South Eastern Suture of the Appalachian Margin Experiment (SESAME)

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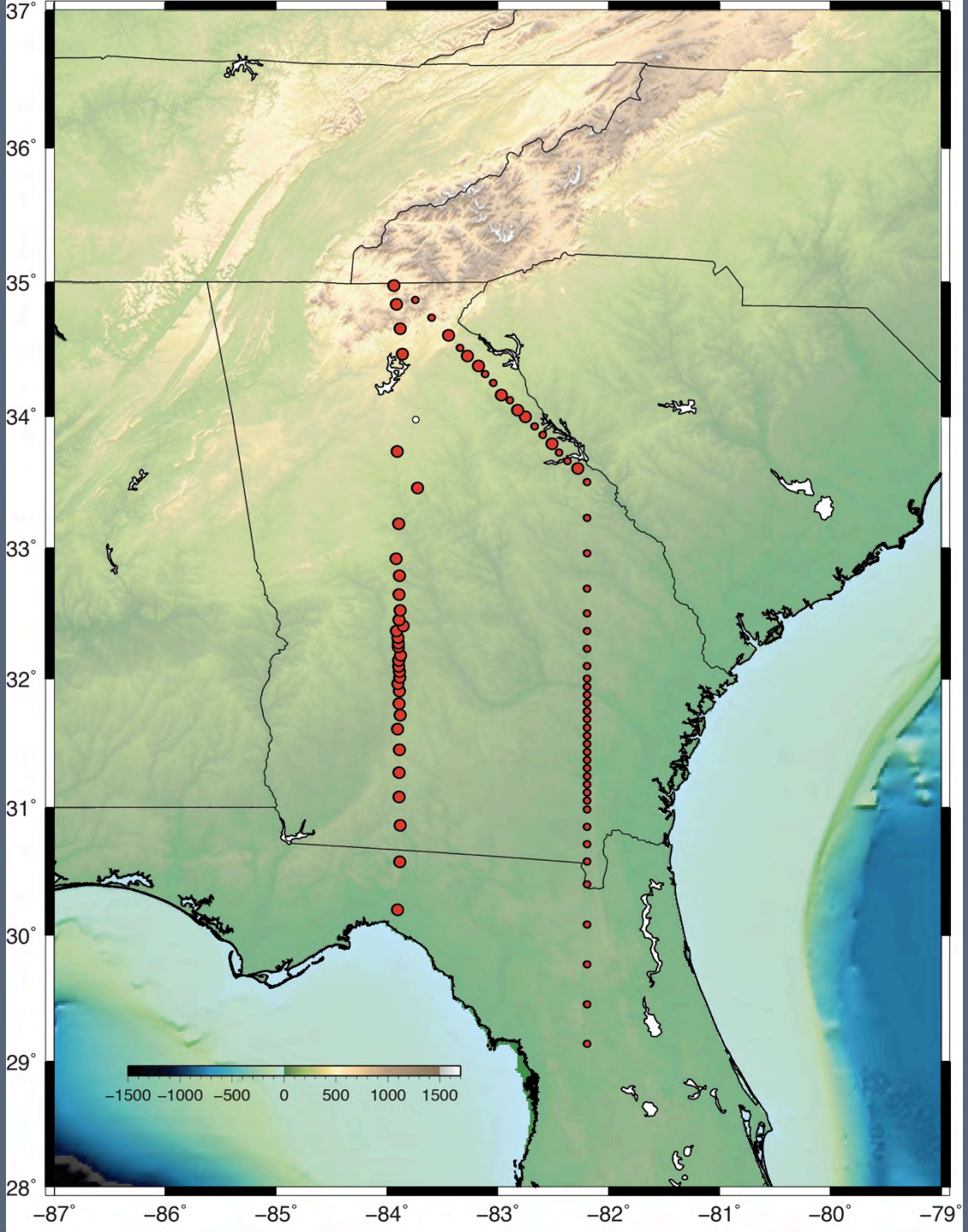
Acknowledgements

SESAME Field Crews: E. Horry Parker, Julia Macdougall, Sara Hanson-Hedgecock, Ved Lekic, Pnina Miller, Jacqui Maleski, Abby Saenger, Tony Gesualdo, Hamilton Goodner, Nick Taylor, Davison Hogan

IRIS-PASSCAL instrument center

NSF-EarthScope



SESAME

85 broadband sensors

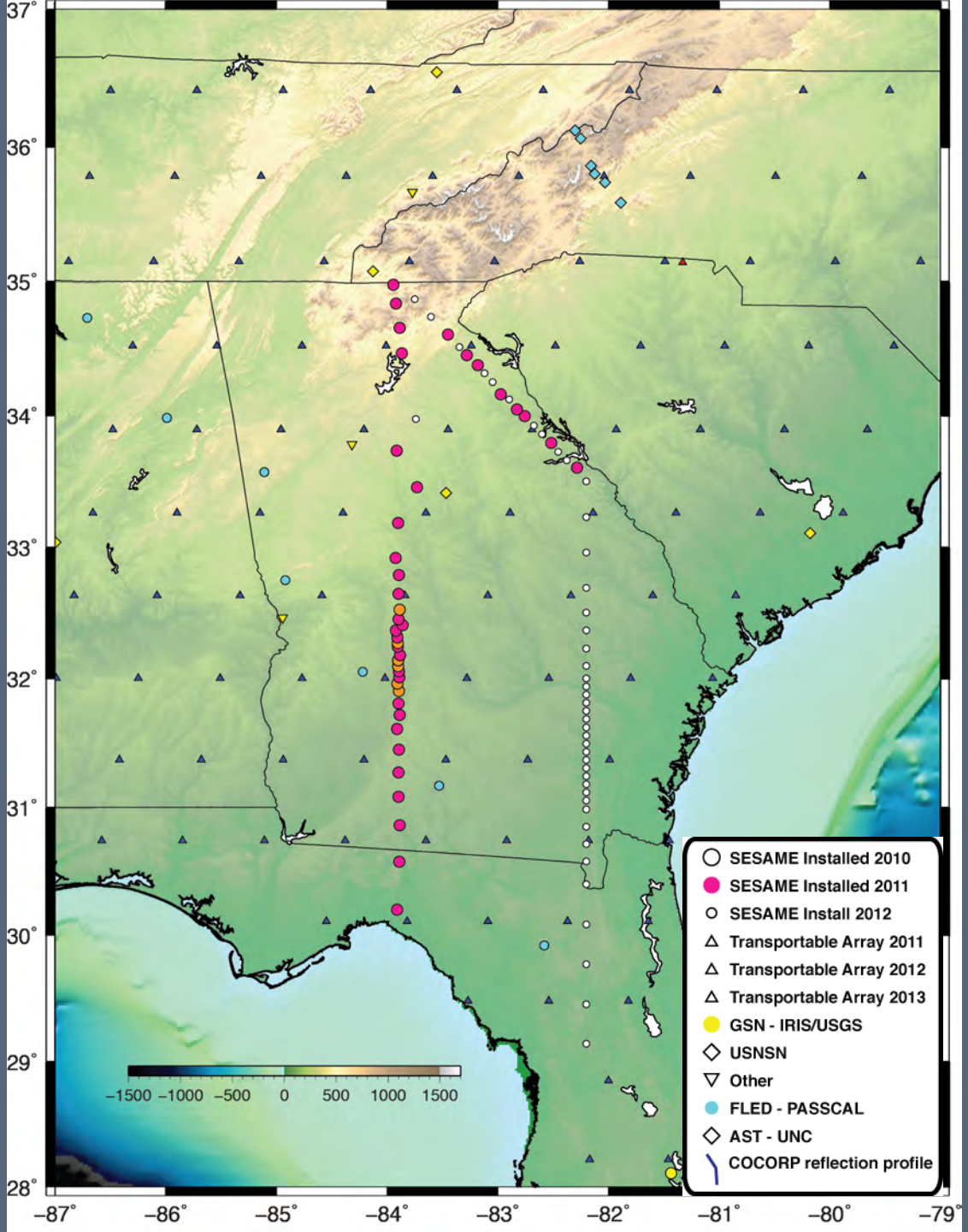
3 Transects

1st stations installed July, 2010

42 stations currently installed

43 remaining stations installed by summer, 2012

demob: summer, 2014



SESAME

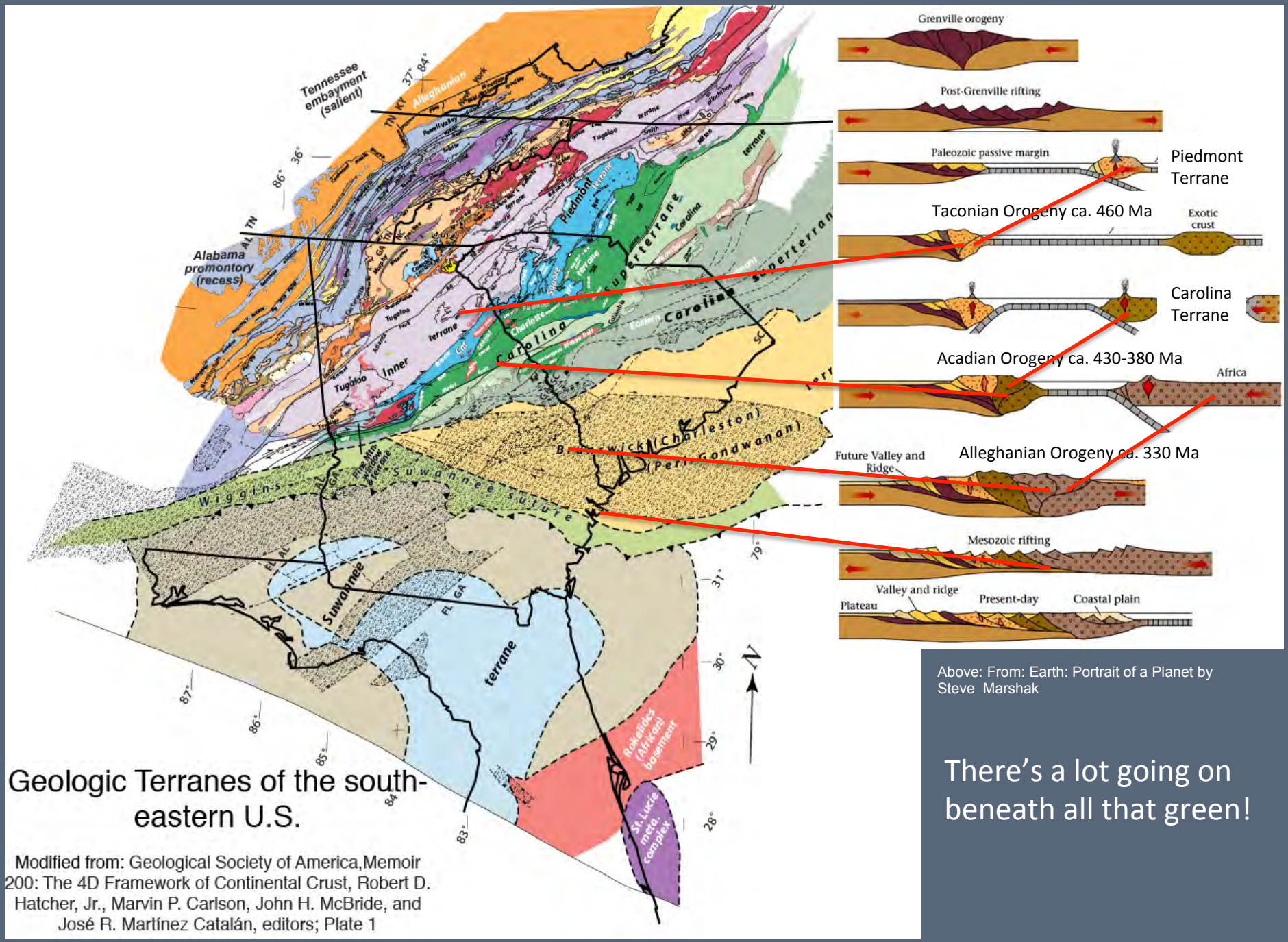
2010 - 2014

TA stations installed by:

2011: (grey triangles)

2012: (blue triangles)

2013: (orange triangles)



Geologic Terranes of the south-eastern U.S.

Modified from: Geological Society of America,Memoir 200: The 4D Framework of Continental Crust, Robert D. Hatcher, Jr., Marvin P. Carlson, John H. McBride, and José R. Martínez Catalán, editors; Plate 1

Above: From: Earth: Portrait of a Planet by Steve Marshak

There's a lot going on beneath all that green!

