

Surprising Magnetotelluric Results from the Eastern North American Margin

Benjamin S. Murphy

Gary D. Egbert

College of Earth, Ocean, and Atmospheric Sciences

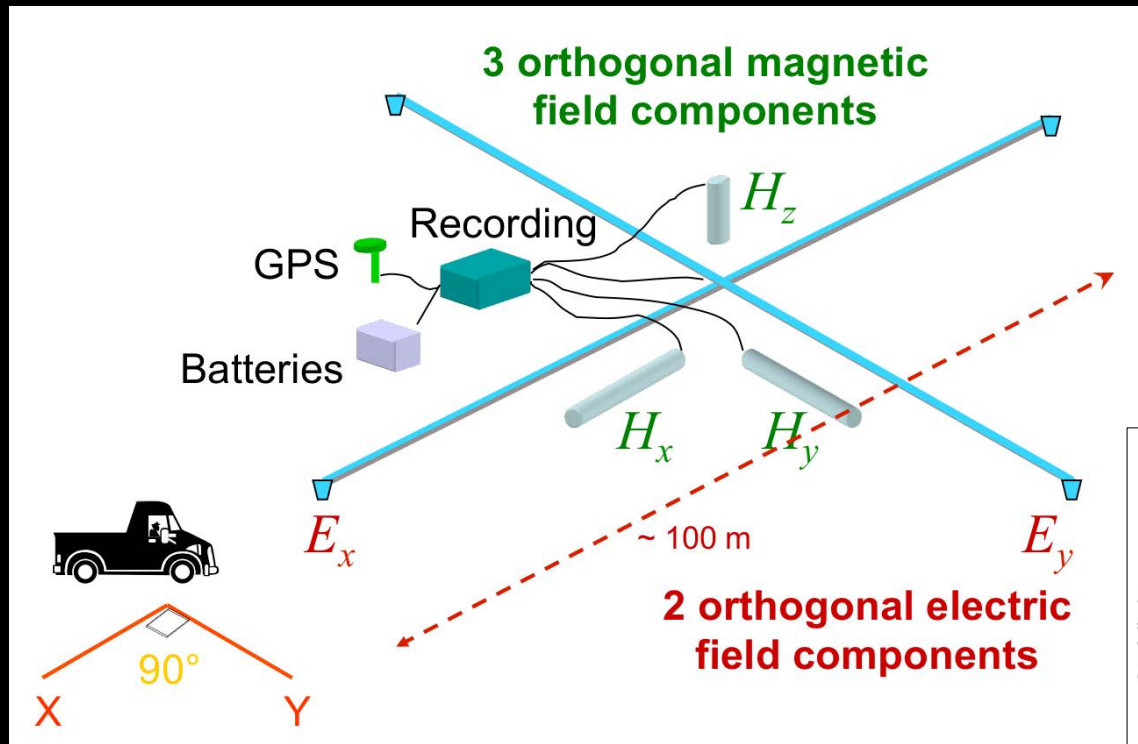
Oregon State University

OSU

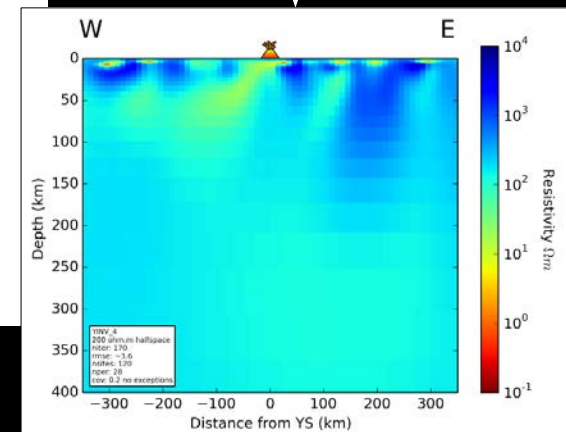
Oregon State
