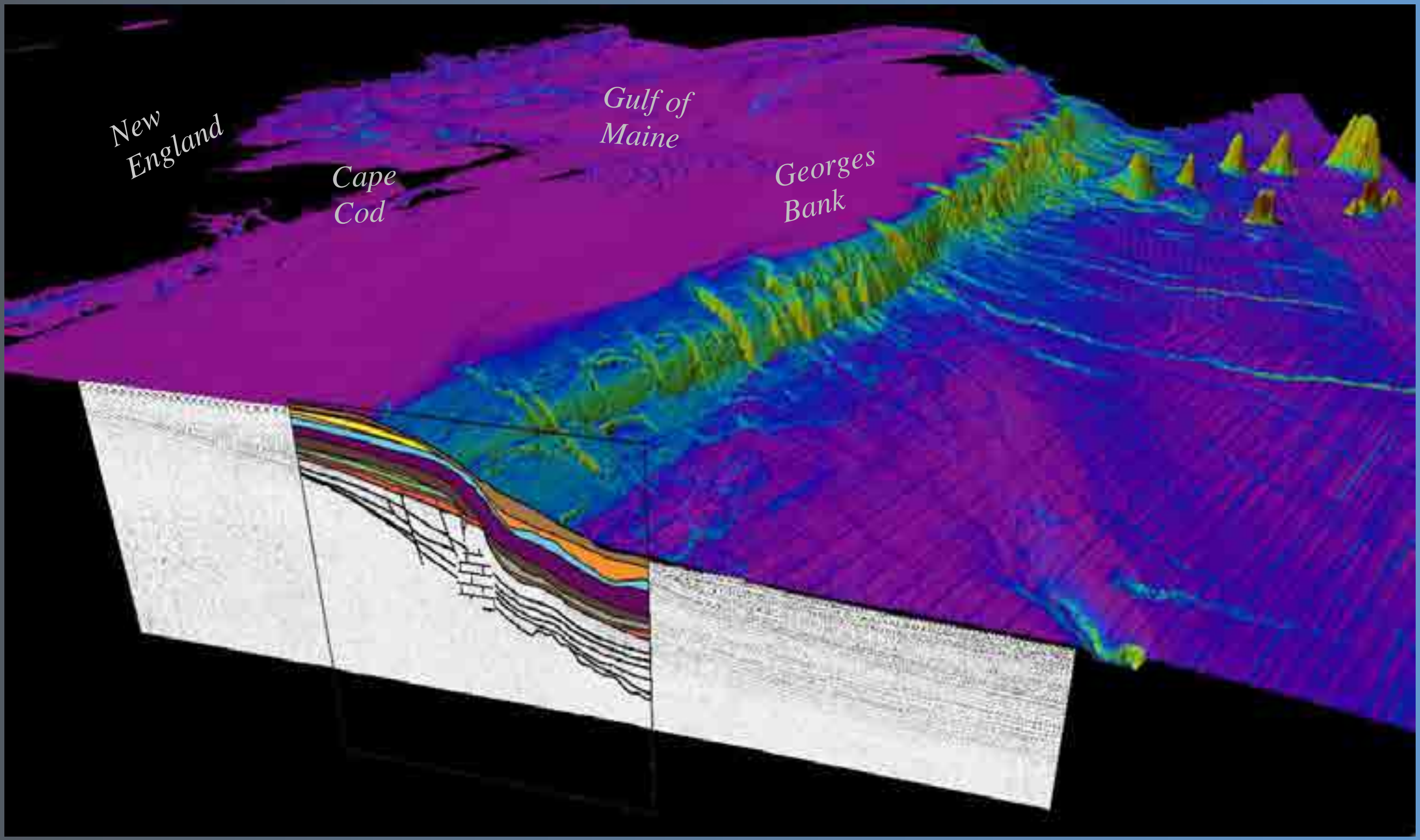
# US Atlantic Continental Margin

White Papers:

#7 - Gaherty et al. #9 – Hornbach et al. #12 – Olsen et al.