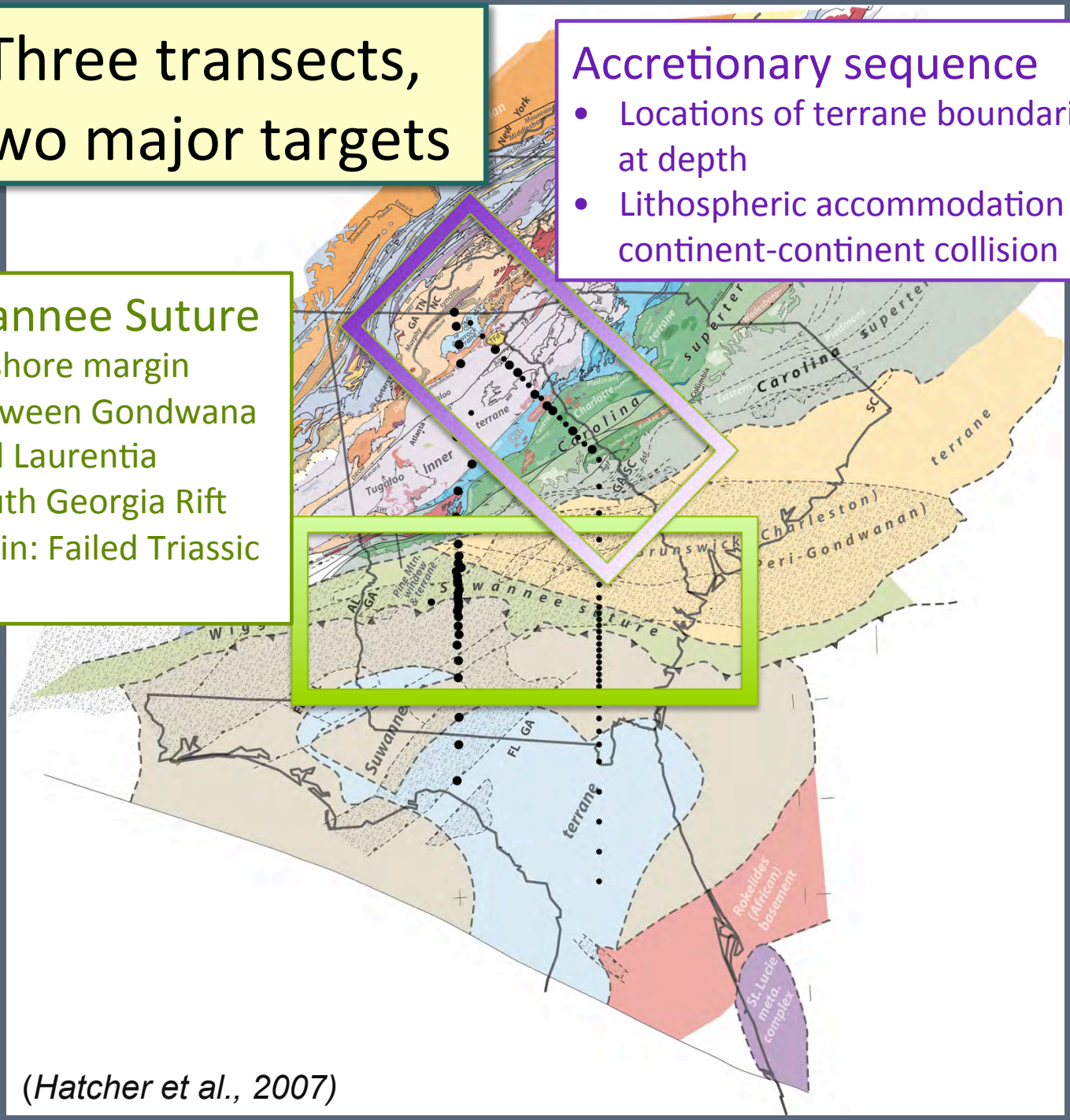
Three transects, Two major targets

Accretionary sequence

- Locations of terrane boundaries at depth
- Lithospheric accommodation of continent-continent collision

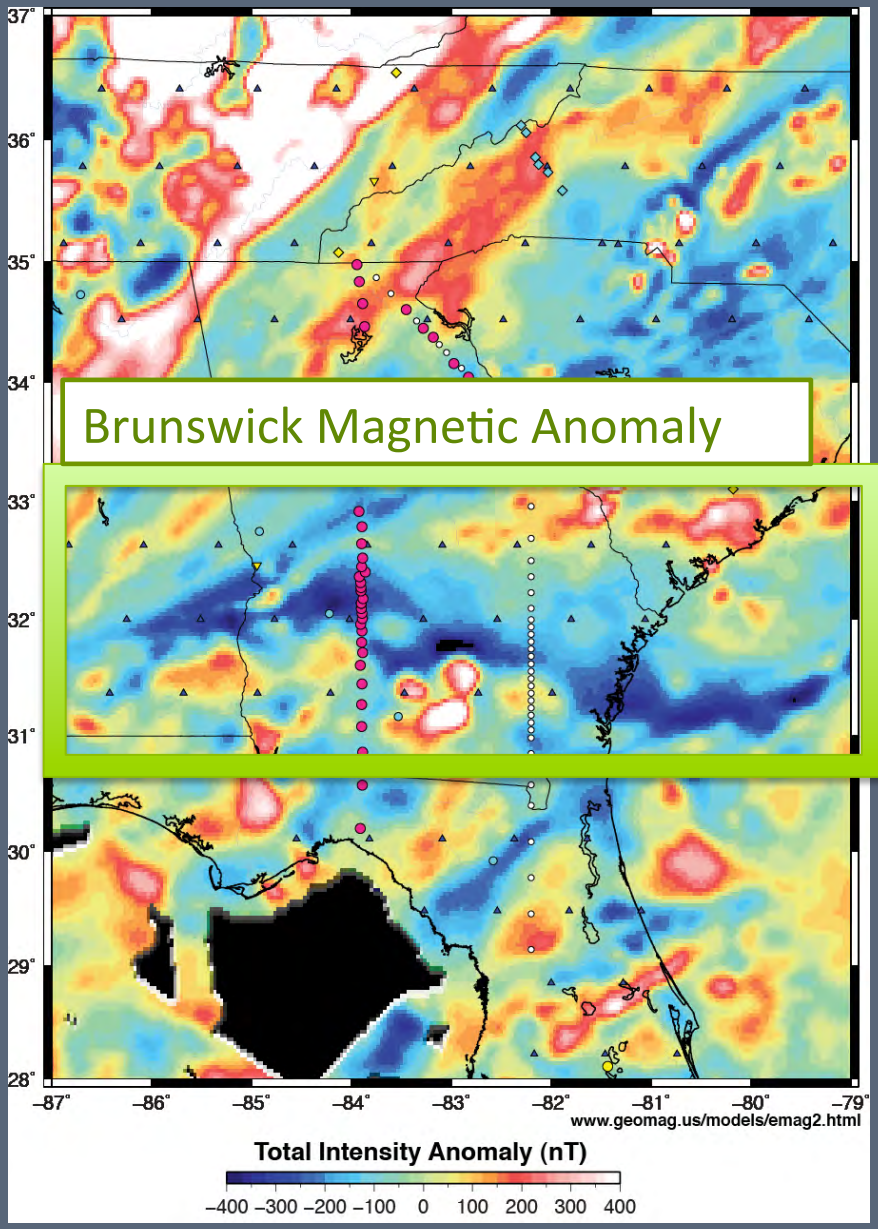
Suwannee Suture

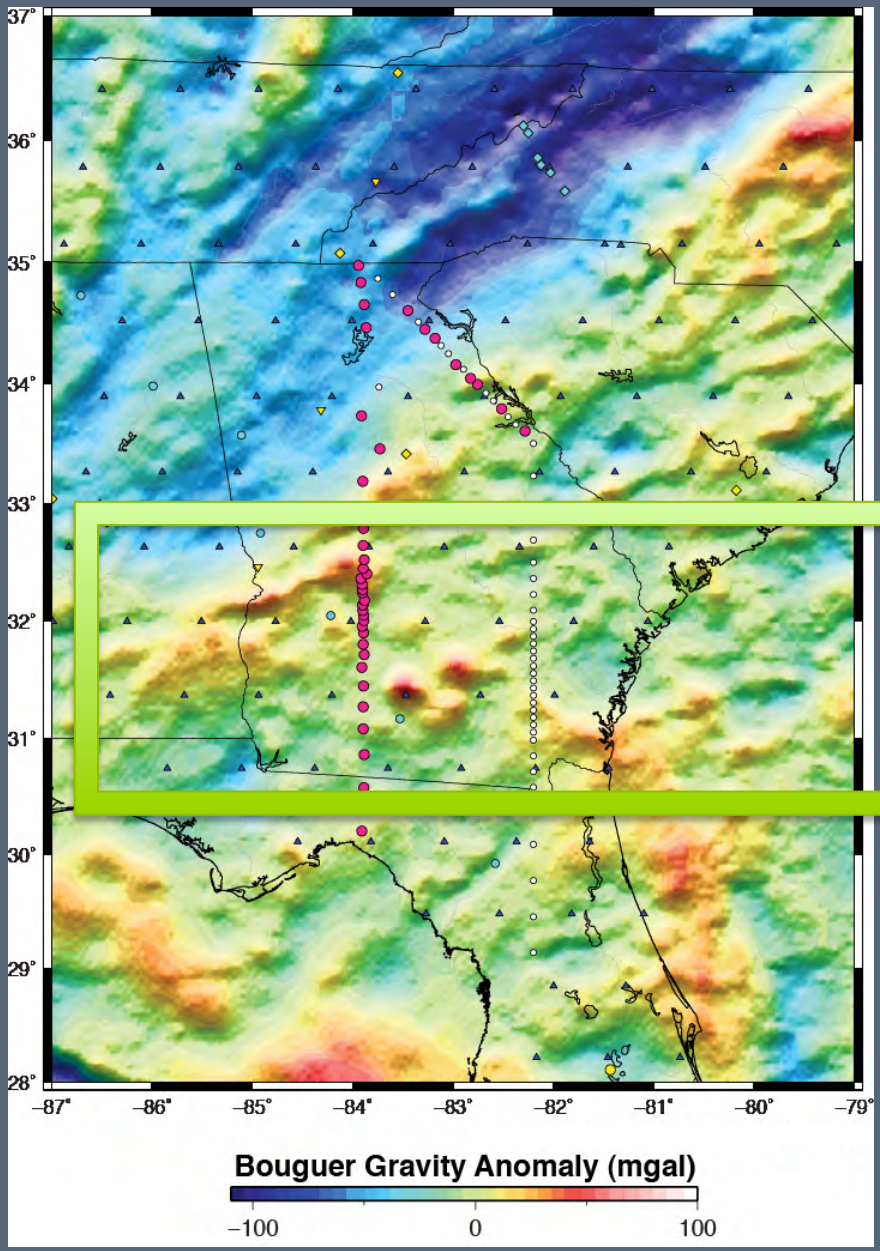
- onshore margin between Gondwana and Laurentia
- South Georgia Rift Basin: Failed Triassic Rift



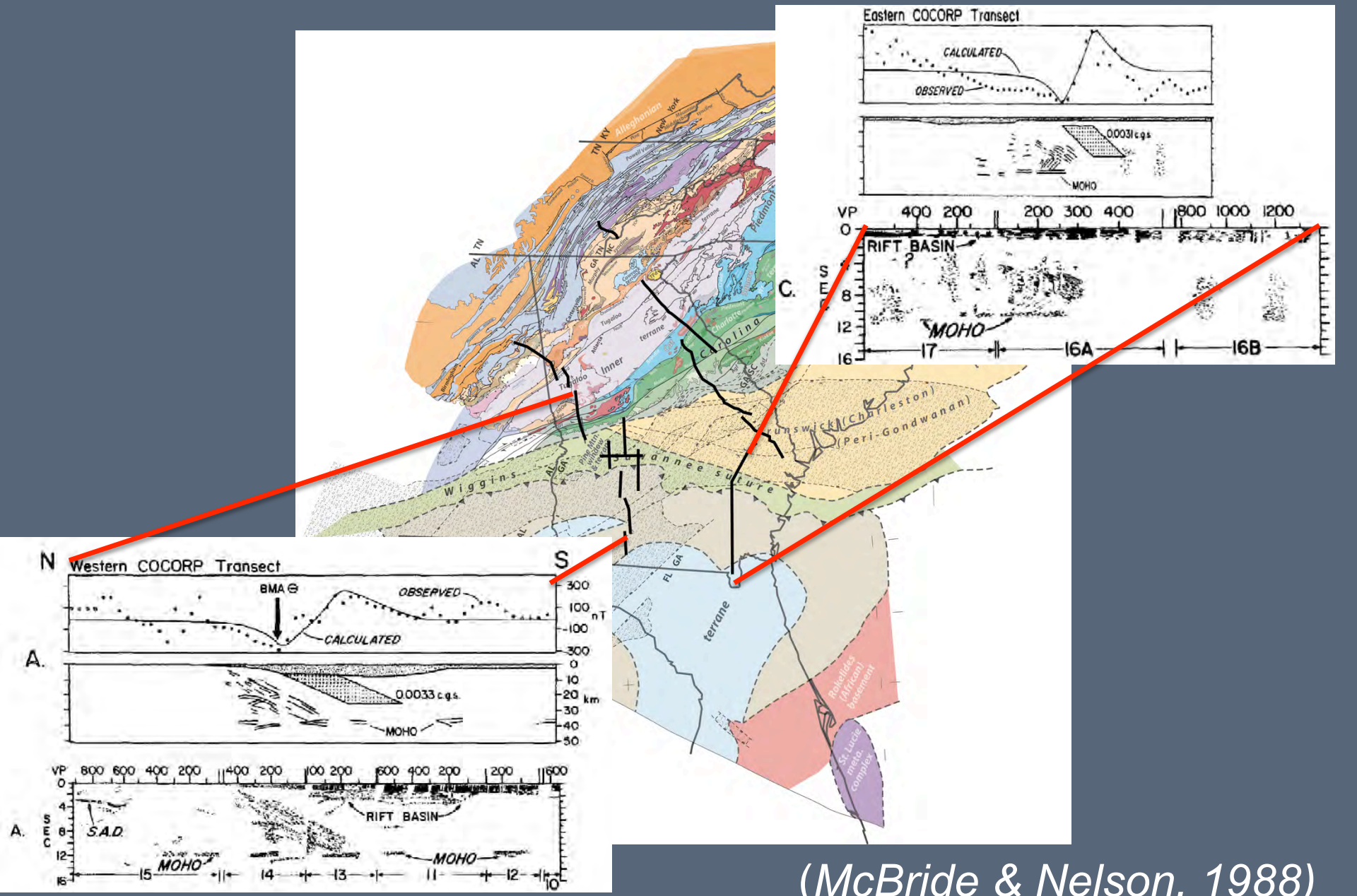
(*Hatcher et al., 2007*)