UNIVERSITY

College of Earth, Ocean,
and Atmospheric Sciences

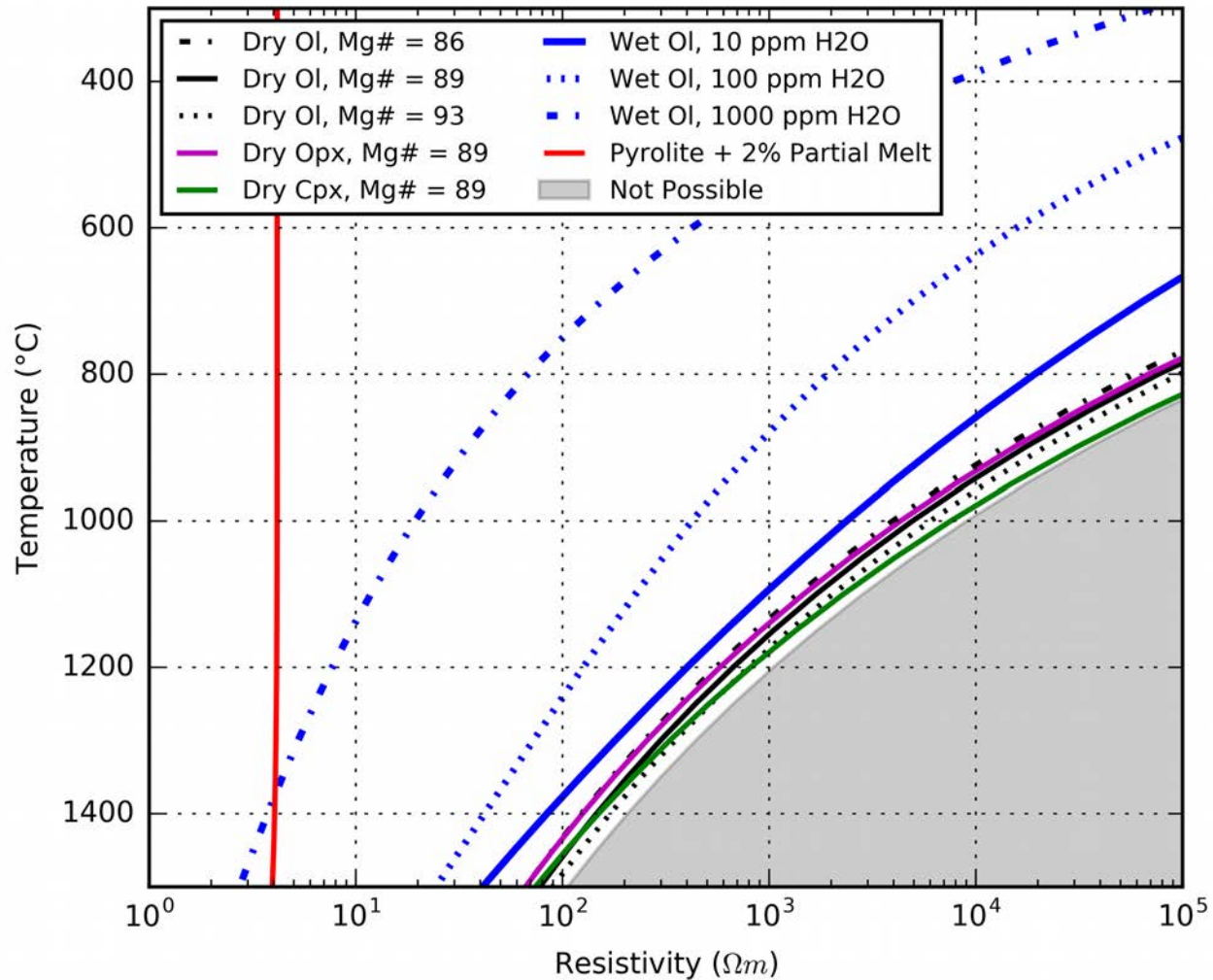
The Magnetotelluric Method



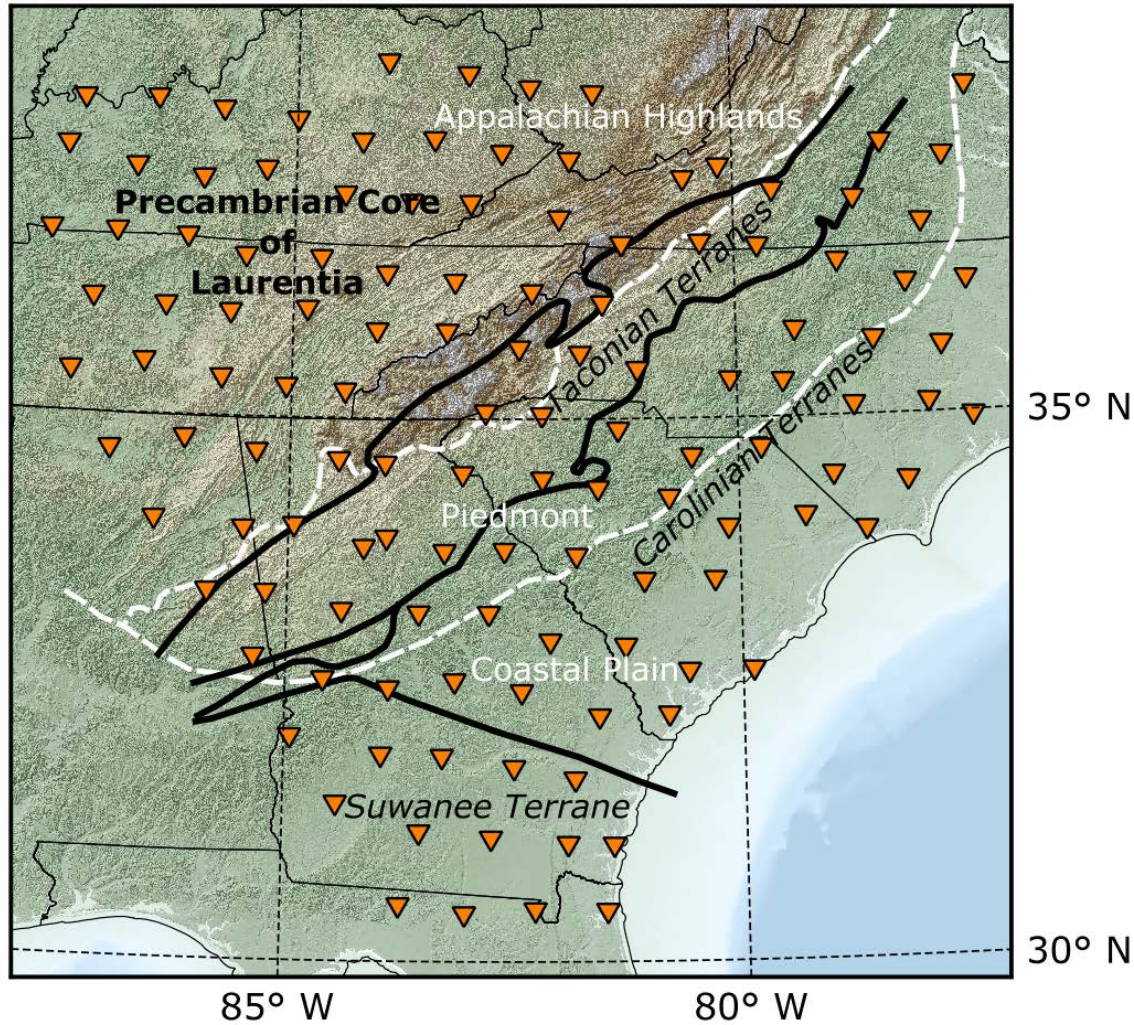
G.D. Egbert



Electrical Conductivity in the Mantle

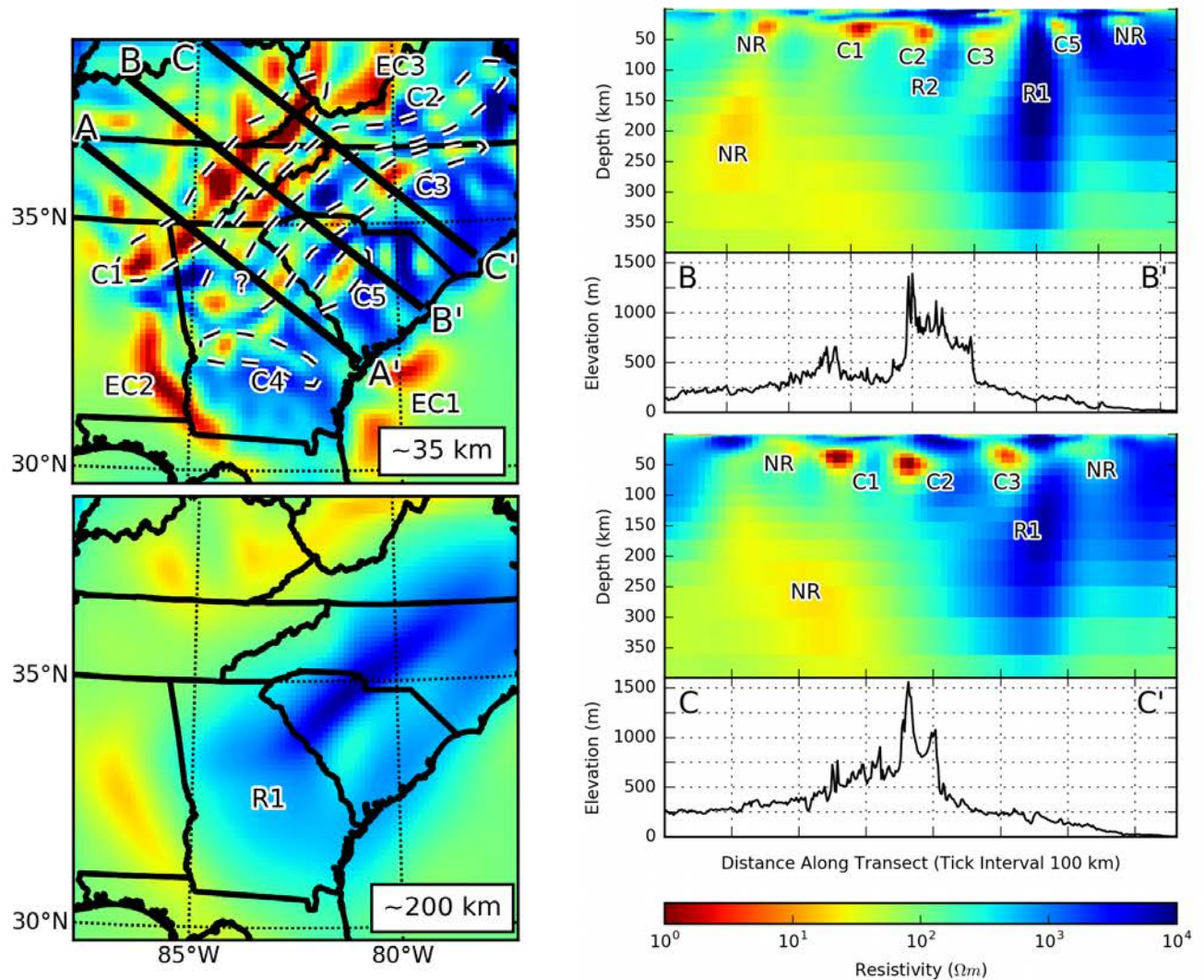


Southeastern United States MT

