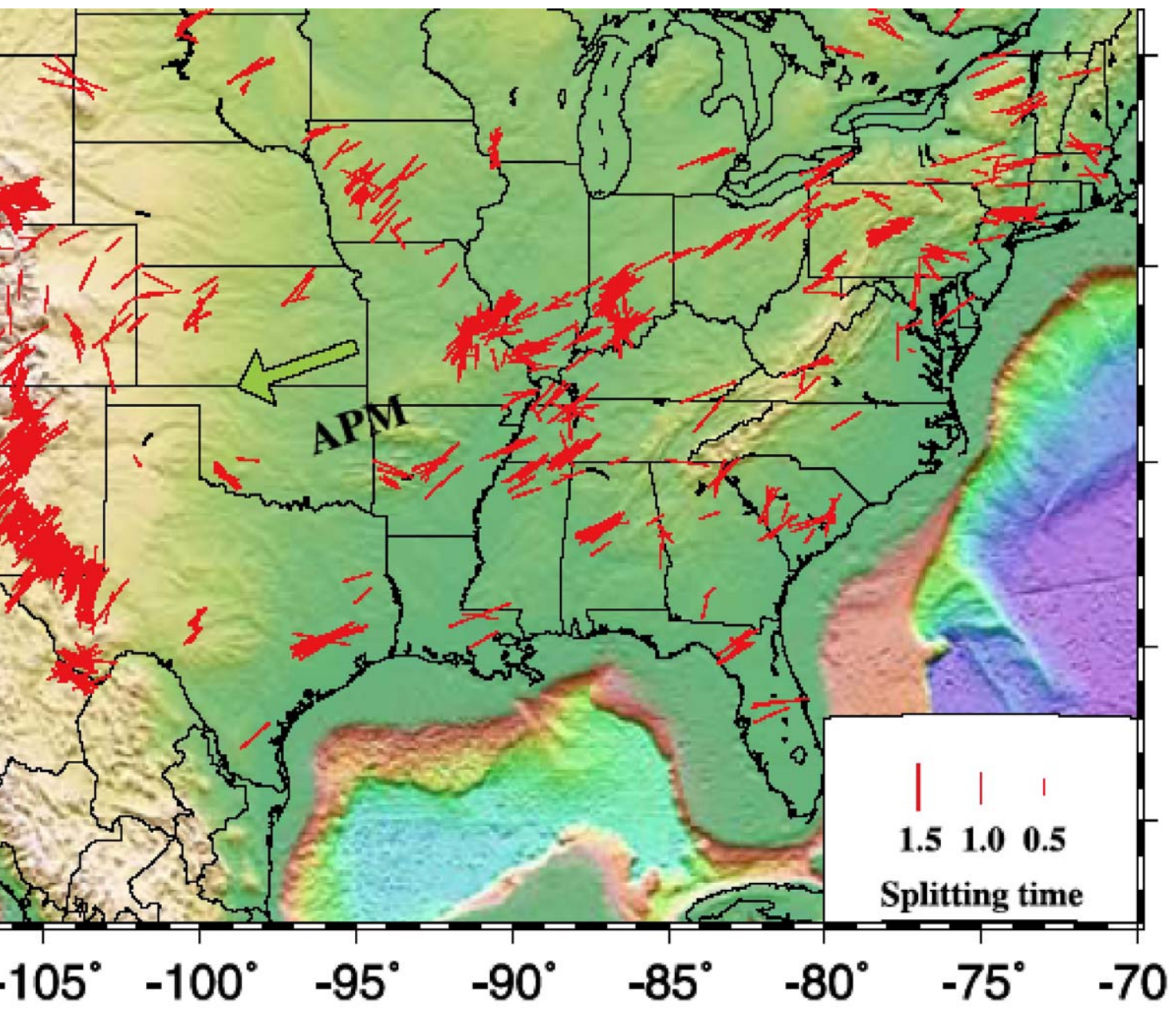
DEVONIAN-SILURIAN: Taconic

— >30 m/my    — >50 m/my