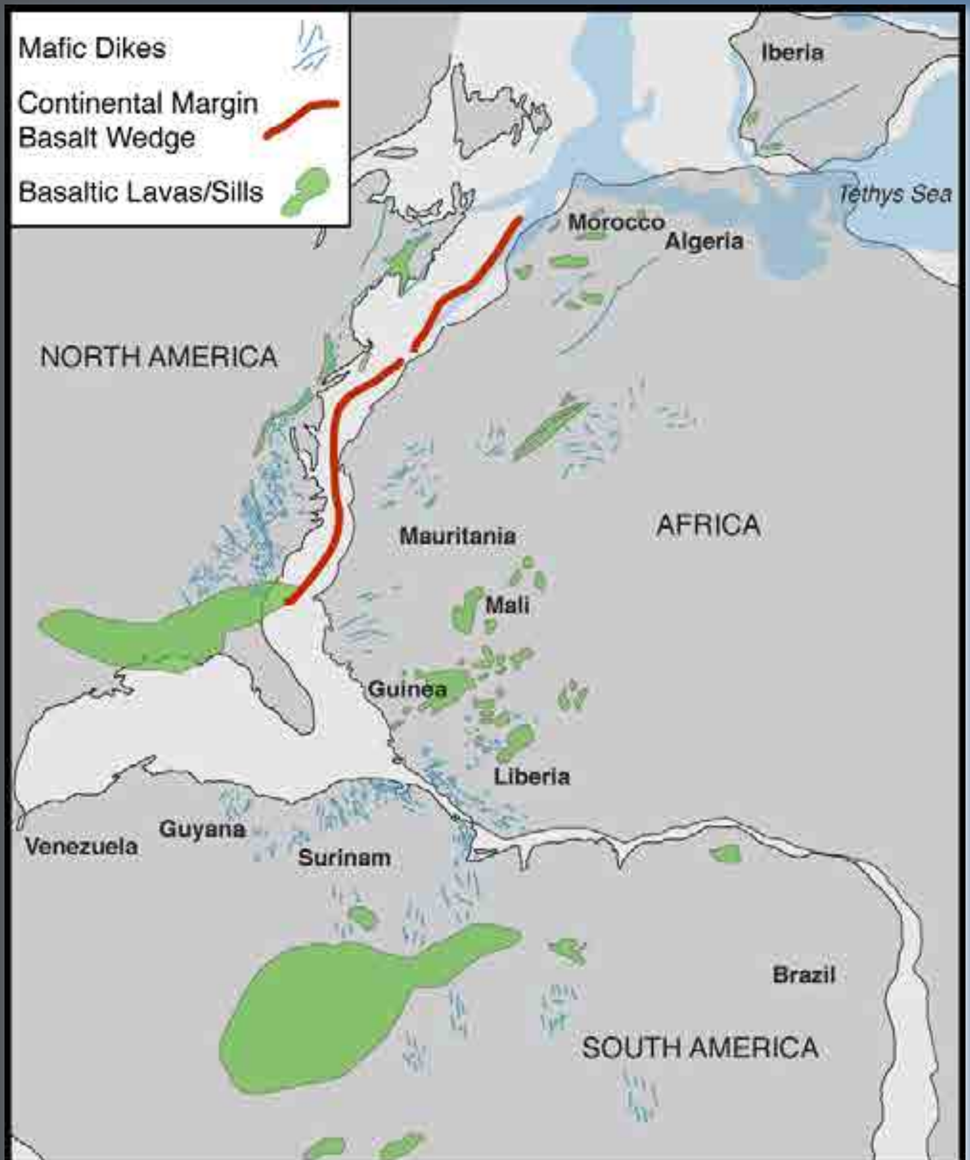
# Outline

1. RIE Research Opportunities
   (rift --> breakup --> post-rift)
2. Groundwork and Logistics
3. Synergistic Opportunities

# Rift Initiation and Evolution: Compelling Science at a Drifting Margin

1. Distribution of magmatism and deformation in the mantle lithosphere
2. 3D rift structure and segmentation
3. Nature of transitional crust
4. Relationship between failed rift basins and successfully rifted margin
5. Post-rift evolution and growth of a passive margin