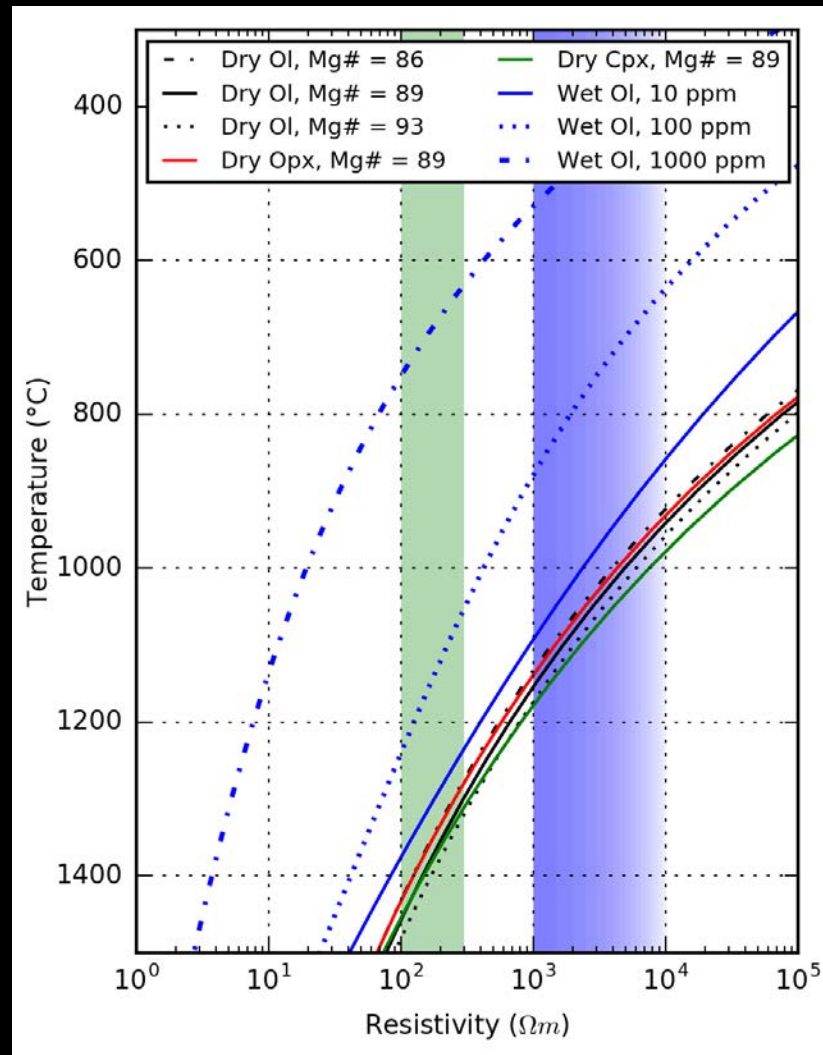


Murphy &
Egbert,
EPSL, 2017

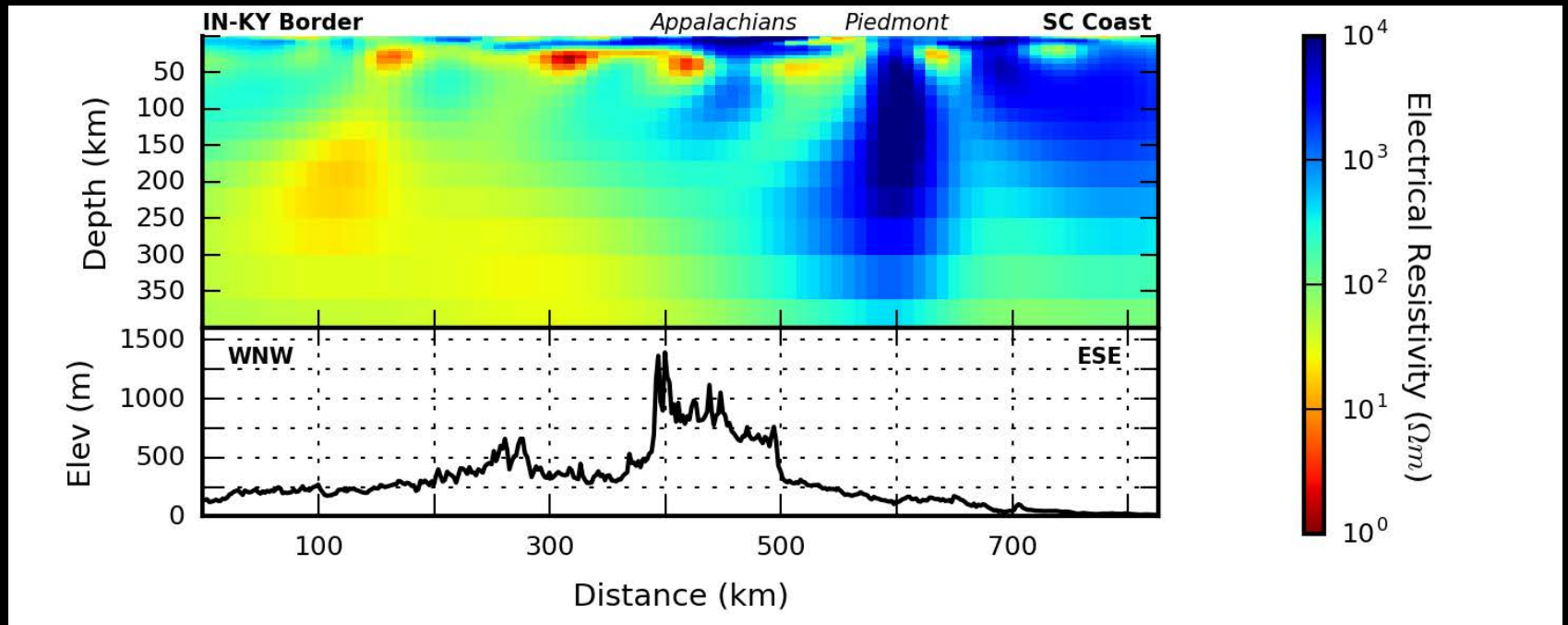
Inverse Solution: Anomalous Resistor



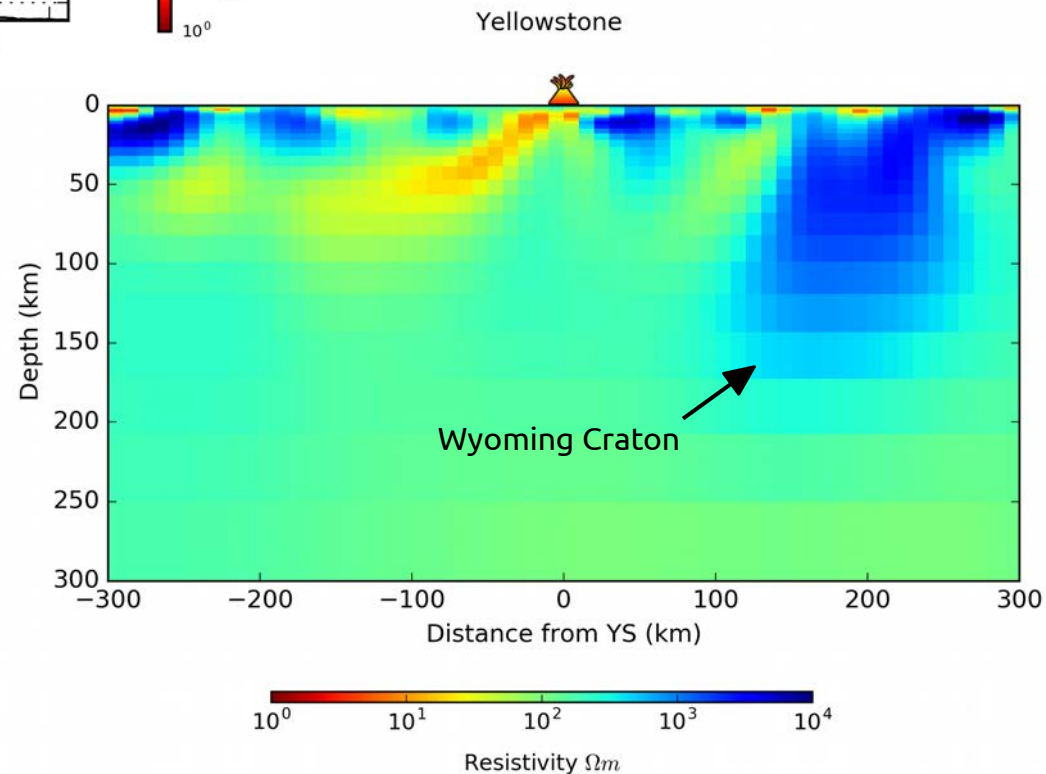
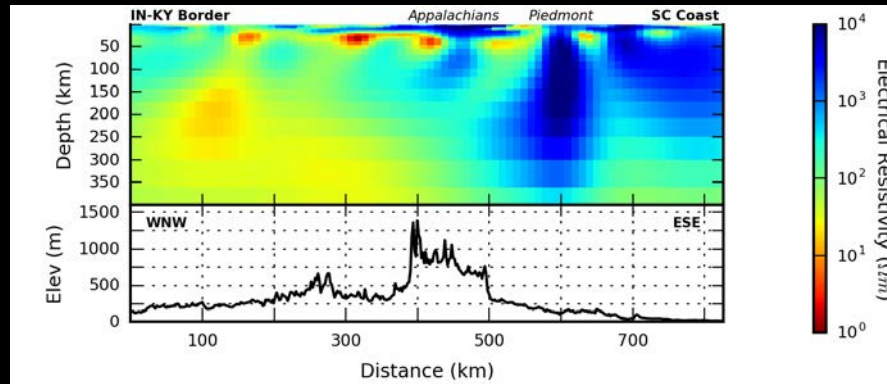
Interpreting Electrical Resistivity