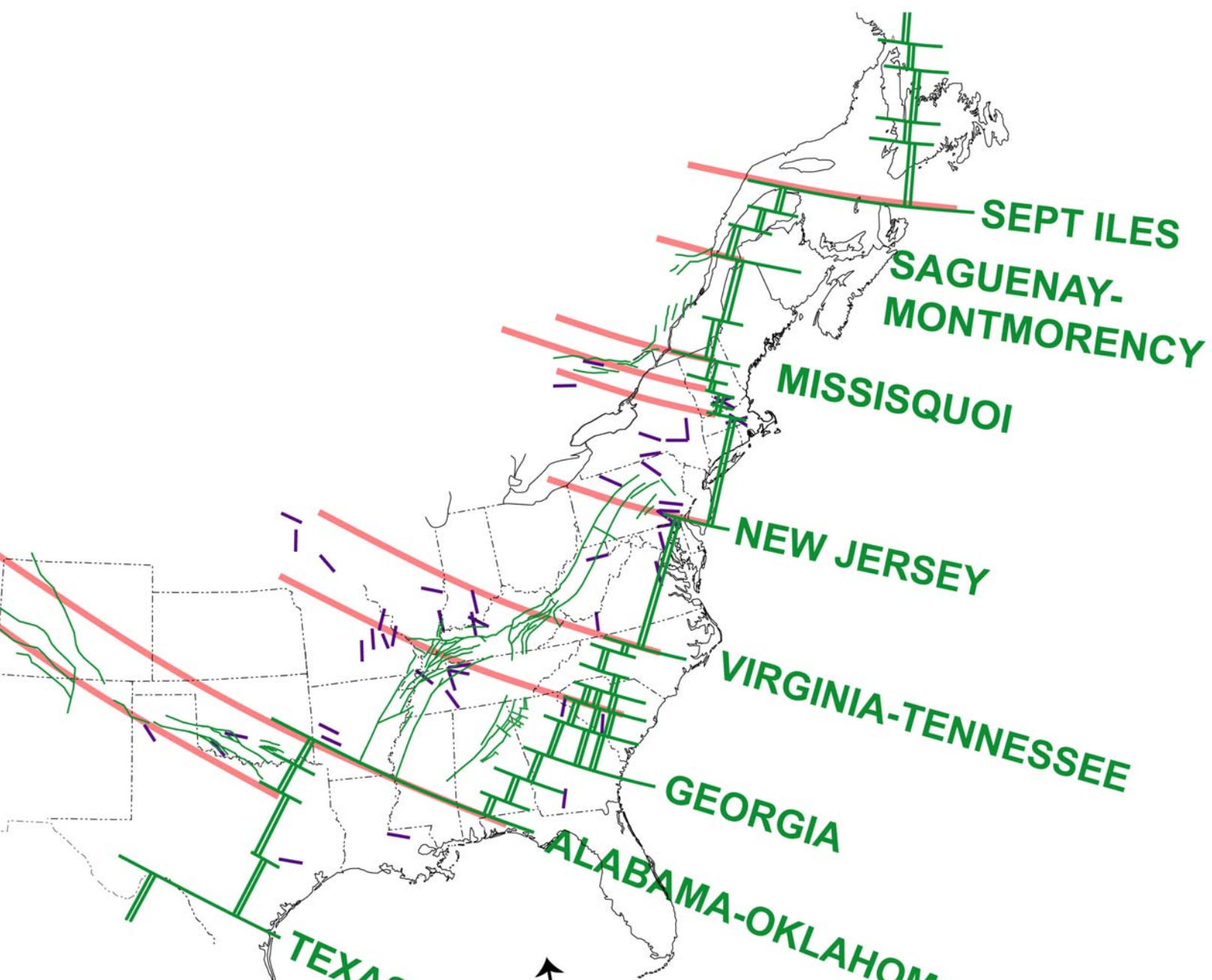














ODINIA  
PETUS  
ANGAEA  
LANTIC