Suwannee Suture:
Magnetic and Gravity Anomalies



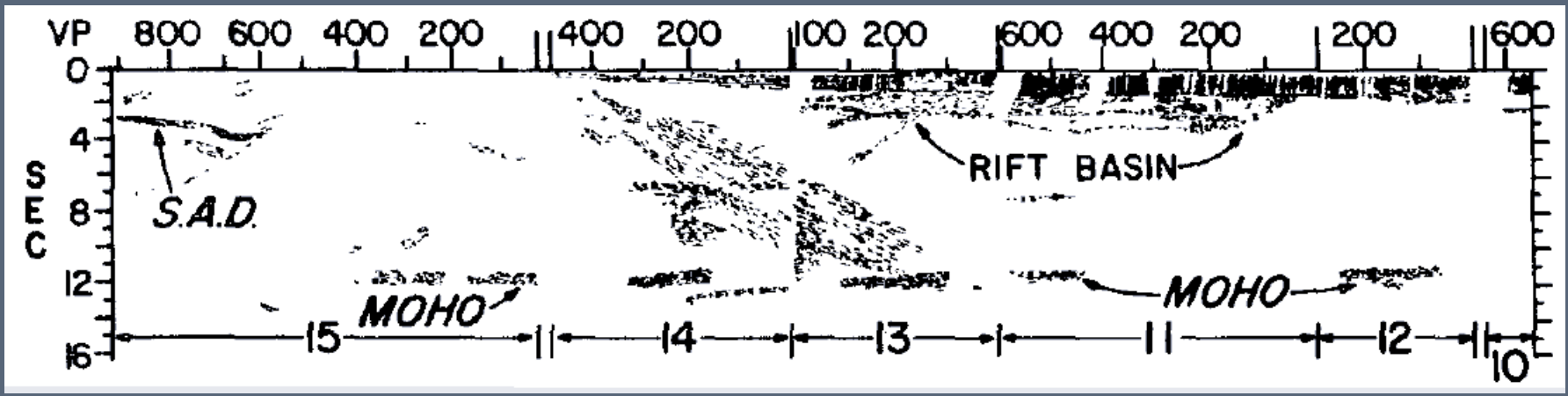


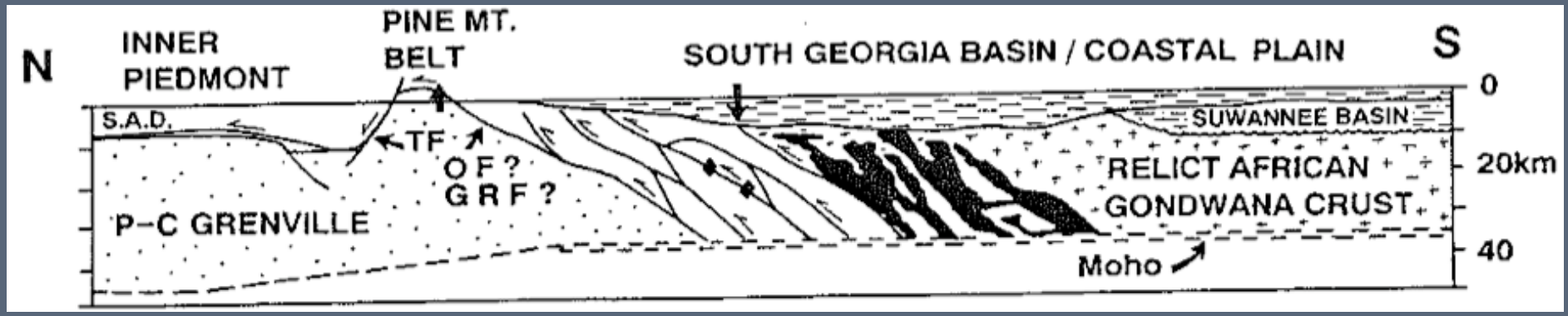
COCORP



(*McBride & Nelson, 1988*)

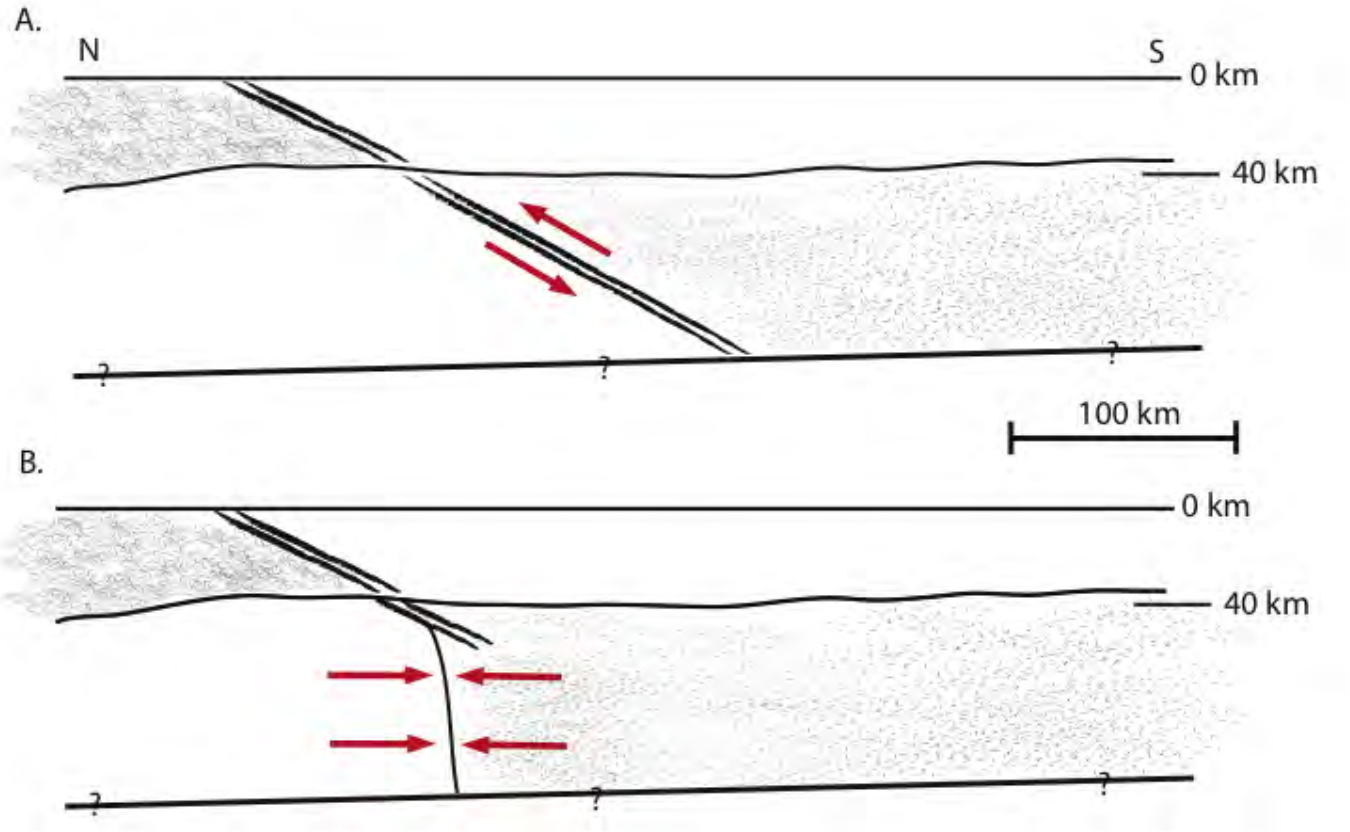
Geologic interpretation of dipping reflections