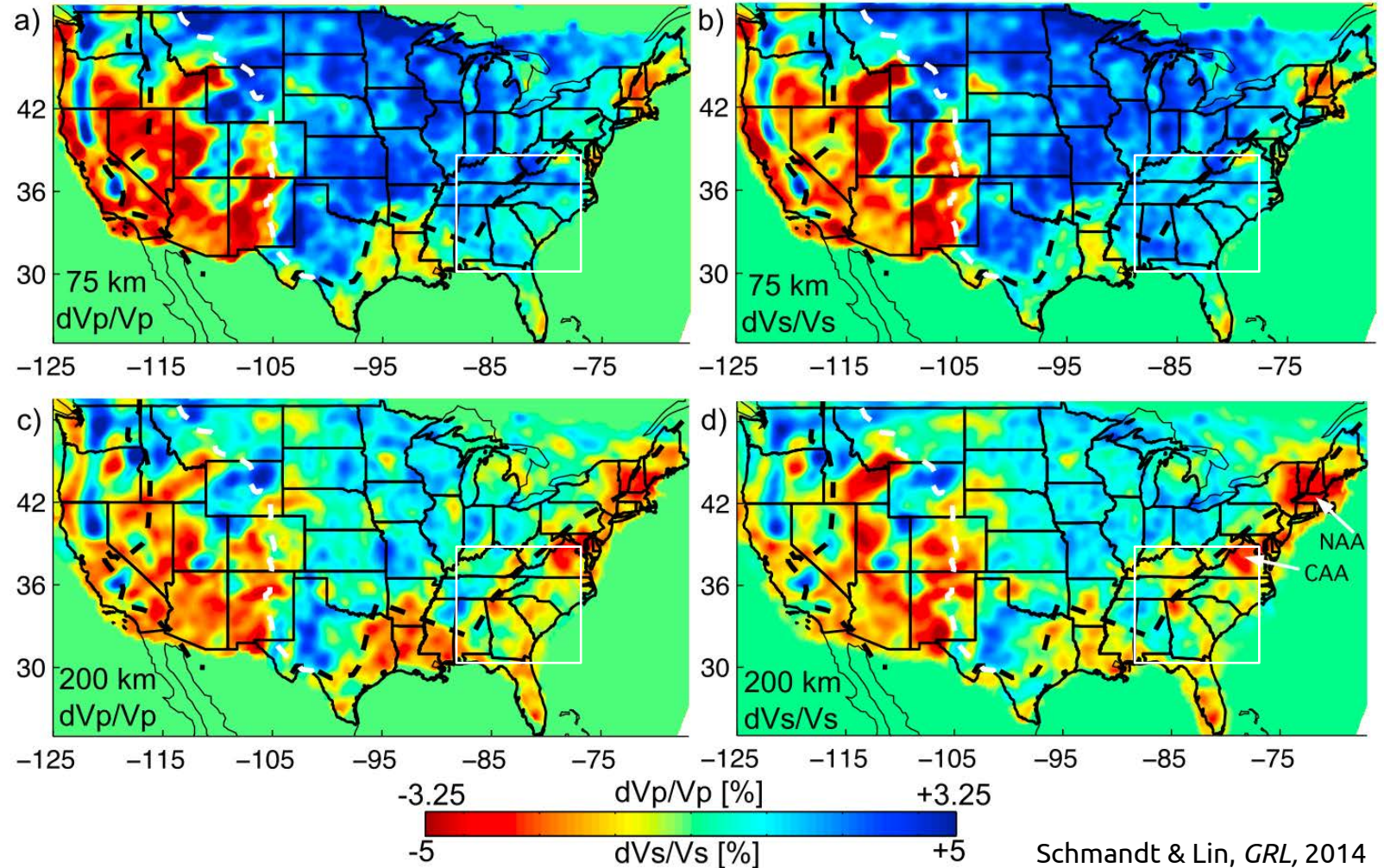
The Piedmont Resistor



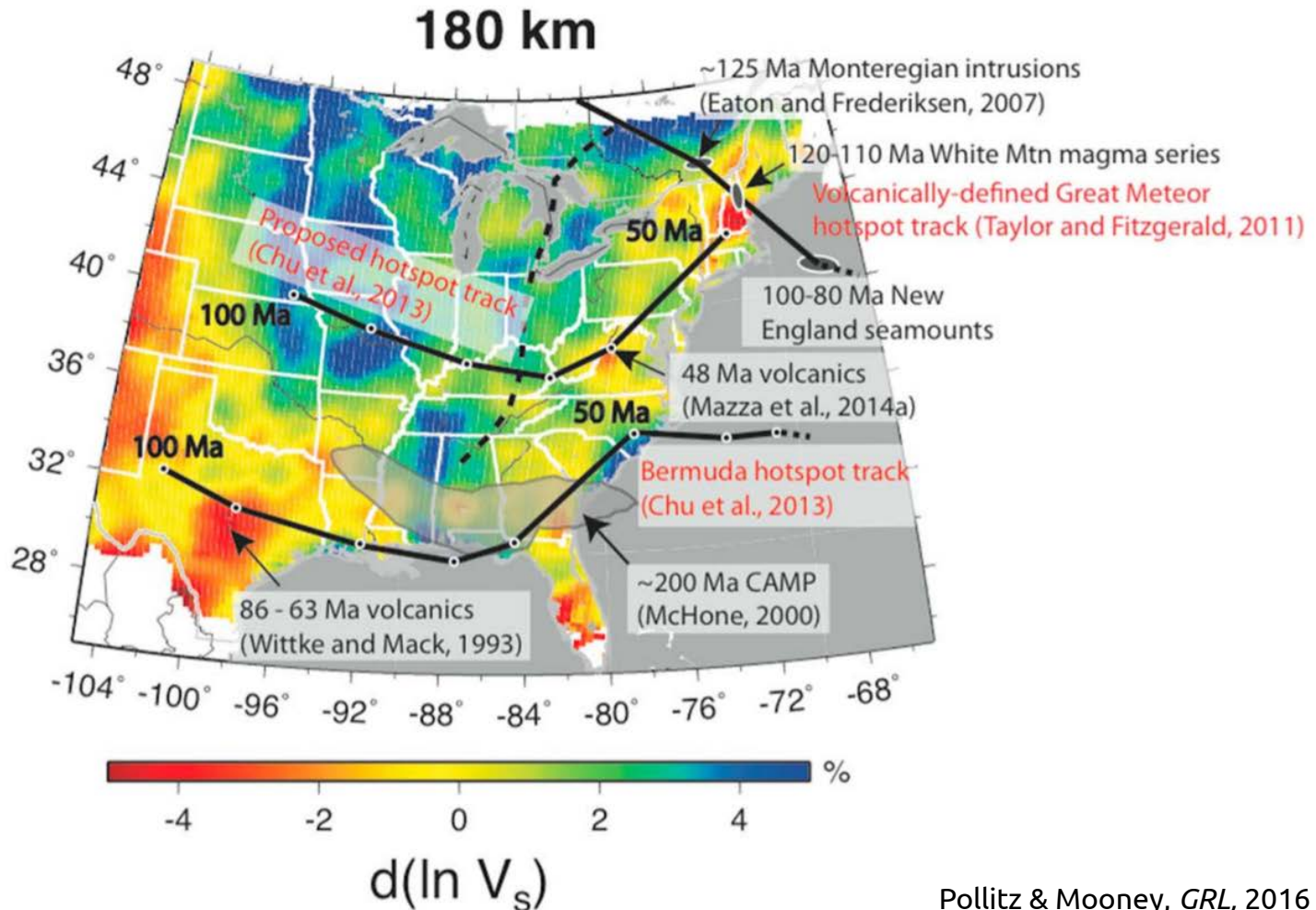
More Resistive Than Cratonic Lithosphere?!



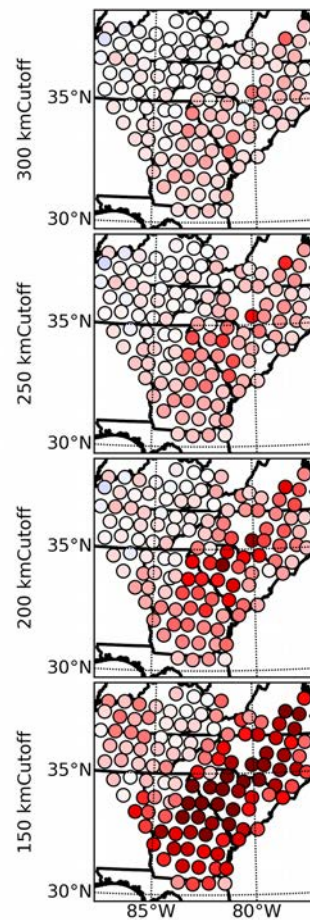
Seismic Studies