# Central Atlantic Magmatic Province (CAMP)




*McHone (Tectonophysics, 2000)*

Rifting began ~230 Ma

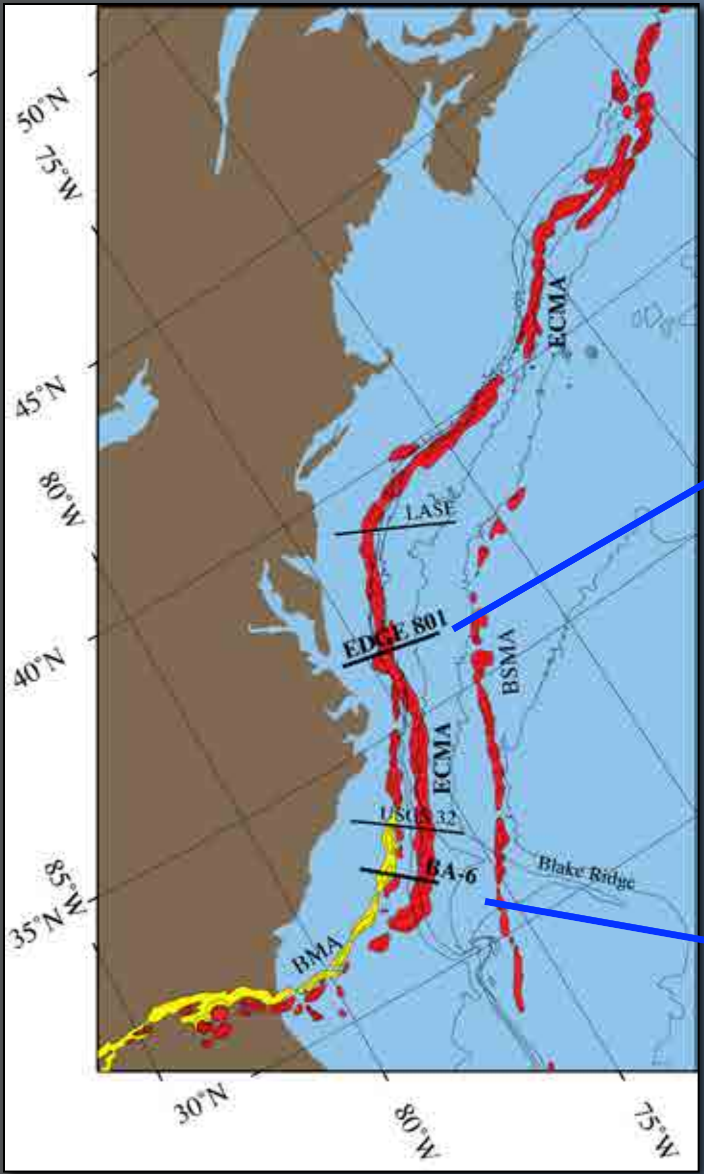
~200 Ma LIP emplaced --> Approximately coincident w/ breakup and mass extinction (end-Triassic)

Relationship between deformation, magmatism and syn-rift sedimentation onshore and offshore is poorly understood (failed versus successful rifting)

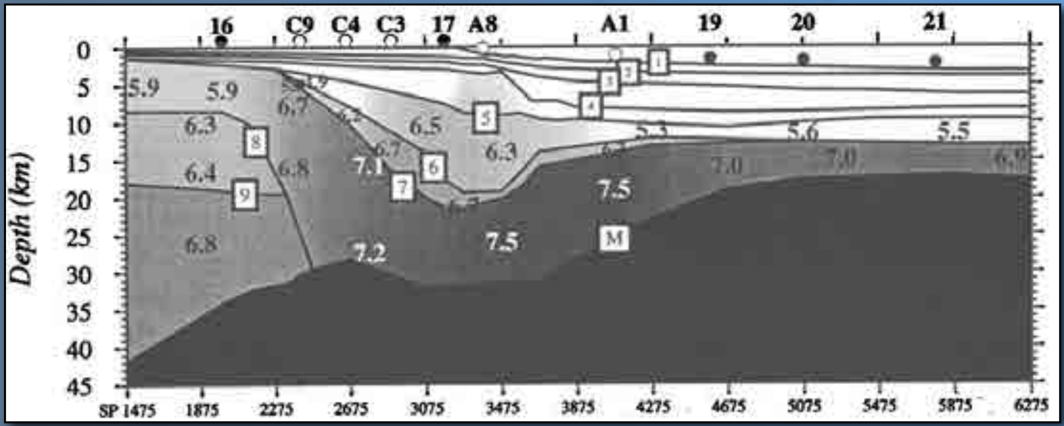
Unknown geodynamic source for magma

See white papers by Gaherty et al. and Olsen et al.

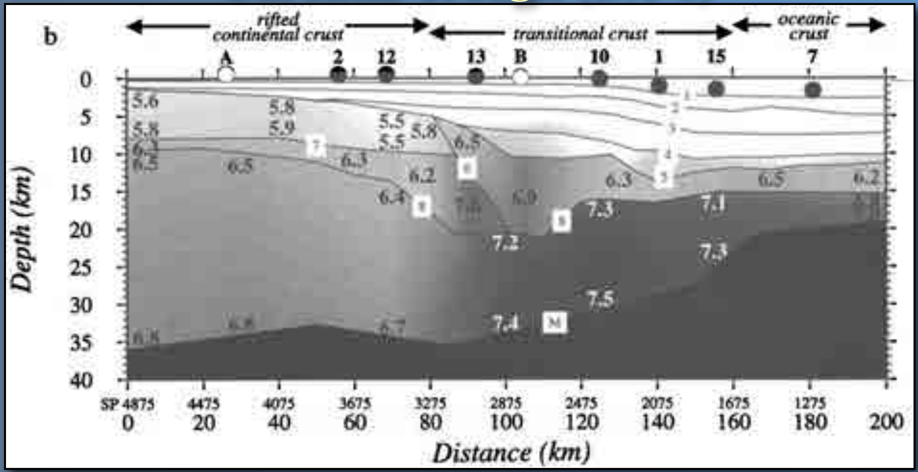
# High lower crustal Vp – different melting regime than MOR