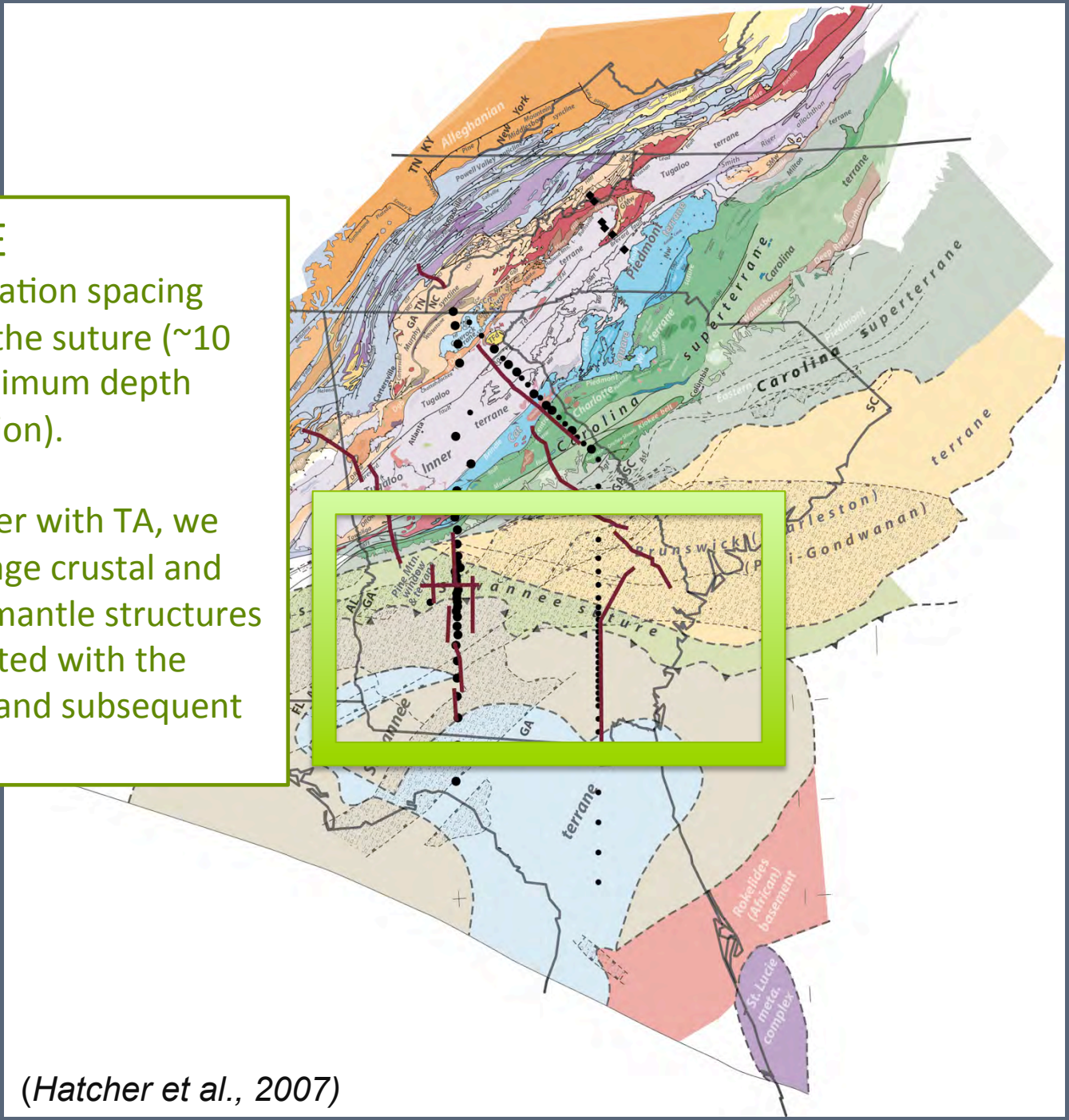
(*McBride & Nelson, 1988; 1991)*

Response of Mantle Lithosphere

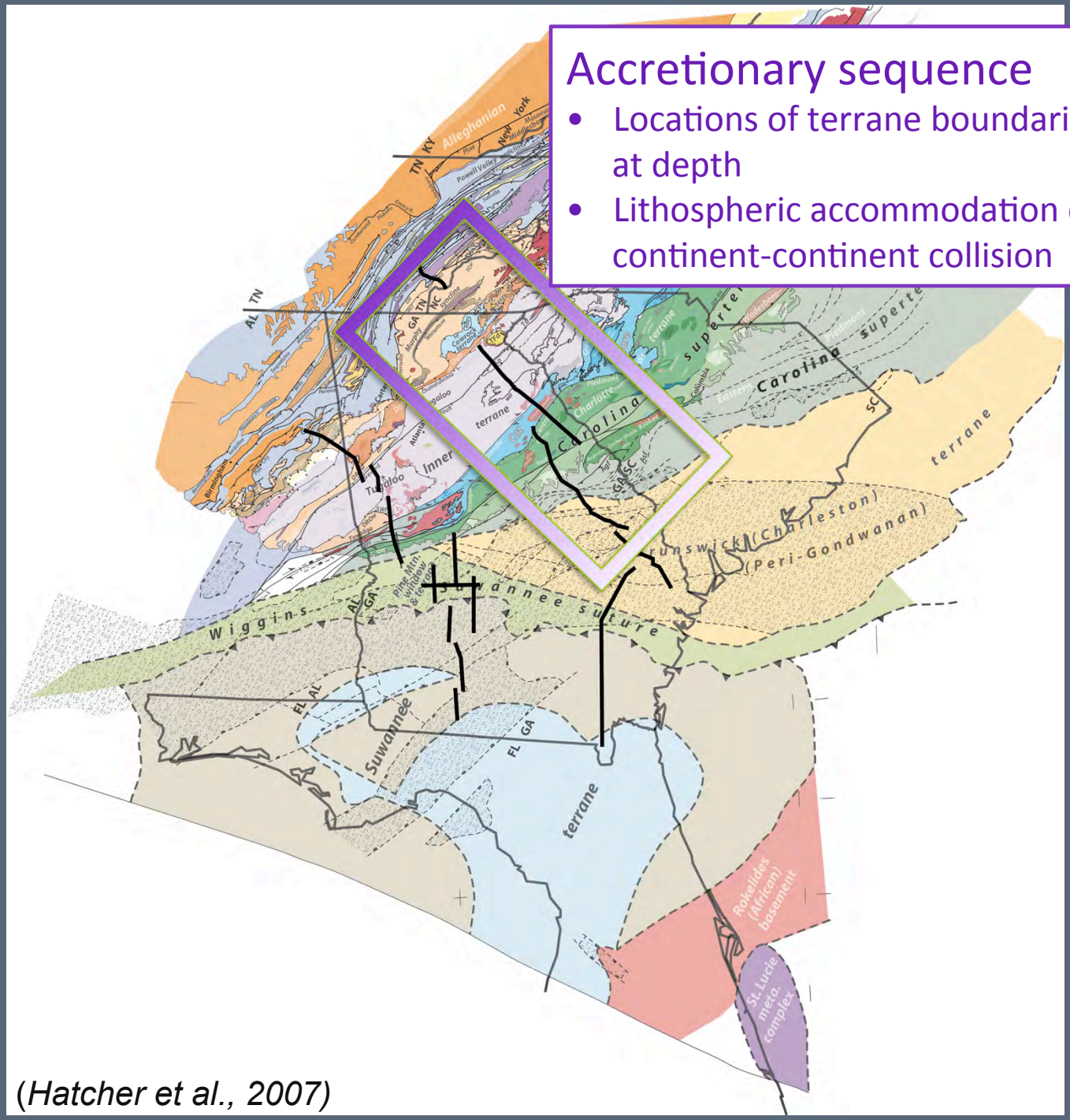


SESAME

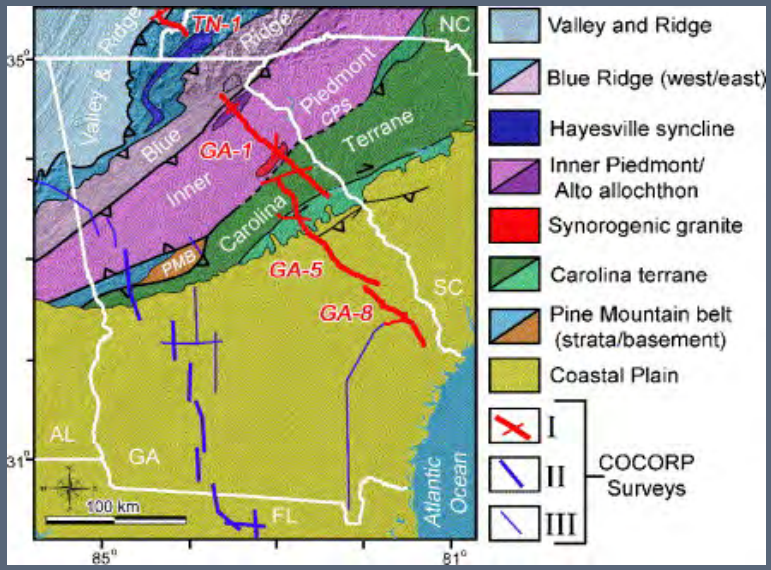
- 5 km station spacing across the suture (~10 km minimum depth resolution).
- Together with TA, we will image crustal and upper mantle structures associated with the suture and subsequent rifting



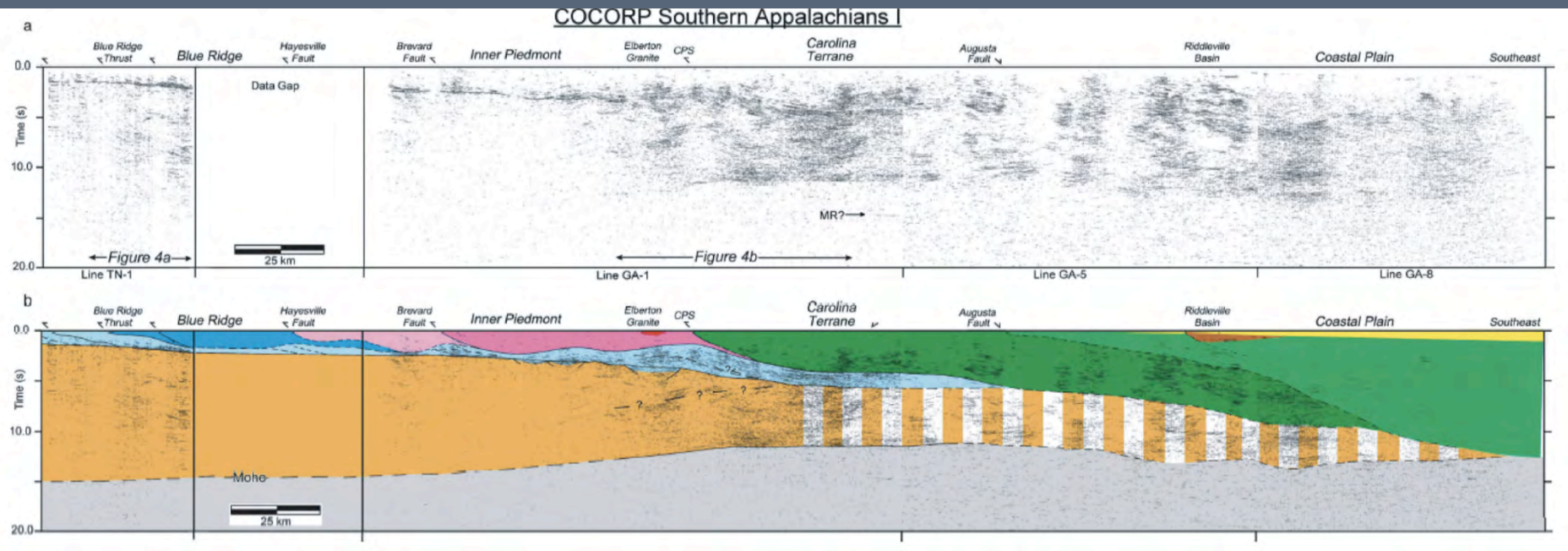
(*Hatcher et al., 2007*)



(*Hatcher et al., 2007*)

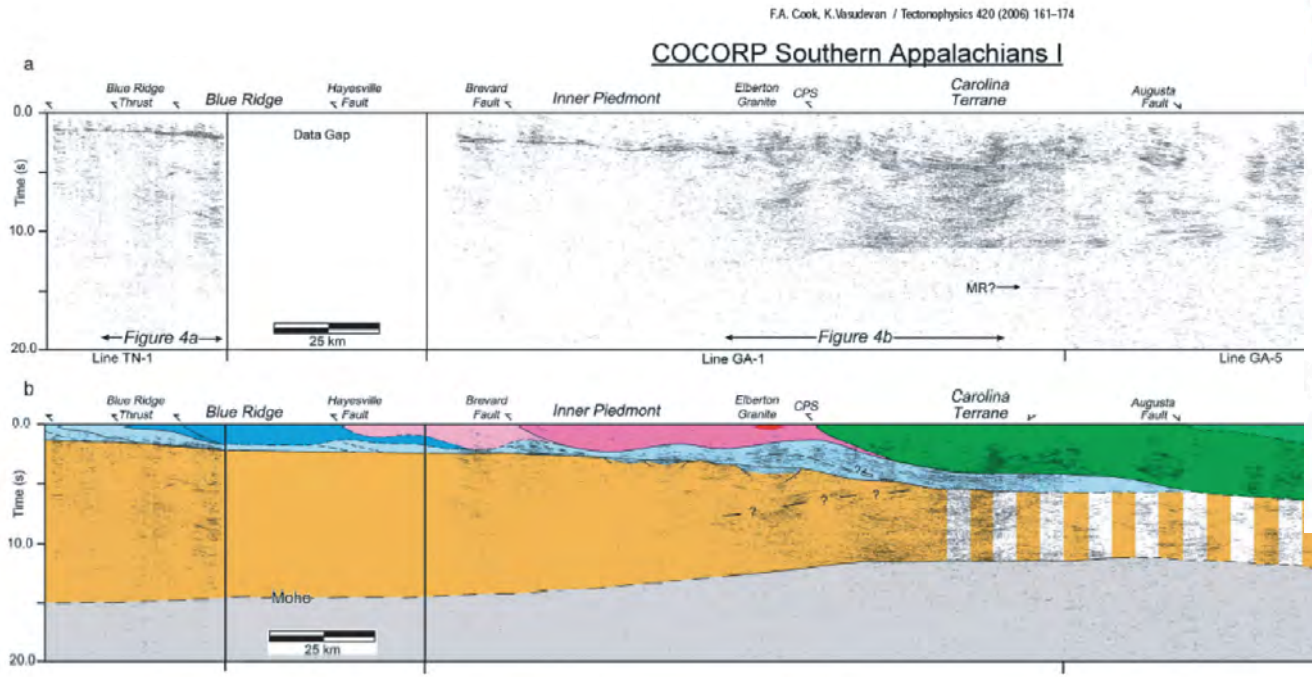


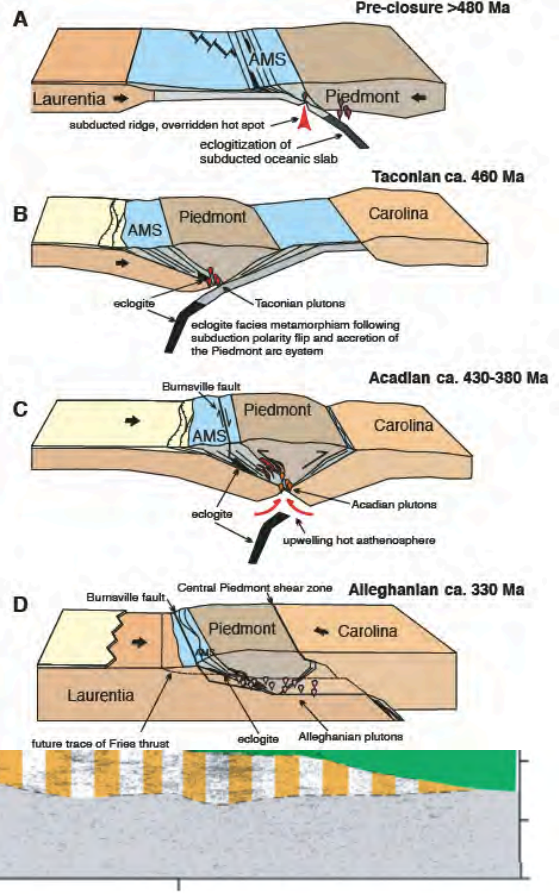
(Cook & Vasudevan, 2006)

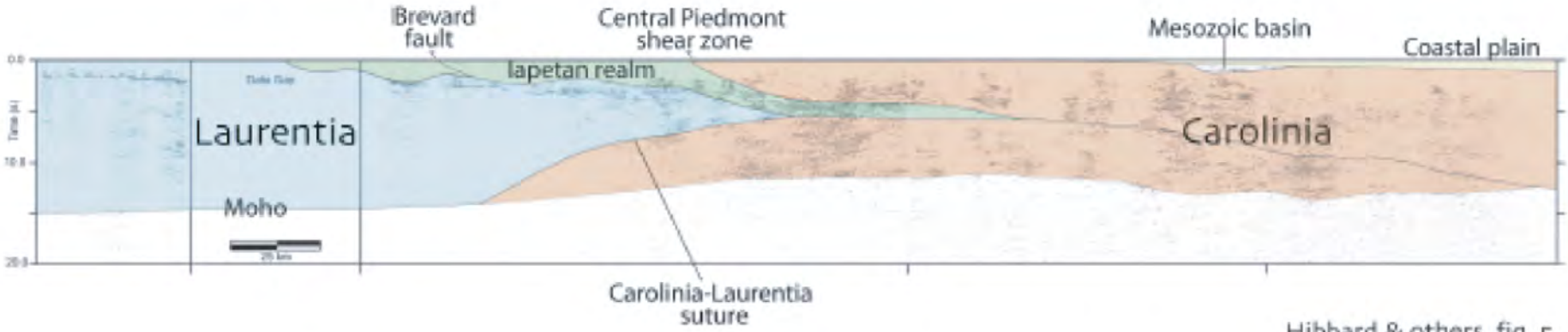


Reprocessed COCORP lines, and their interpretations:

Top profiles: Cook and Vasudevan, 2006
Bottom profile: Hibbard et al., 2007

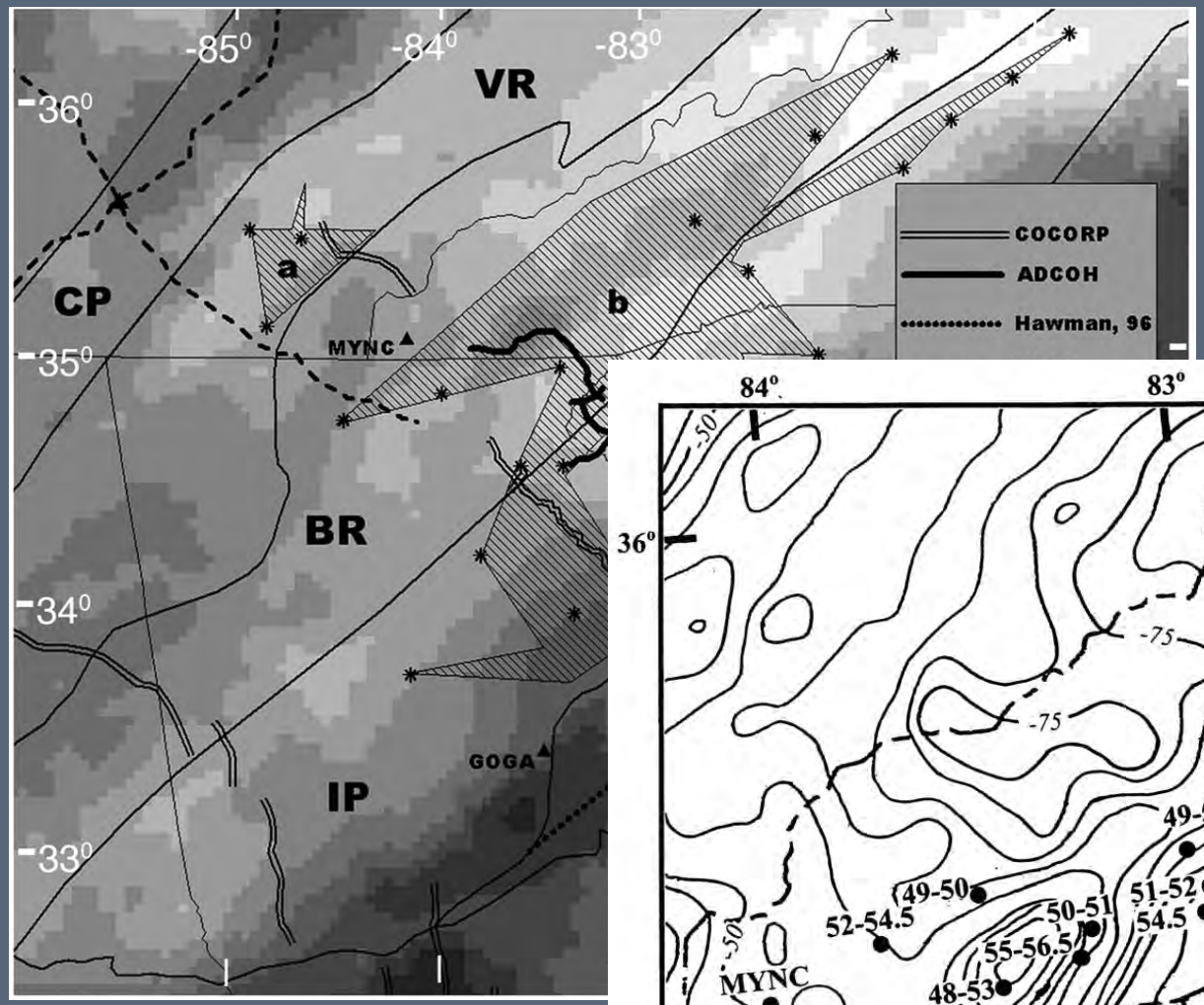




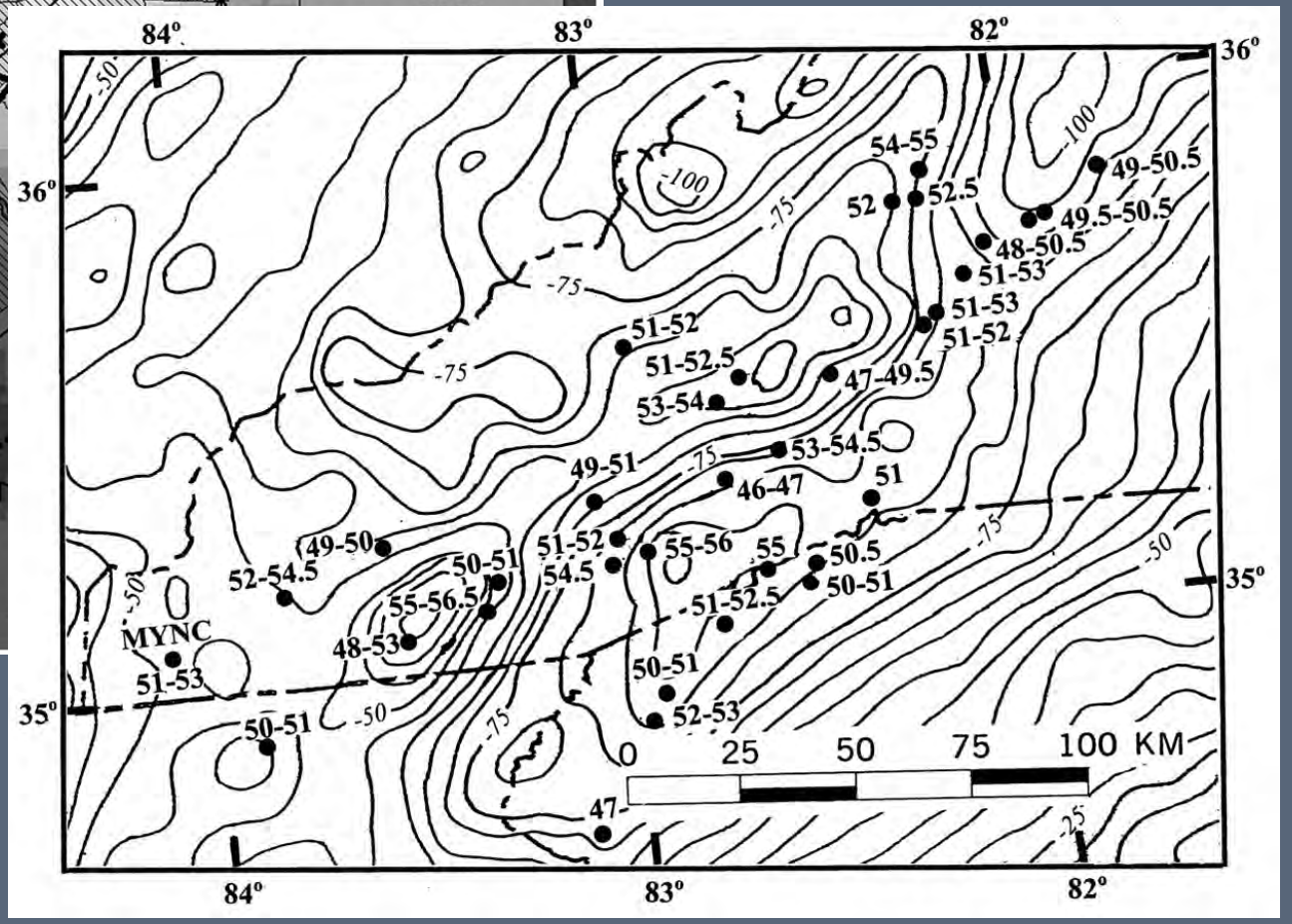


Hibbard & others, fig. 5

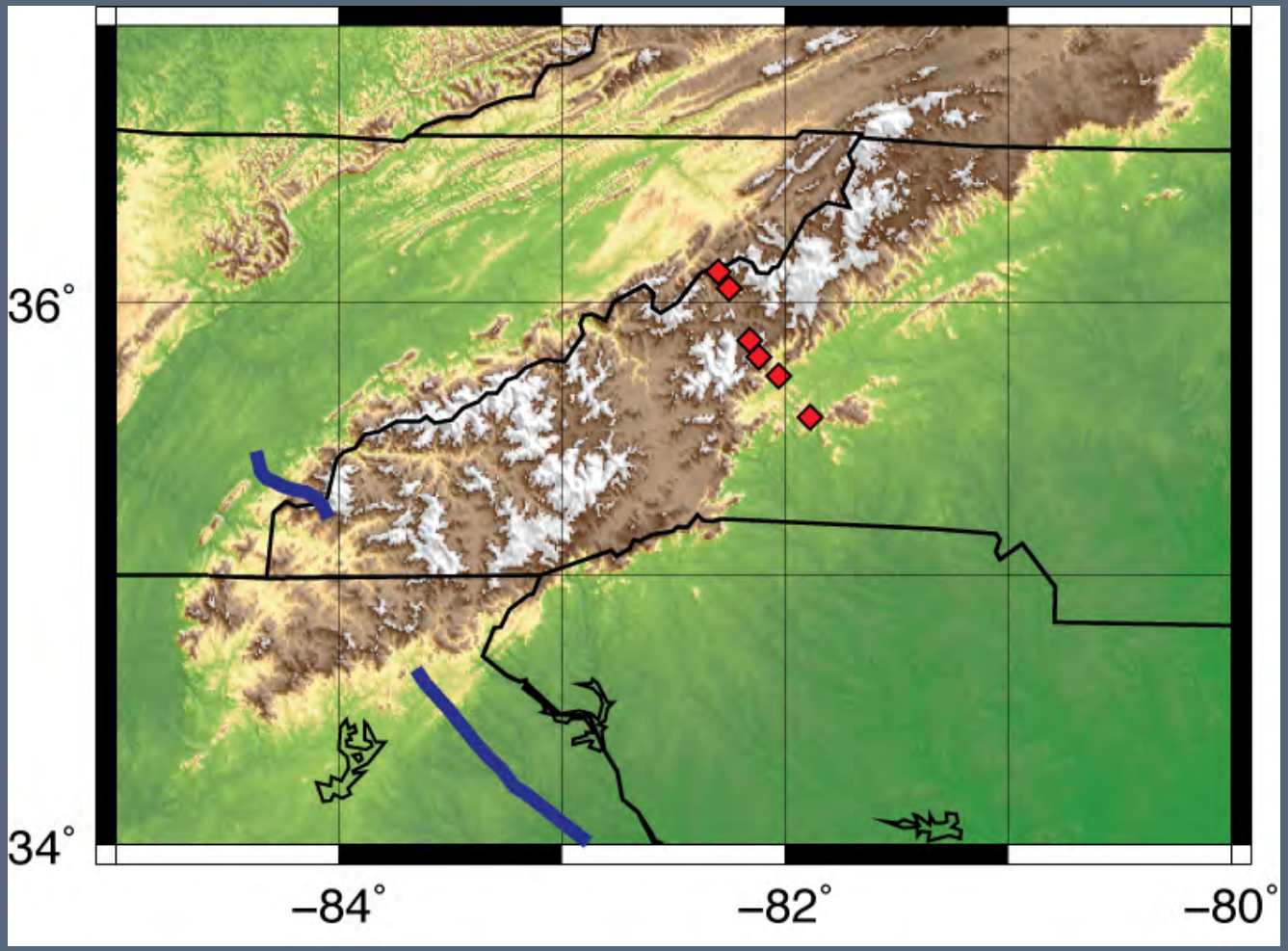
Two broadbands, dozens of mine blasts



Hawman et al. (2008) used mining blasts recorded at the two



Appalachian Seismic Transect (AST)