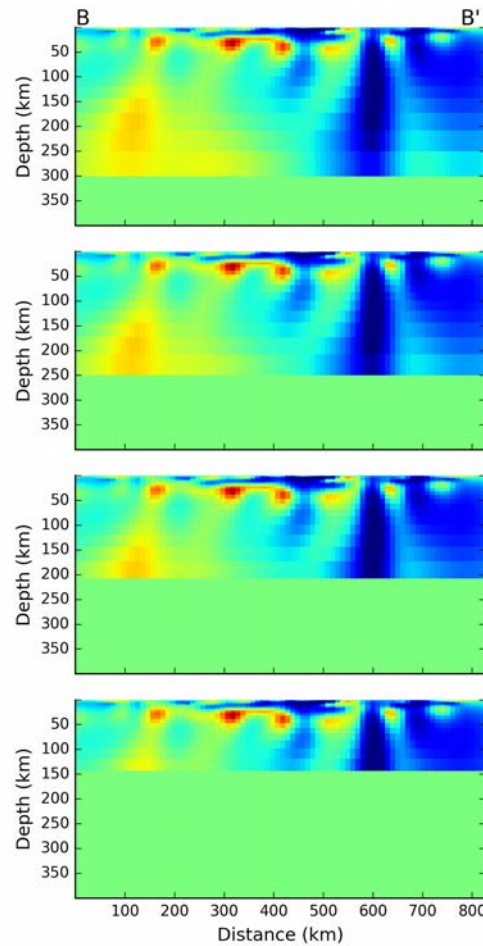
Seismic Studies



Resolution Tests

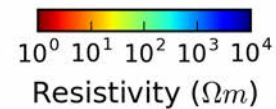
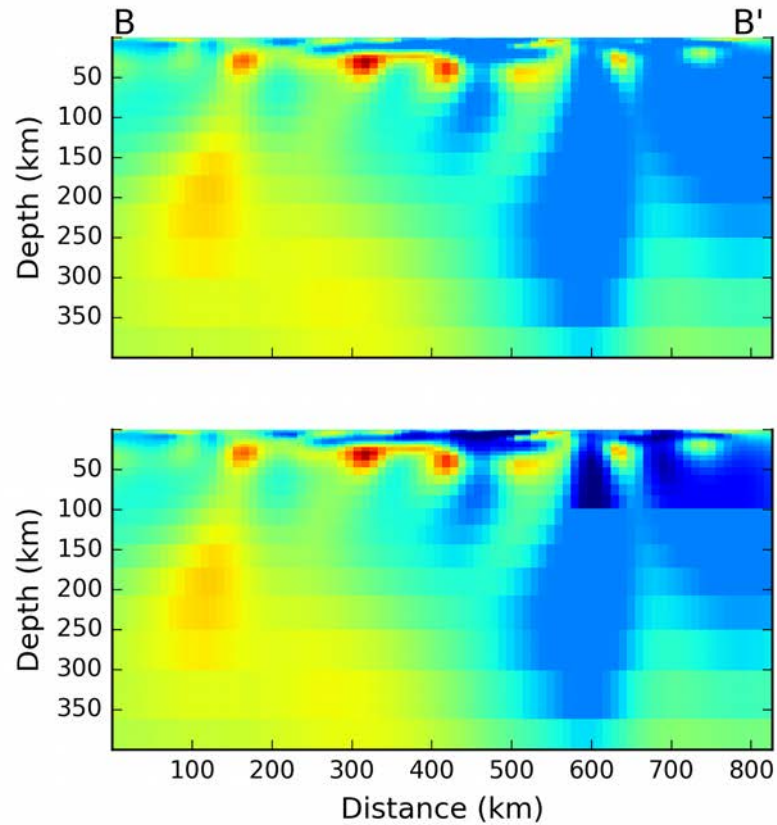
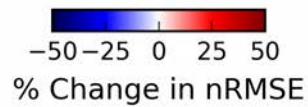
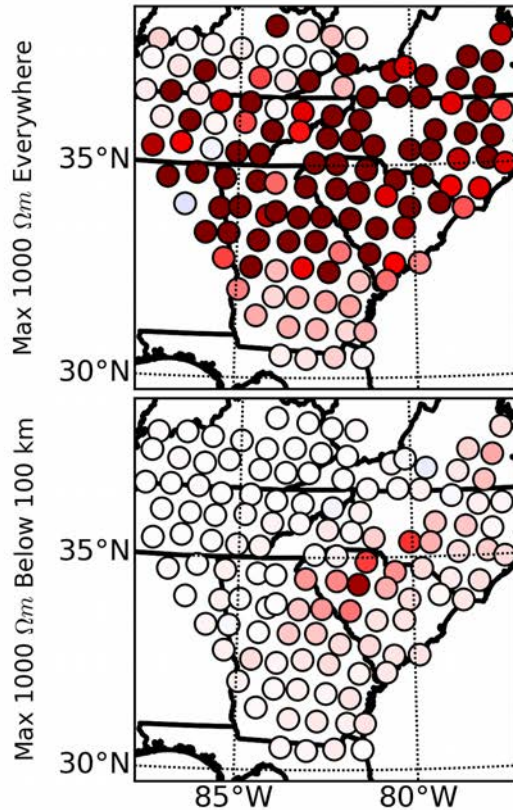