## Mid-Atlantic (EDGE 801)




## Carolina Trough (BA-6)

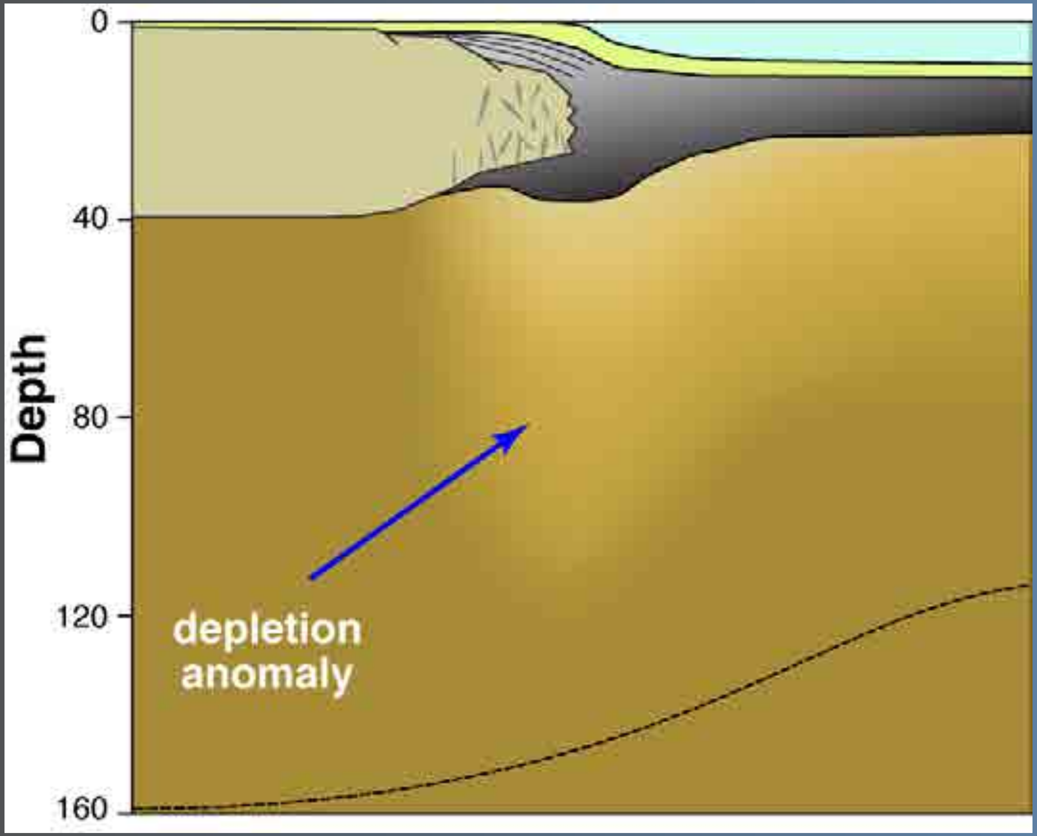


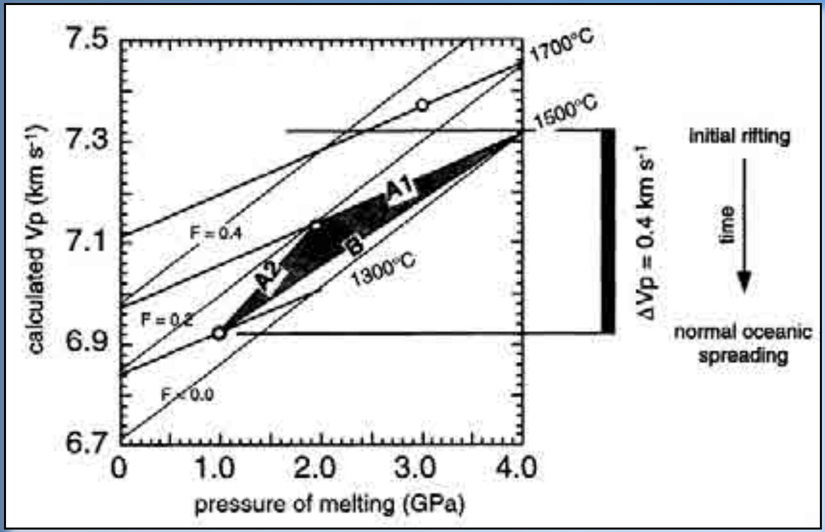

*Holbrook et al. (JGR 1994a,b)*

Need more constraints on the nature of transitional crust

# High Vp > High pressure of melting > Depletion anomaly

New seismic imaging:
- Along-margin architecture
- Mantle source of melt



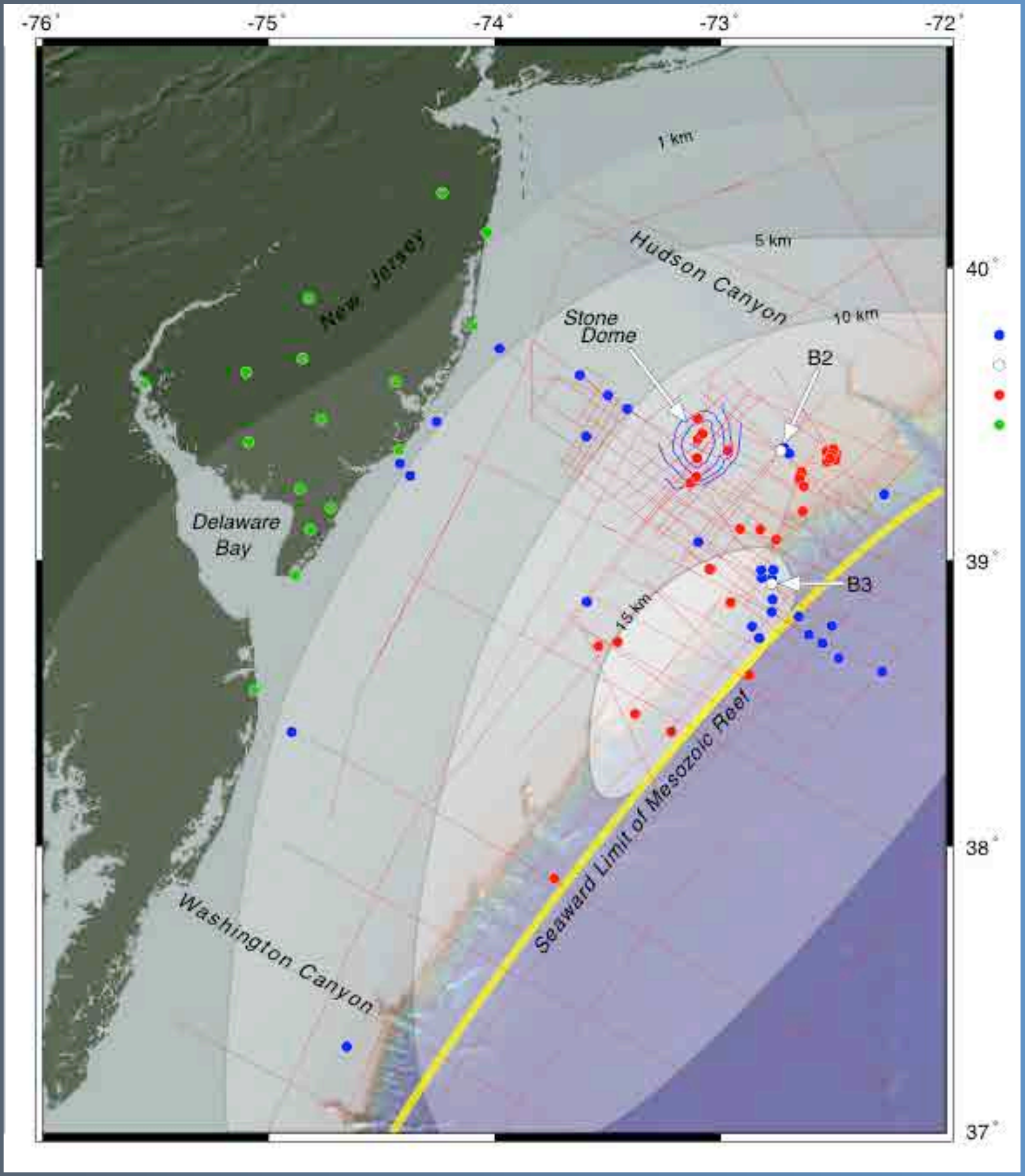




High velocities imply high average pressure of melting

This should leave behind a low density residue of melting that may stabilize the margin.