6 broadbands

12 months of data

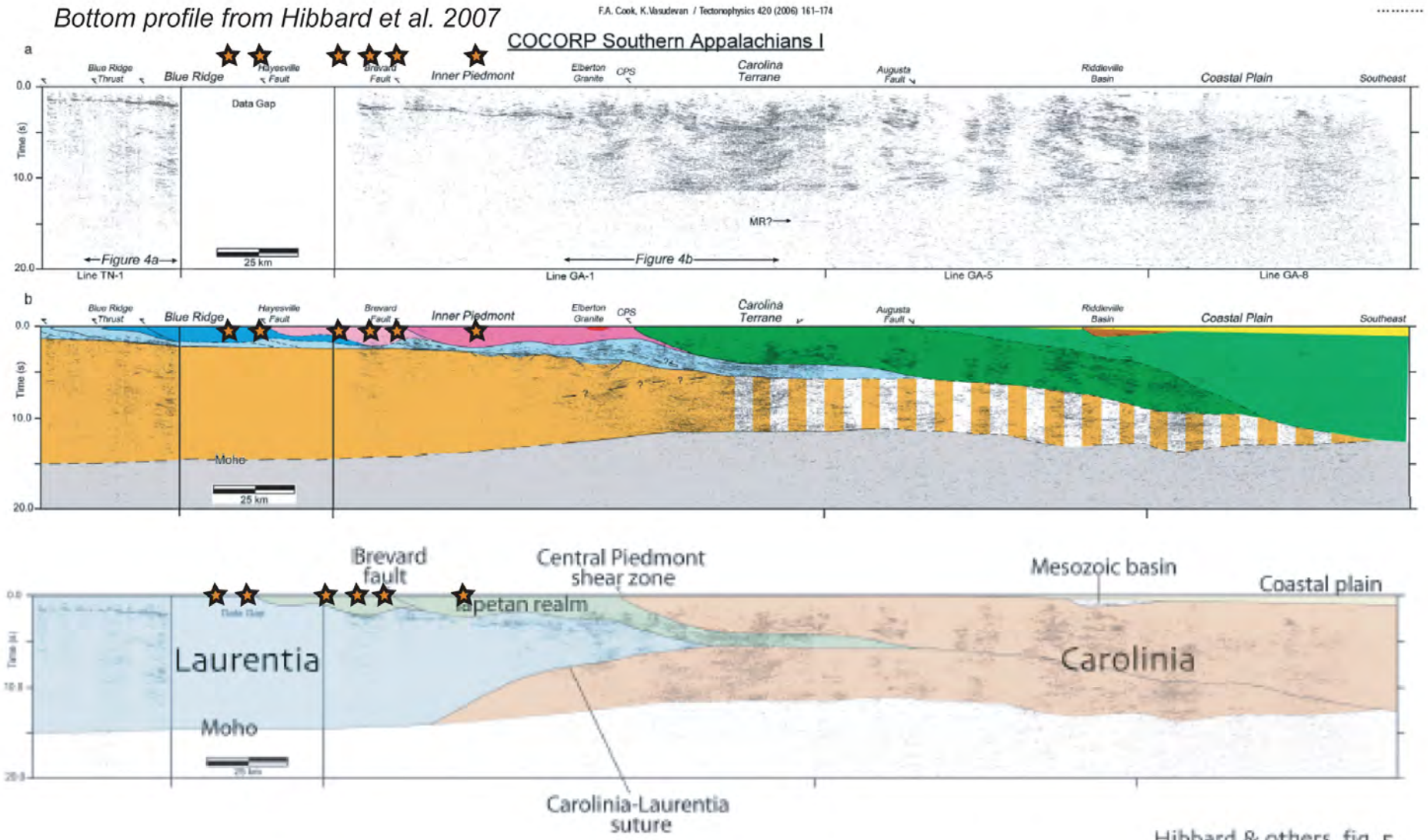
Transect across the high topography

Fills in the gap in the COCORP line

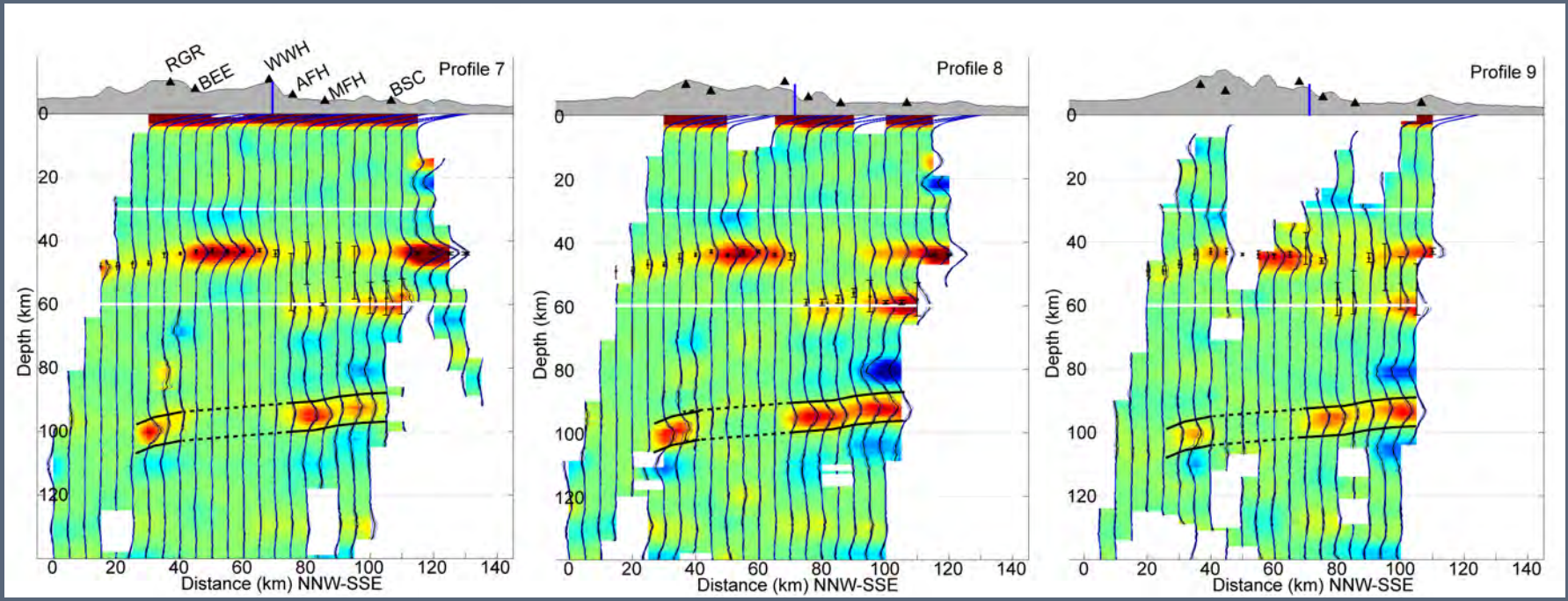
Reprocessed COCORP lines, and their interpretations:

Top profiles from Cook & Vasudevan, 2006

Bottom profile from Hibbard et al. 2007



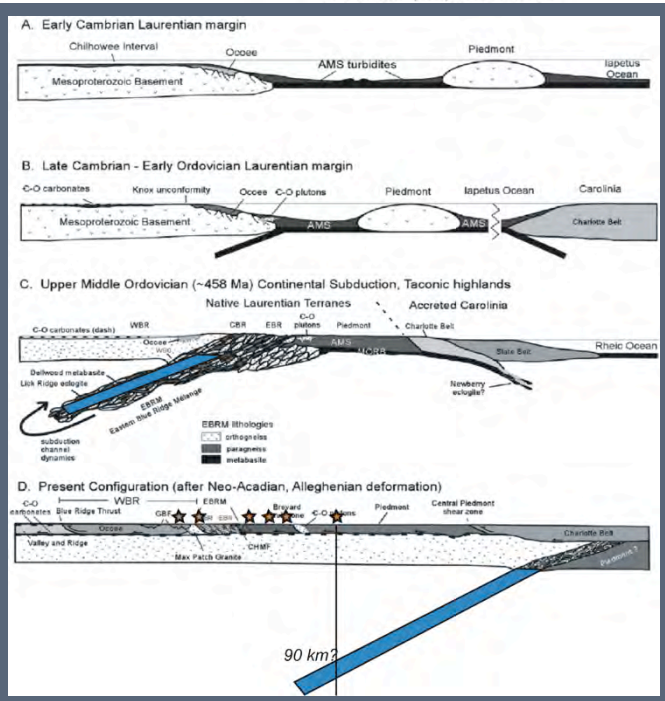
Hibbard & others, fig. 5



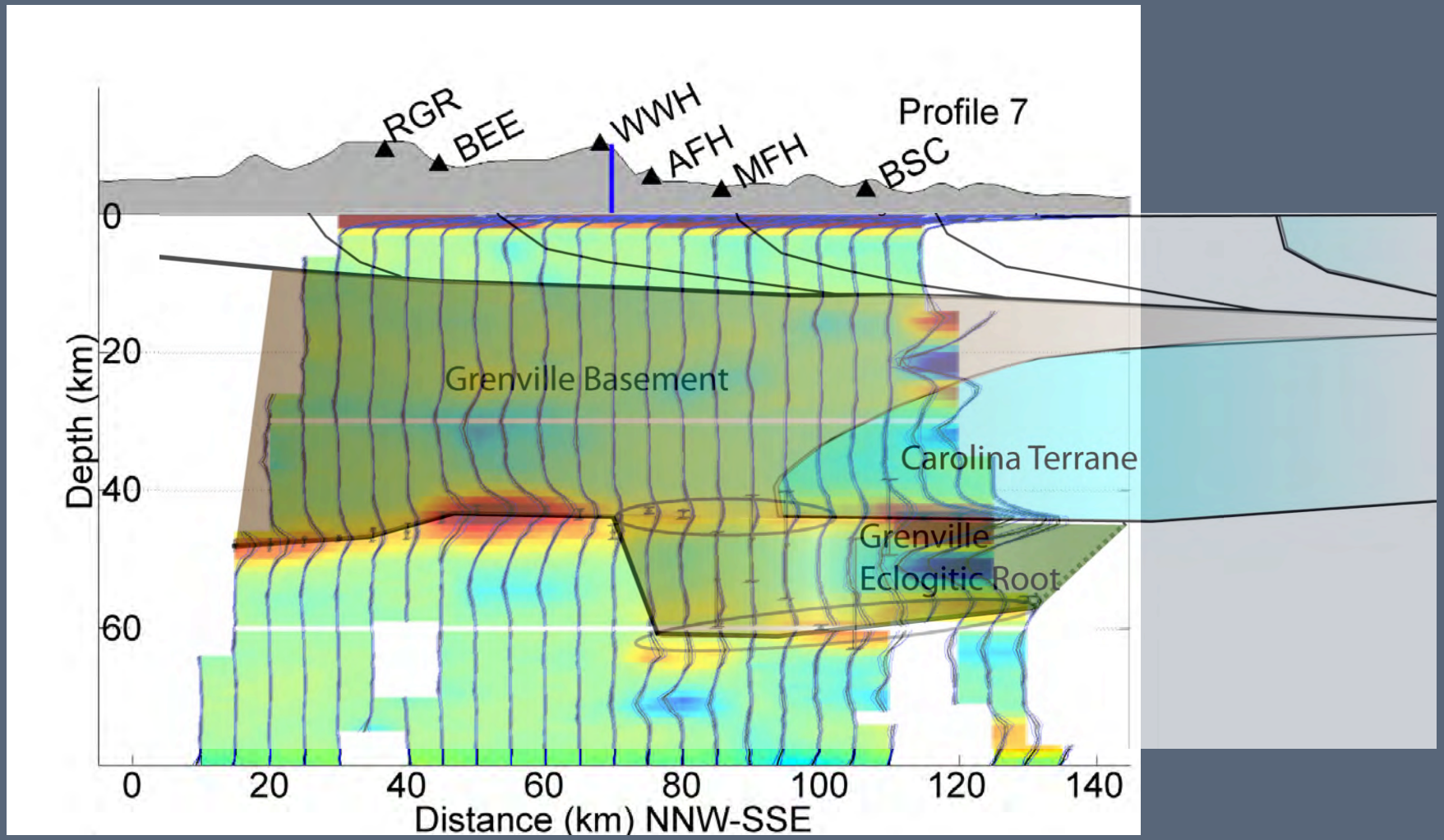
Things we didn't expect to find (but did)

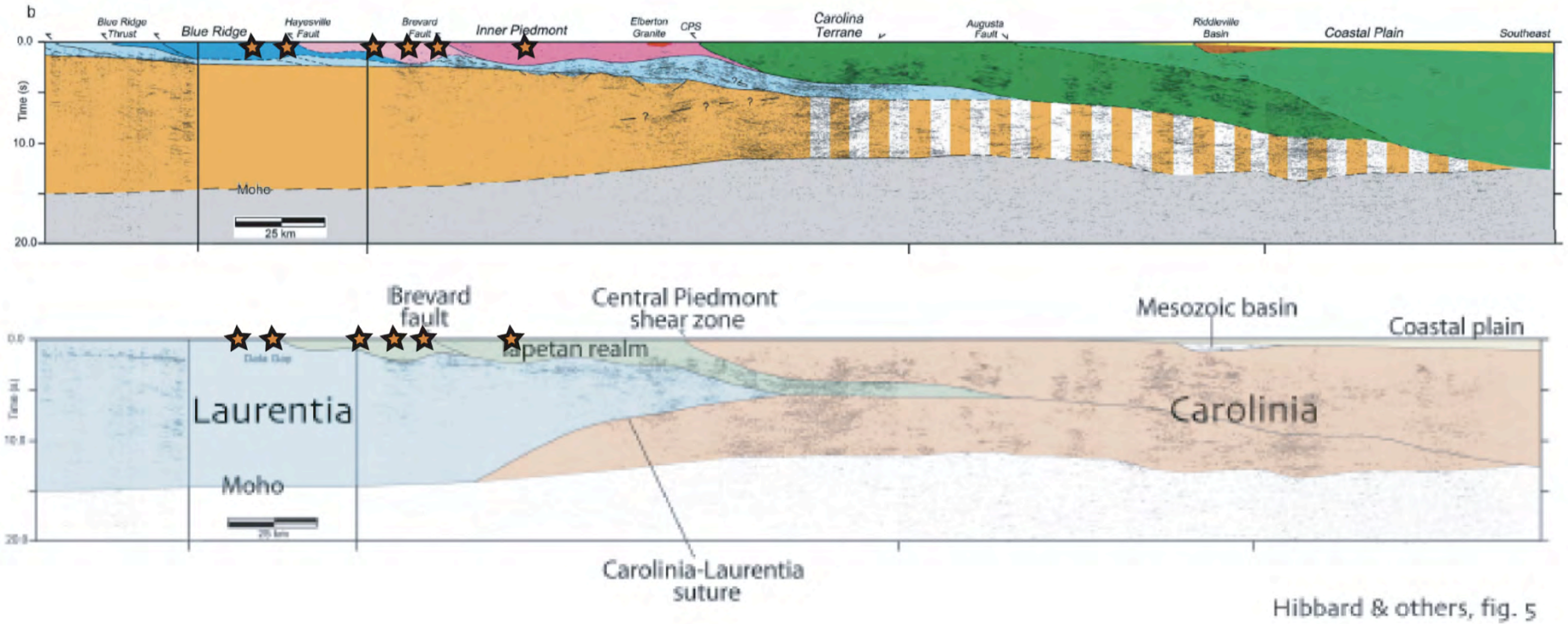
Discontinuous West-dipping arrival at 90 – 110 km depth

Possibly a fossil subducted slab?