-50 -25 0 25 50
% Change in nRMSE

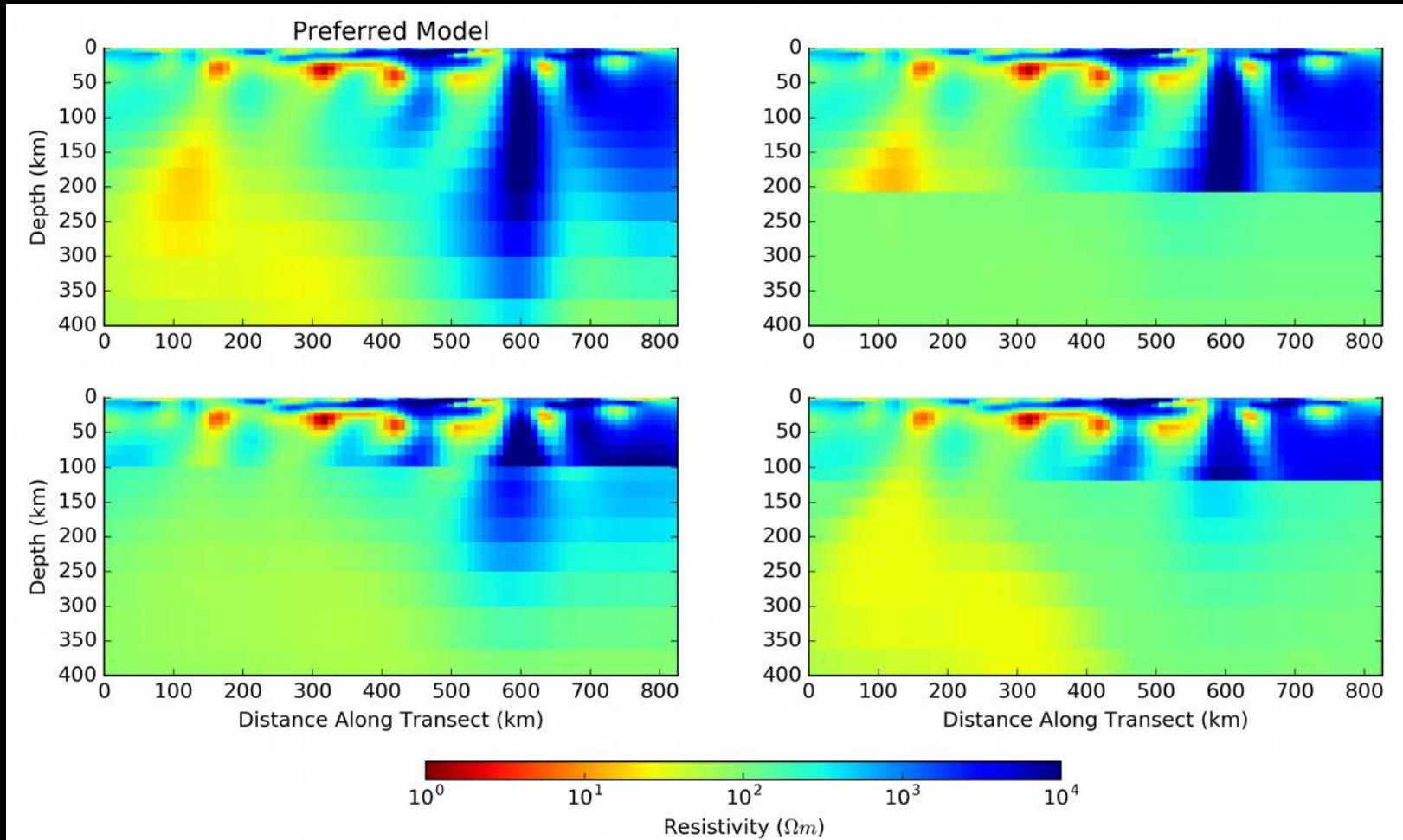


10^0 10^1 10^2 10^3 10^4
Resistivity (Ωm)