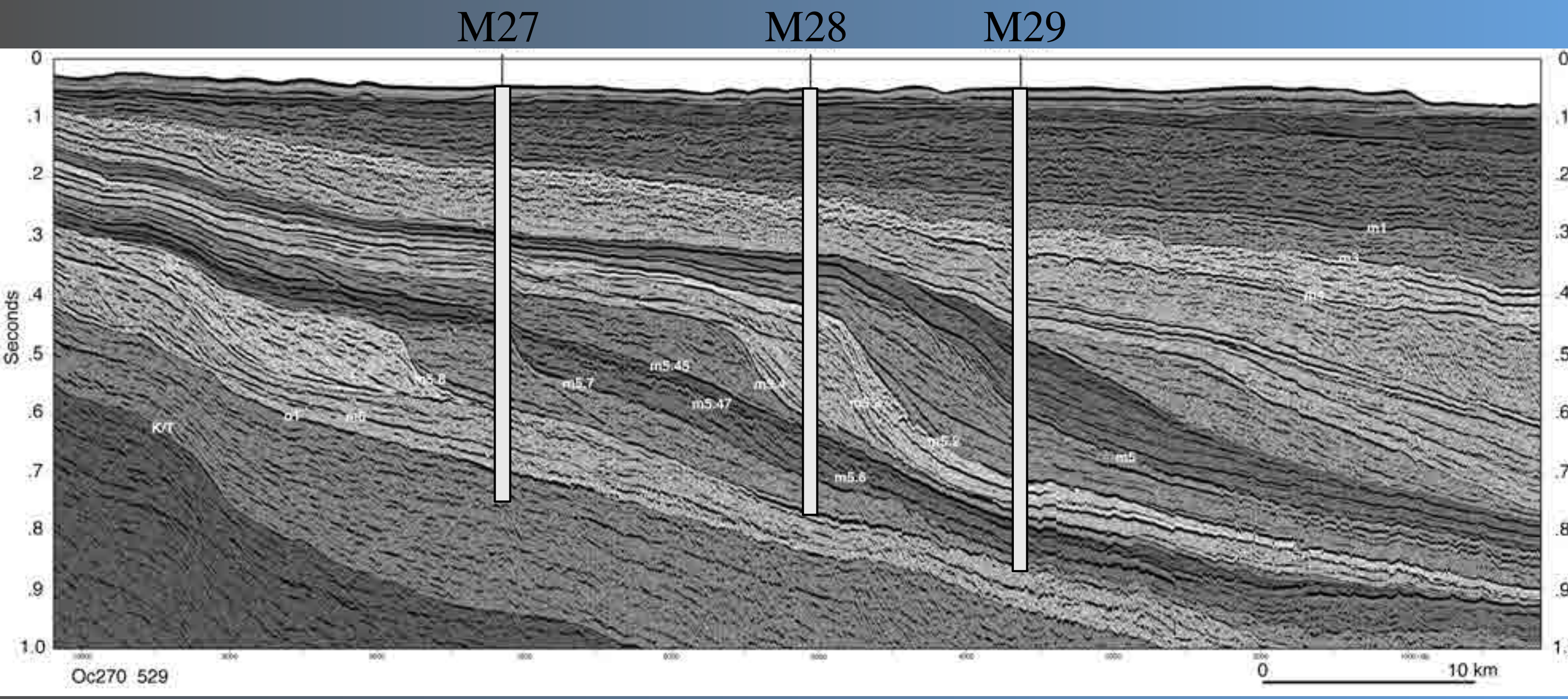
*Kelemen and Holbrook (JGR 1994)*

# Post-rift Evolution




(Figure from Greg Mountain)

How has rift architecture and lithospheric evolution influenced post-rift sediment dispersal and accumulation?




(Figure from Greg Mountain)