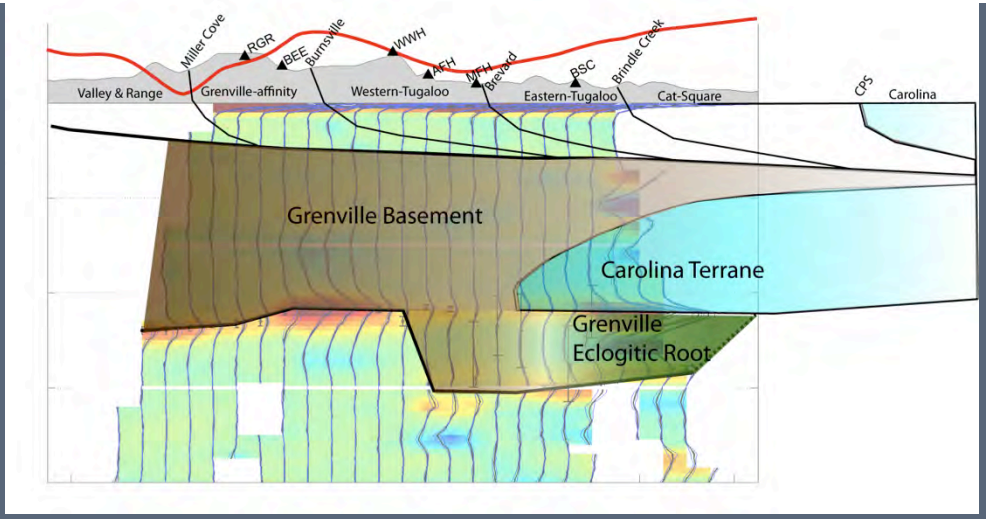


Moho Holes & Double Mohos
Downwelling (Moho Hole) + Eclogitic Crust (Double Moho) = Underthrusting of the lower crust = Tectonic Wedging

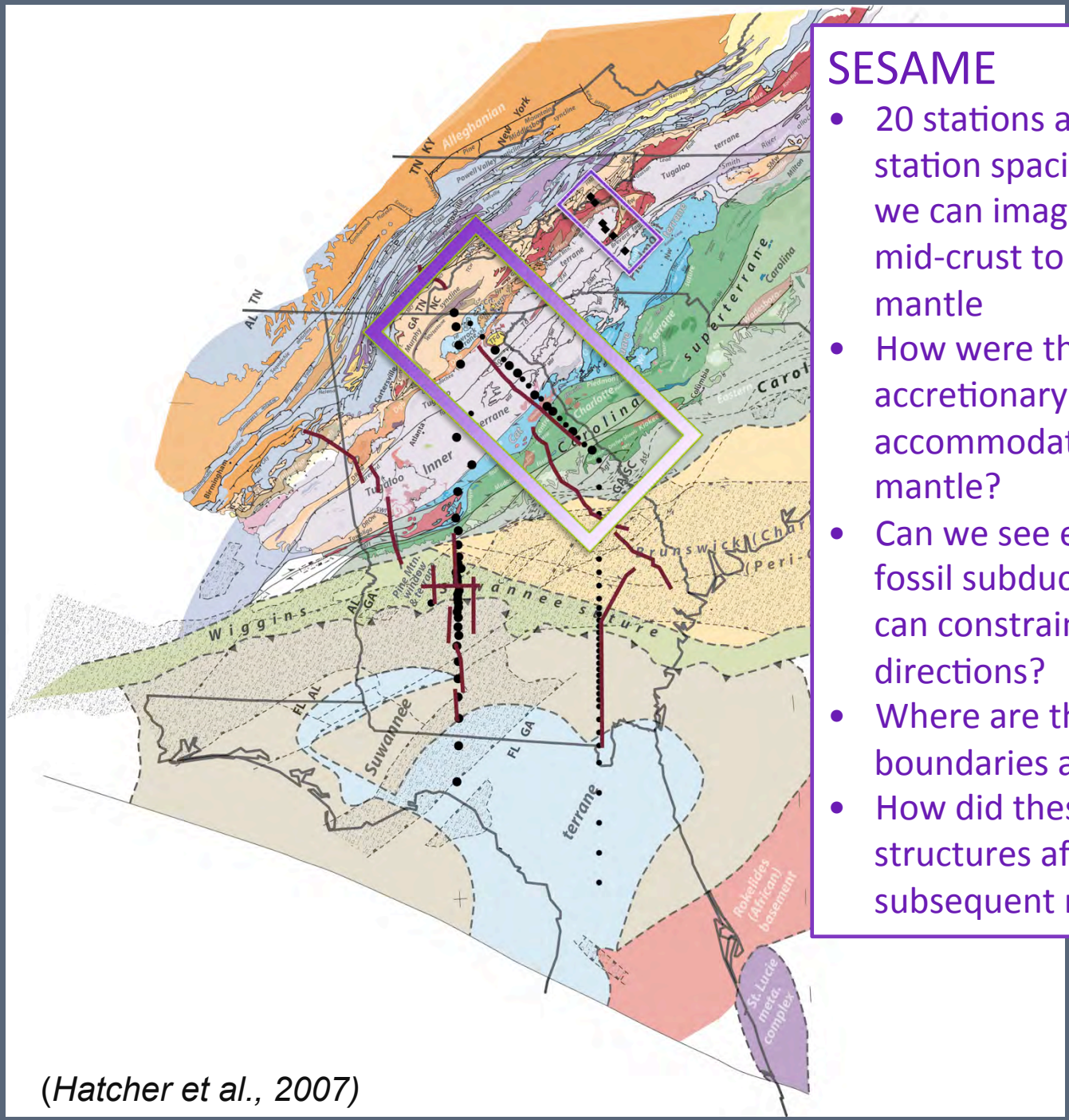




Hibbard & others, fig. 5



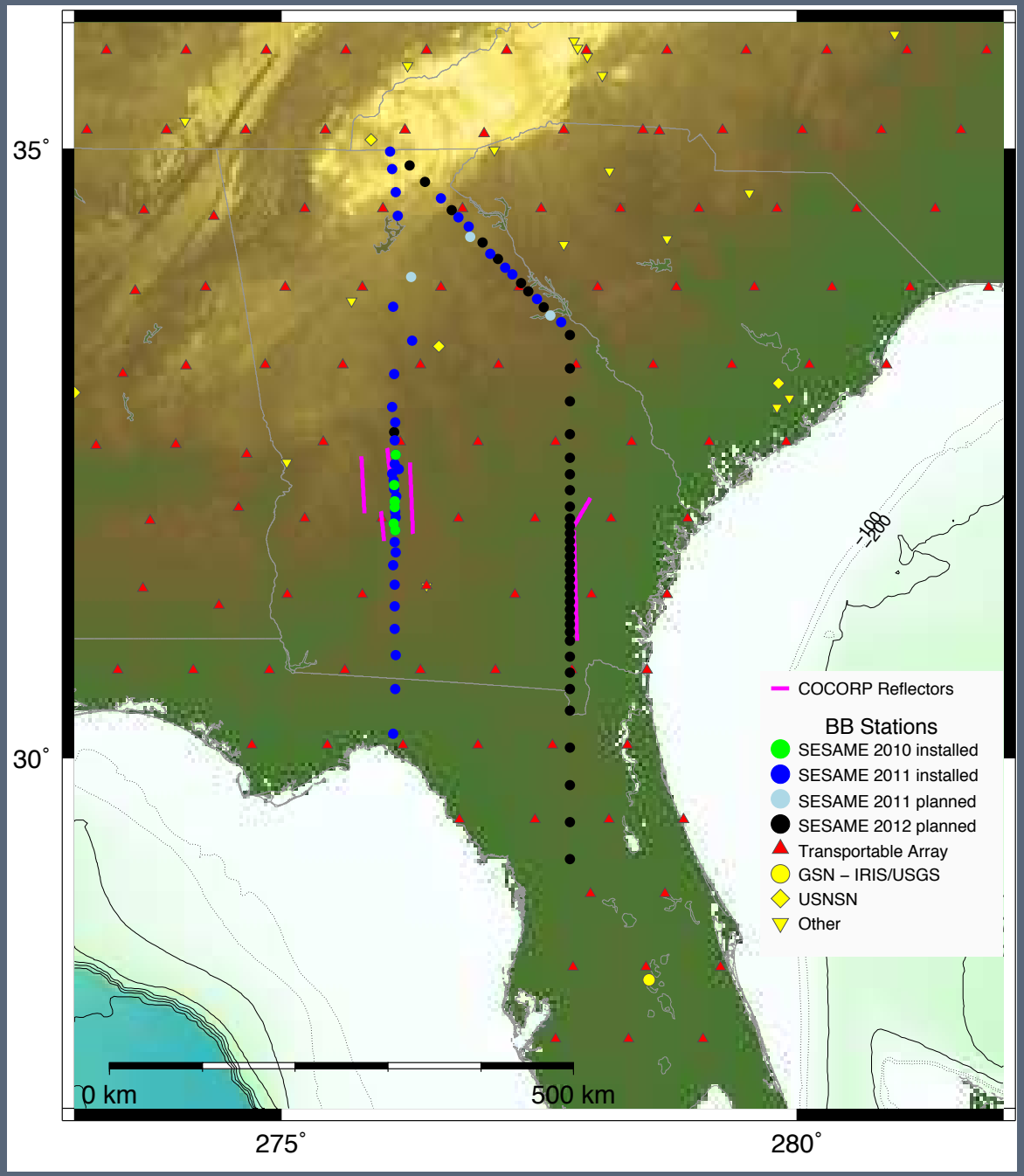
Looks kind of like Hibbard's interpretation of the reprocessed COCORP lines!



(*Hatcher et al., 2007*)

SESAME

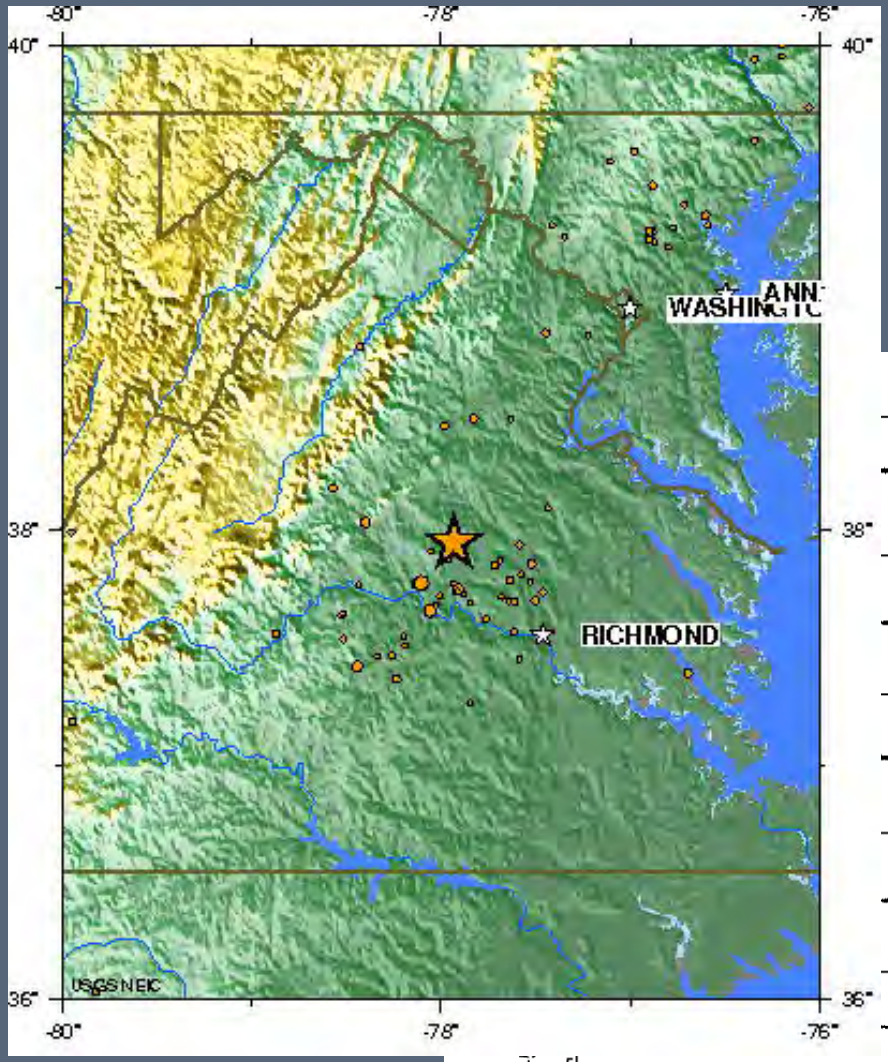
- 20 stations at ~10 km station spacing means we can image from the mid-crust to upper mantle
- How were these accretionary events accommodated in the mantle?
- Can we see evidence of fossil subduction that can constrain dip directions?
- Where are the terrane boundaries at depth?
- How did these structures affect subsequent rifting?