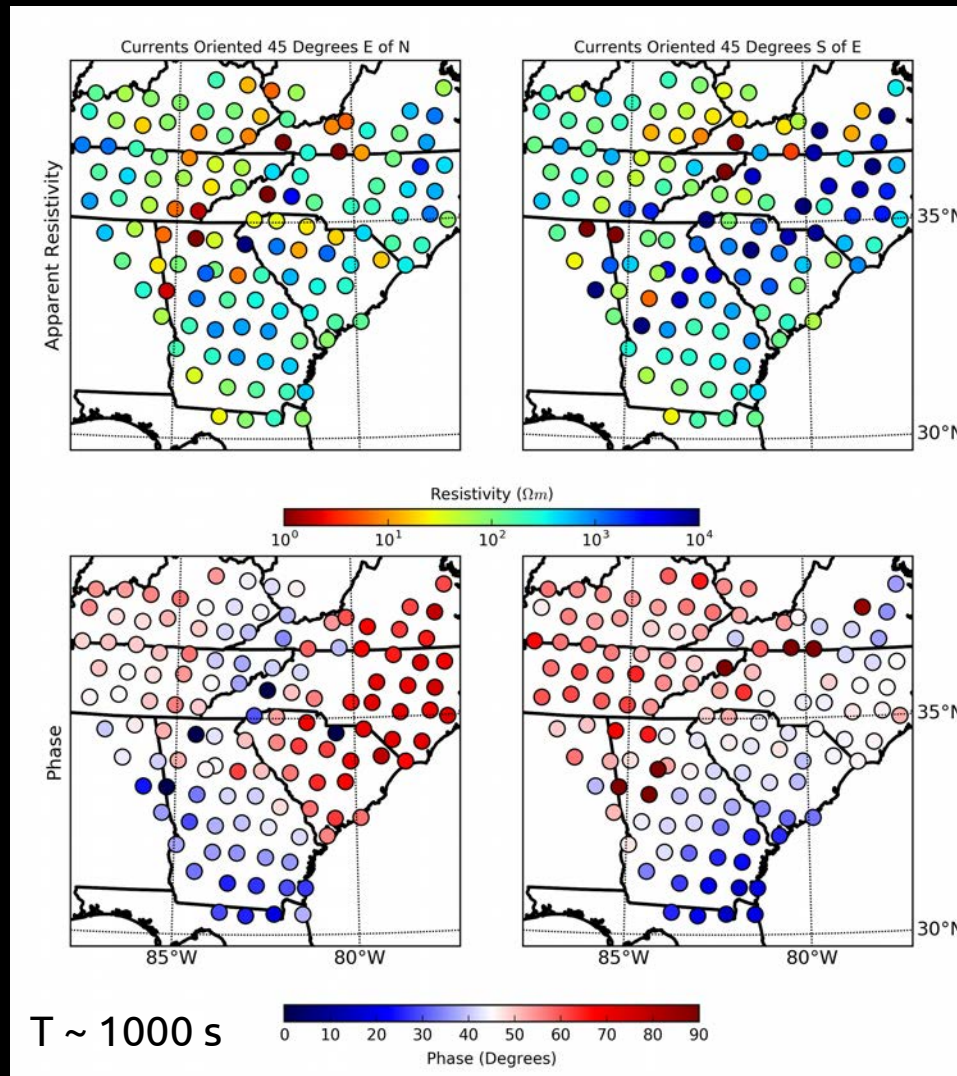
Resolution Tests



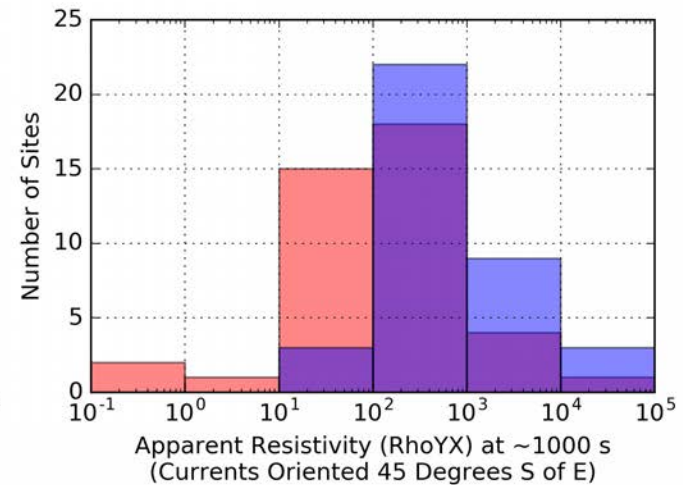
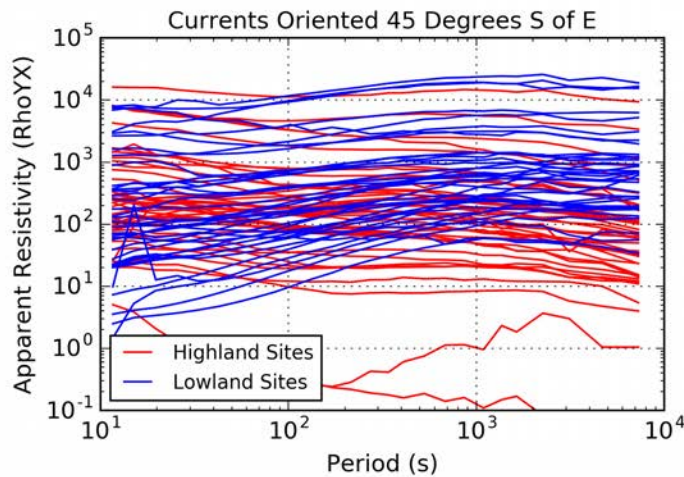
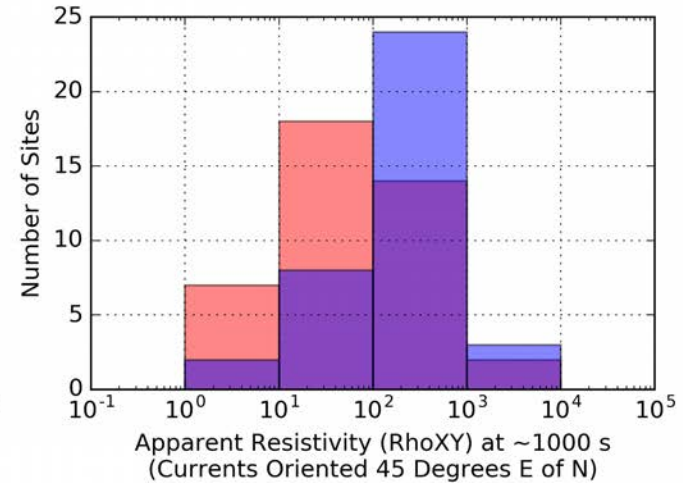
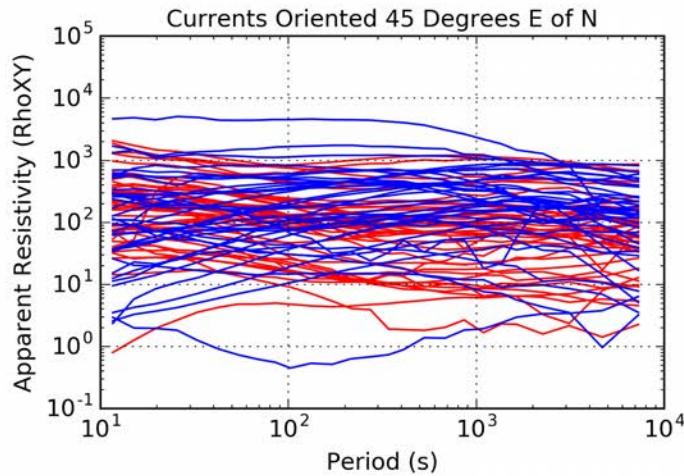
Resolution Tests