**3D complexity requires 3D imagery**

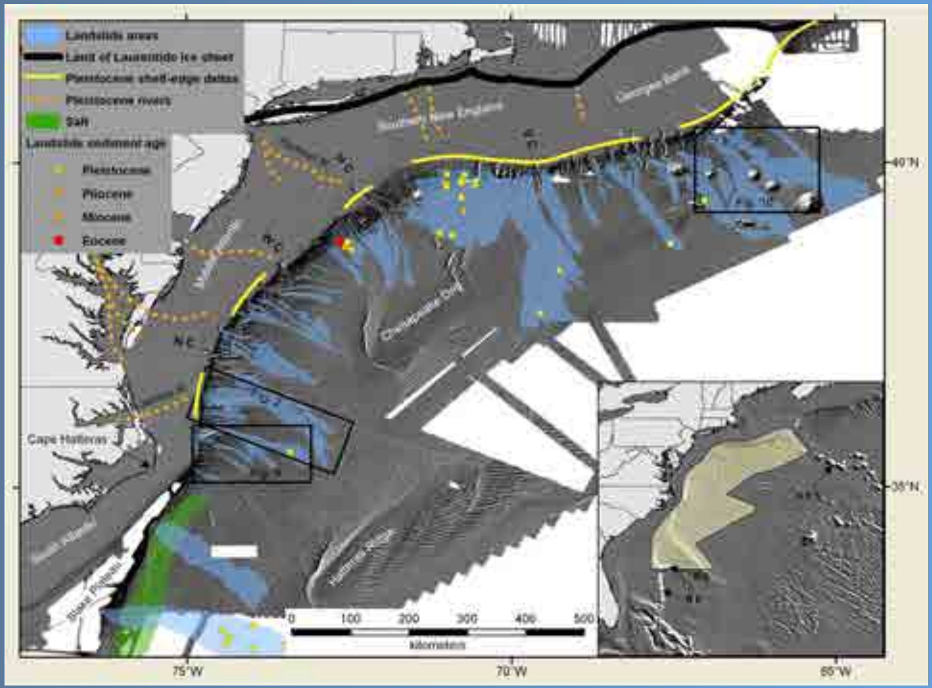
**Surficial Processes:**

How is today's morphology influenced by early margin development ?

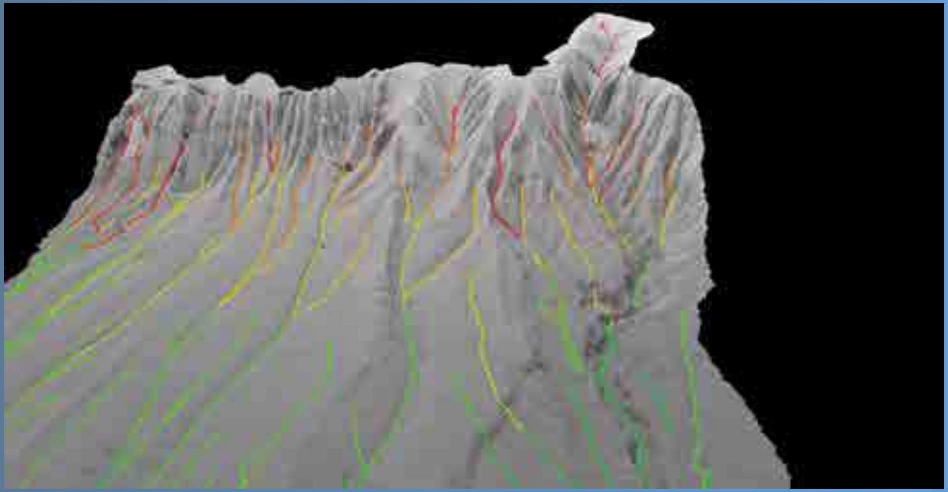
Quantitative geomorphology --> Sediment transport modeling, submarine Canyon formation, turbidity flows

Geohazards --> submarine landslides, slope stability, tsunamis, seismicity

(See white paper by Hornbach et al.)



Twichell et al., (2009)