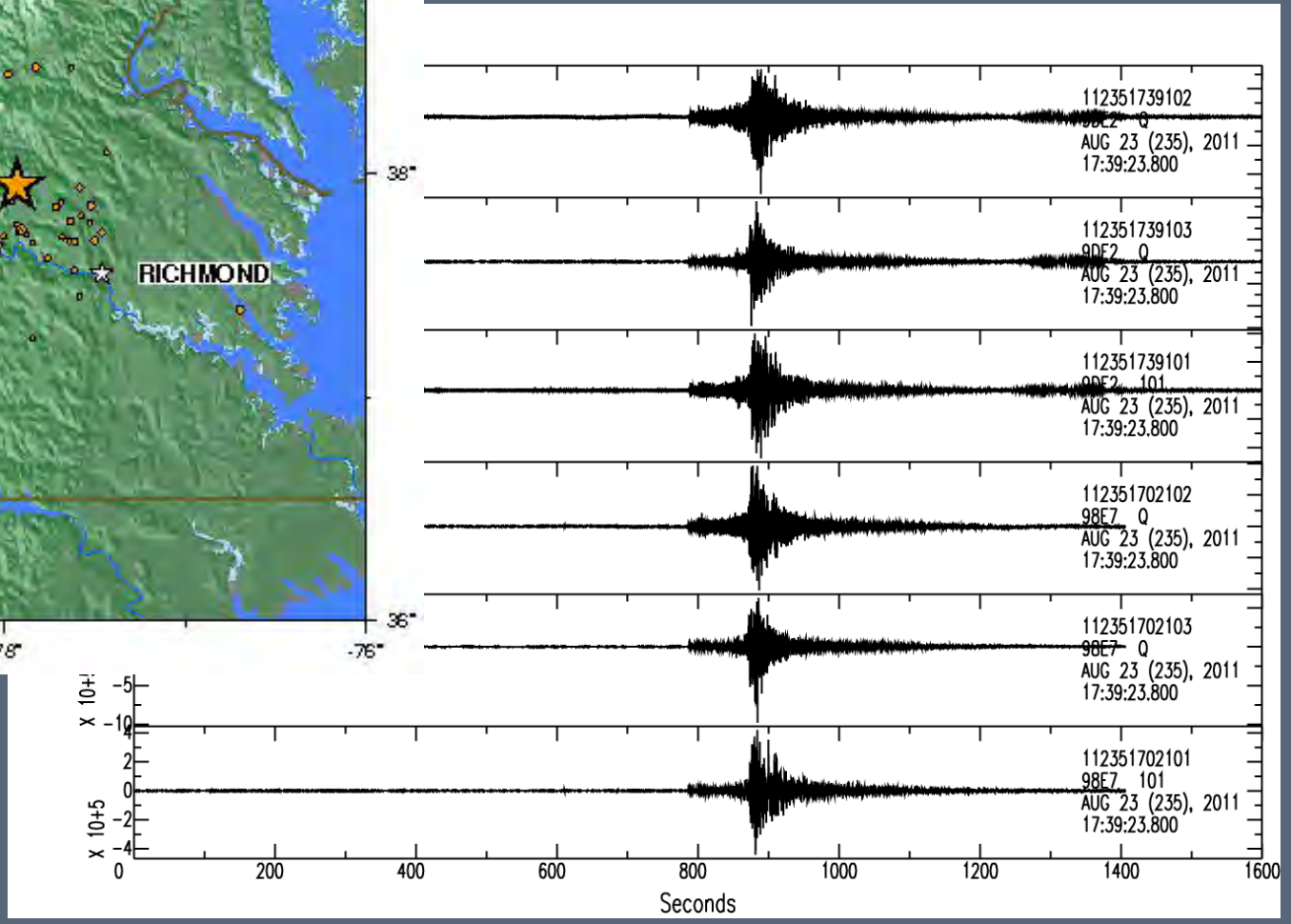


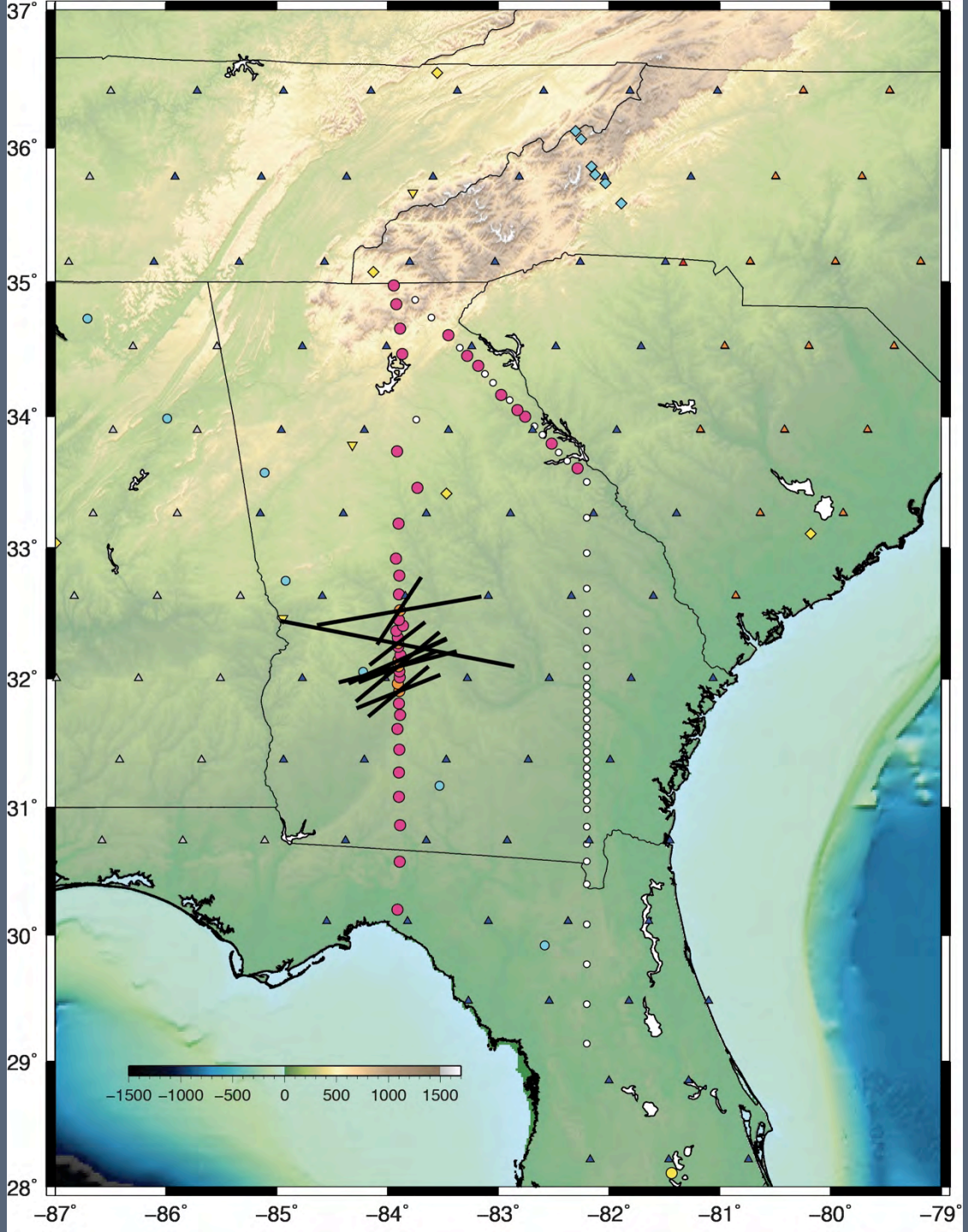
Preliminary Data and Results

Magnitude 5.8 VIRGINIA

Tuesday, August 23, 2011 at 17:51:04 UTC

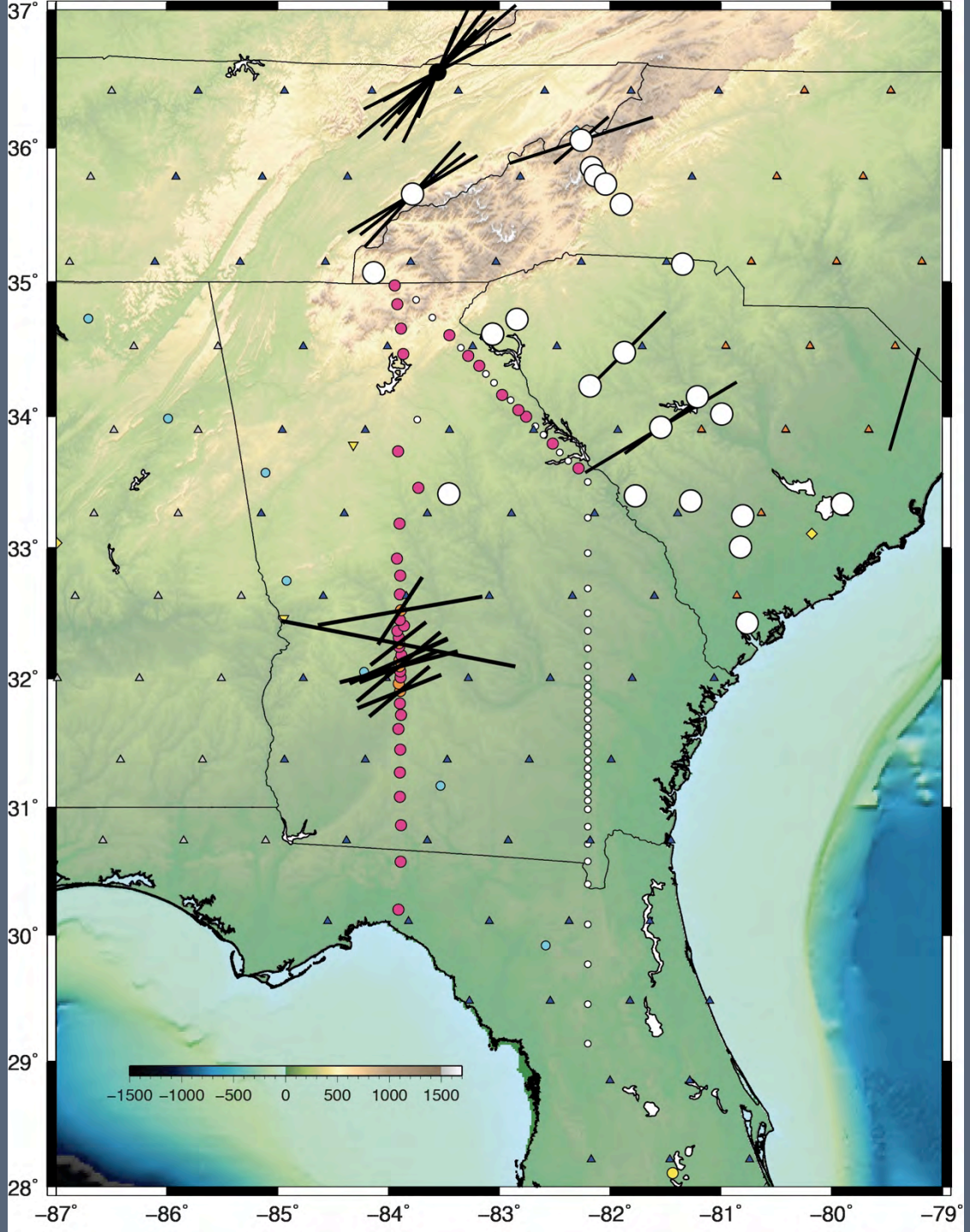






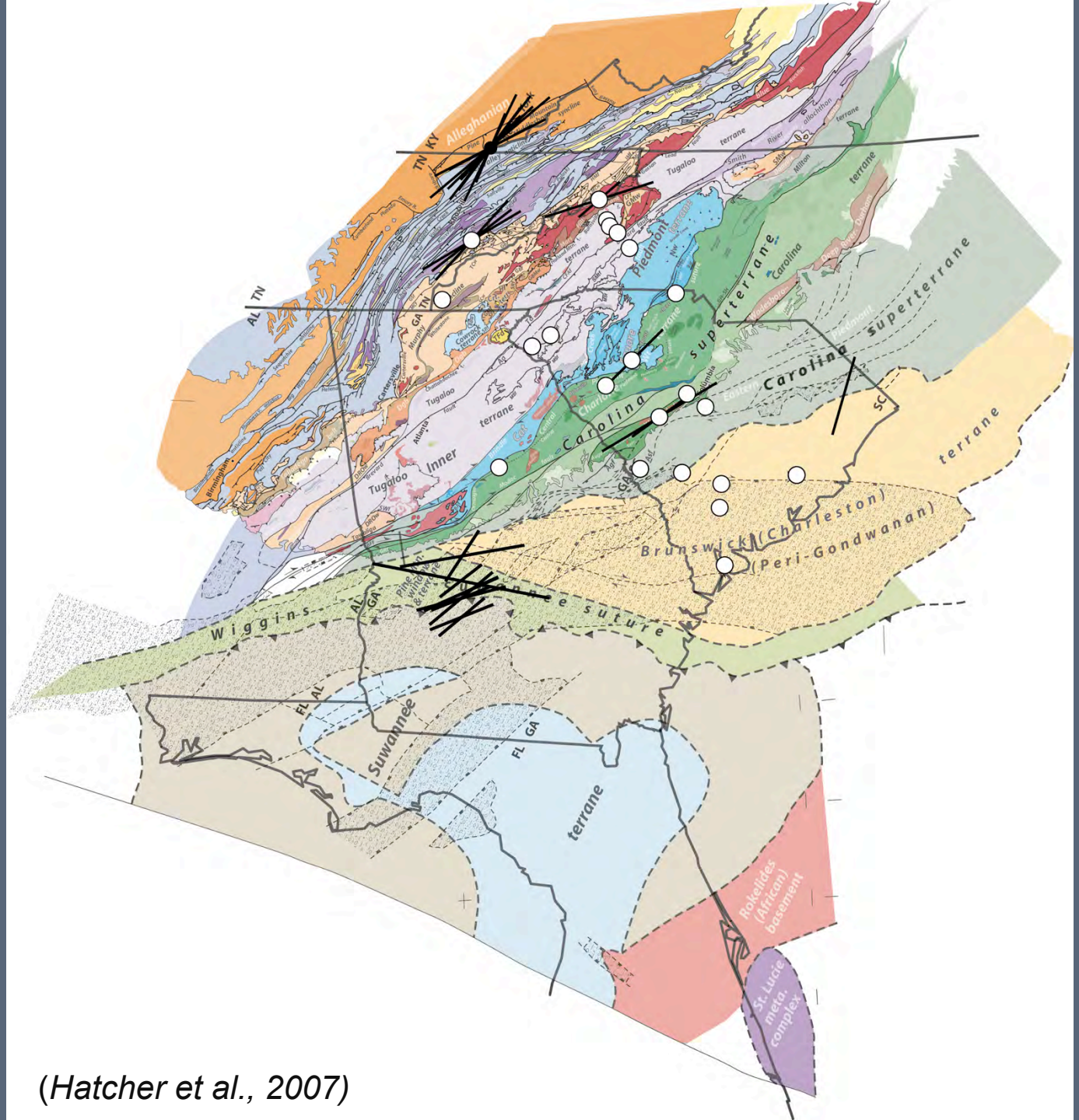
Preliminary SKS splitting results

(courtesy of Julia Macdougall)



Preliminary SKS splitting results

(courtesy of Julia Macdougall, Maureen Long, Emme Johnston)



(*Hatcher et al., 2007)*


Thank you
any questions?