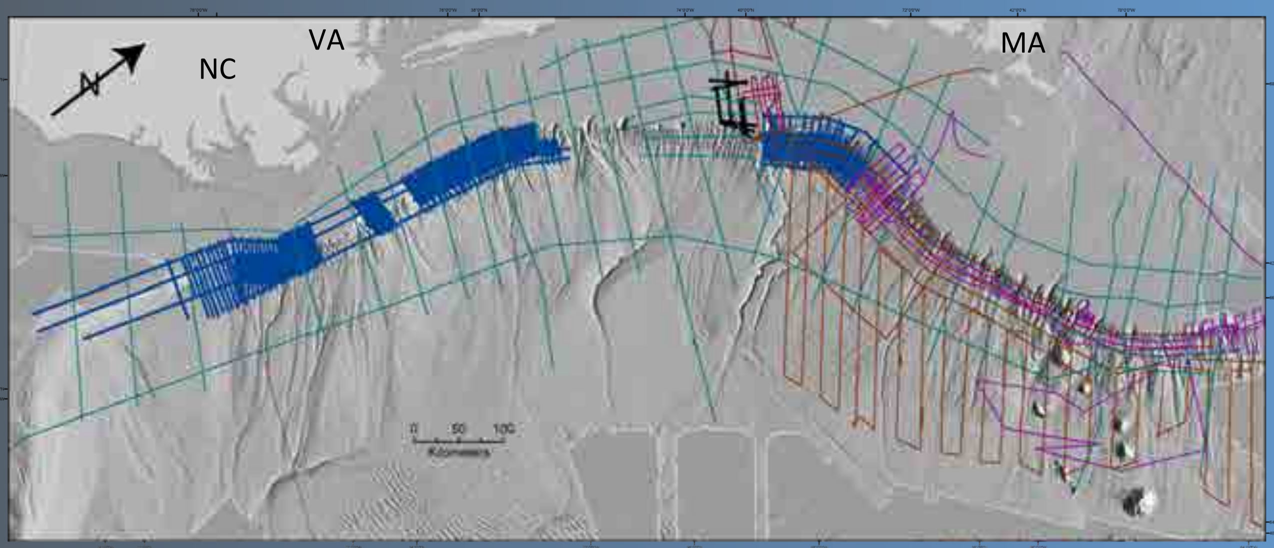


# Groundwork and Logistical Considerations

Very heavily studied margin

- •Dozens of hydrocarbon wells, 1-dozen IODP wells, AMCOR wells, many others
- •10's of thousands of line-km of reconnaissance-grade seismic reflection data
- •Onshore seismic, well data, mapping
- •Opportunity to synthesize onshore and offshore data
- •Comprehensive potential field data

Need onshore/offshore synthesis



# Synergistic Opportunities

Law of the Sea- ECS Project (USGS, NOAA)

-MCS spaced every 60 nautical miles

(beyond 200 nautical mi

-Coincident refraction (select lines)

US Array

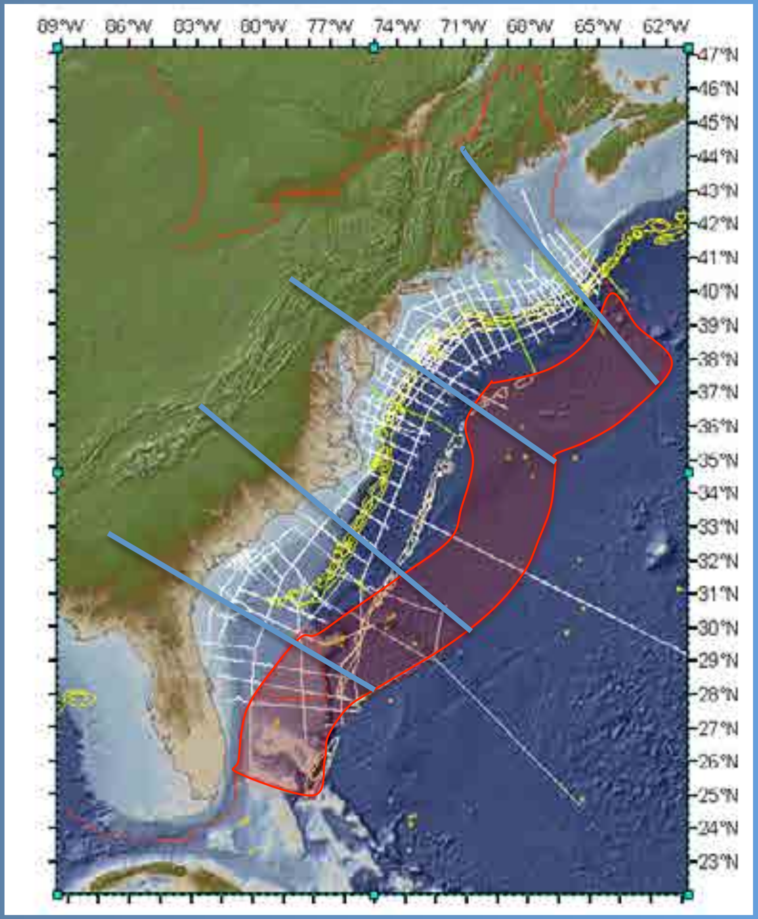
Eastern US transportable array 2013

Oil and Gas Exploration

Moratorium may be lifted…

Canadian-Atlantic and Conjugate Margins

International collaboration




**Numerous Opportunities for Coordinates Studies**

# Summary

1. Late-stage rifting, transition to drifting
   – Magmatism (in time and space) and upper mantle deformation
   – Segmentation and along-axis variation
   – Rift localization and formation of transitional crust
   – Breakup unconformity
2. Post-rift evolution
   – Sediment dispersion patterns, passive margin evolution, climate control
   – Geomorphic evolution (progradation, clinoform development, submarine canyon formation)
   – Geohazards (submarine landslides, tsunami generation, seismicity)
3. Synergistic Opportunities
   – US Array
   – Extended Continental Shelf Project (Law of the Sea)
   – Industry and international collaboration
   – International collaboration