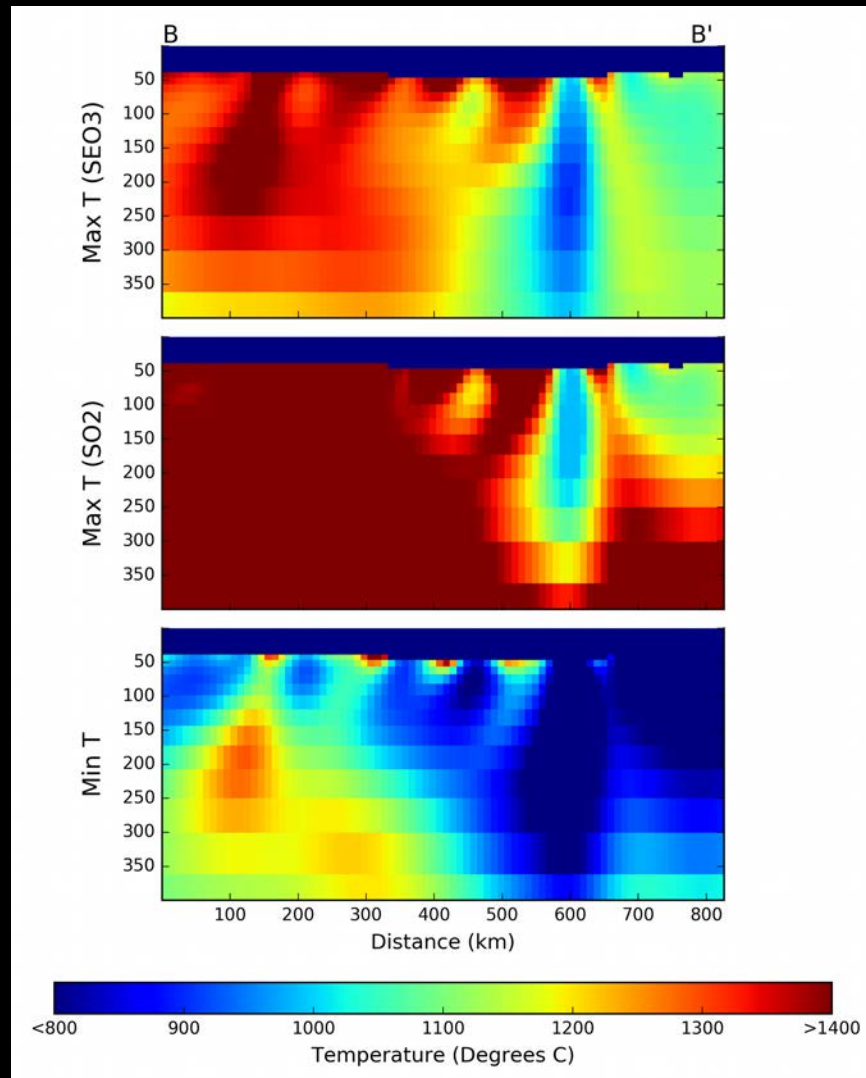
Apparent Resistivities & Phases



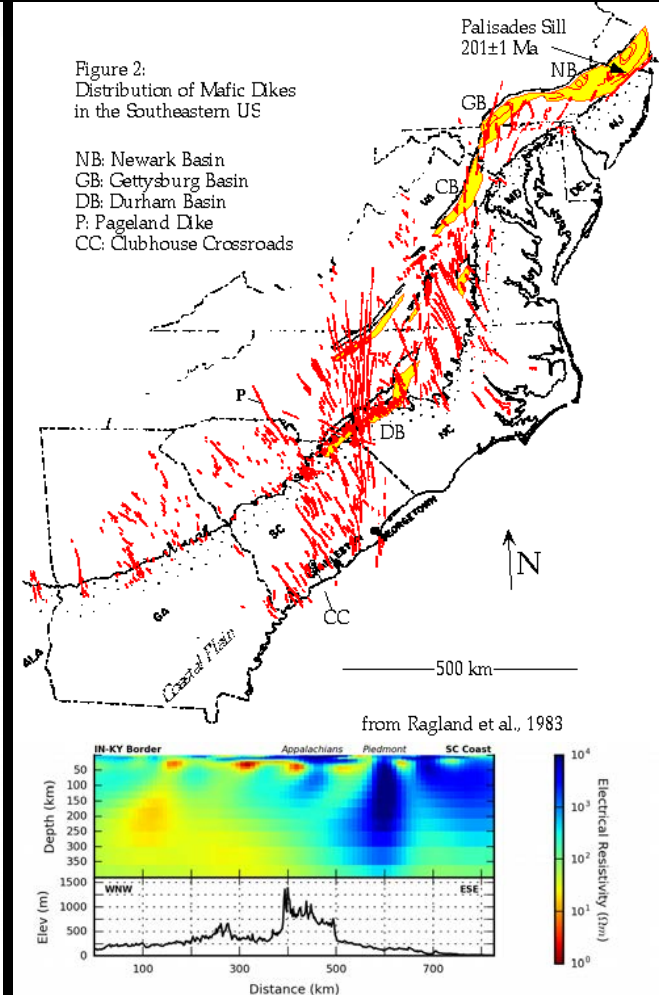
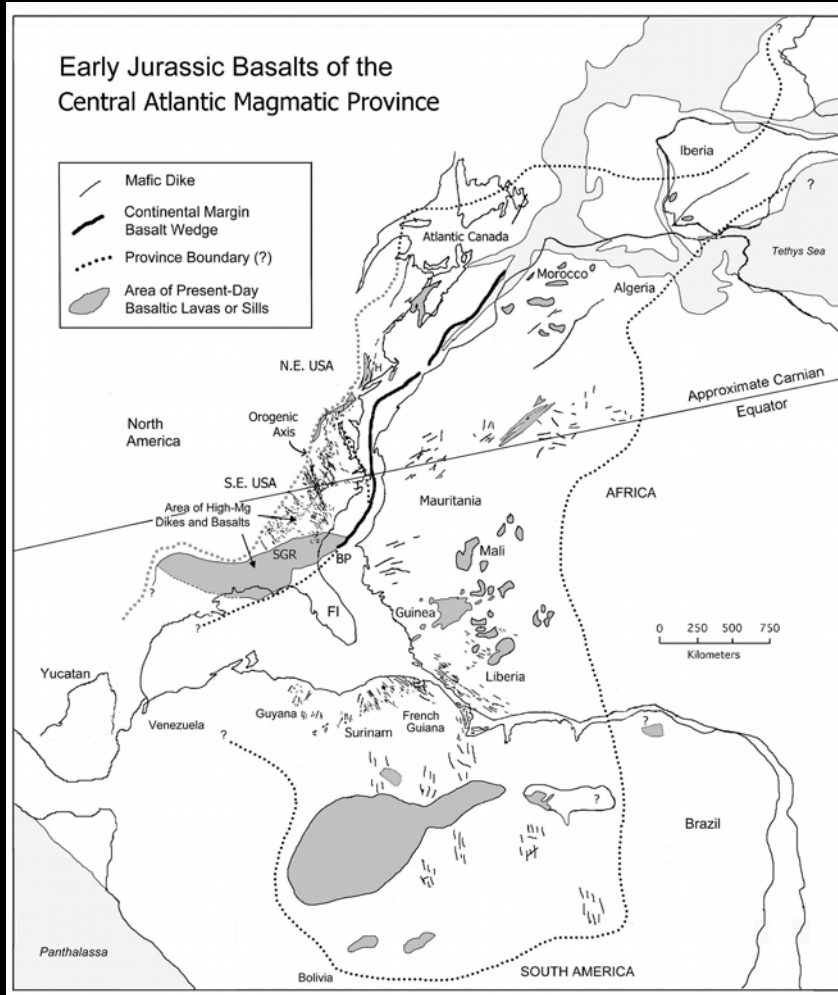
Apparent Resistivity Contrast



Lithospheric Temperature

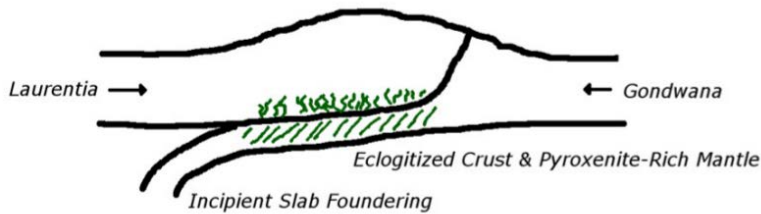


How Did It Get There?

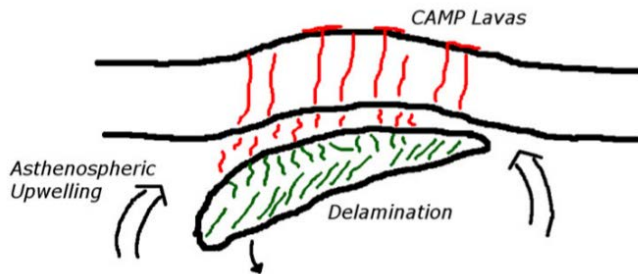


How Did It Get There?

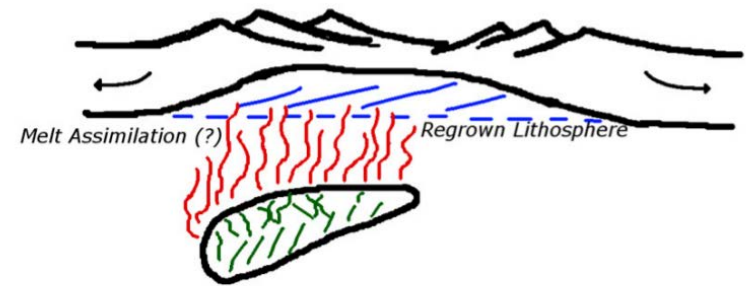
~230 Ma: Assembly of Pangea



~200 Ma: Delamination & CAMP Magmatism



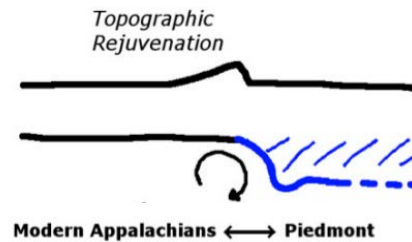
~190 Ma: Rifting



~150 Ma: Cooling & Subsidence

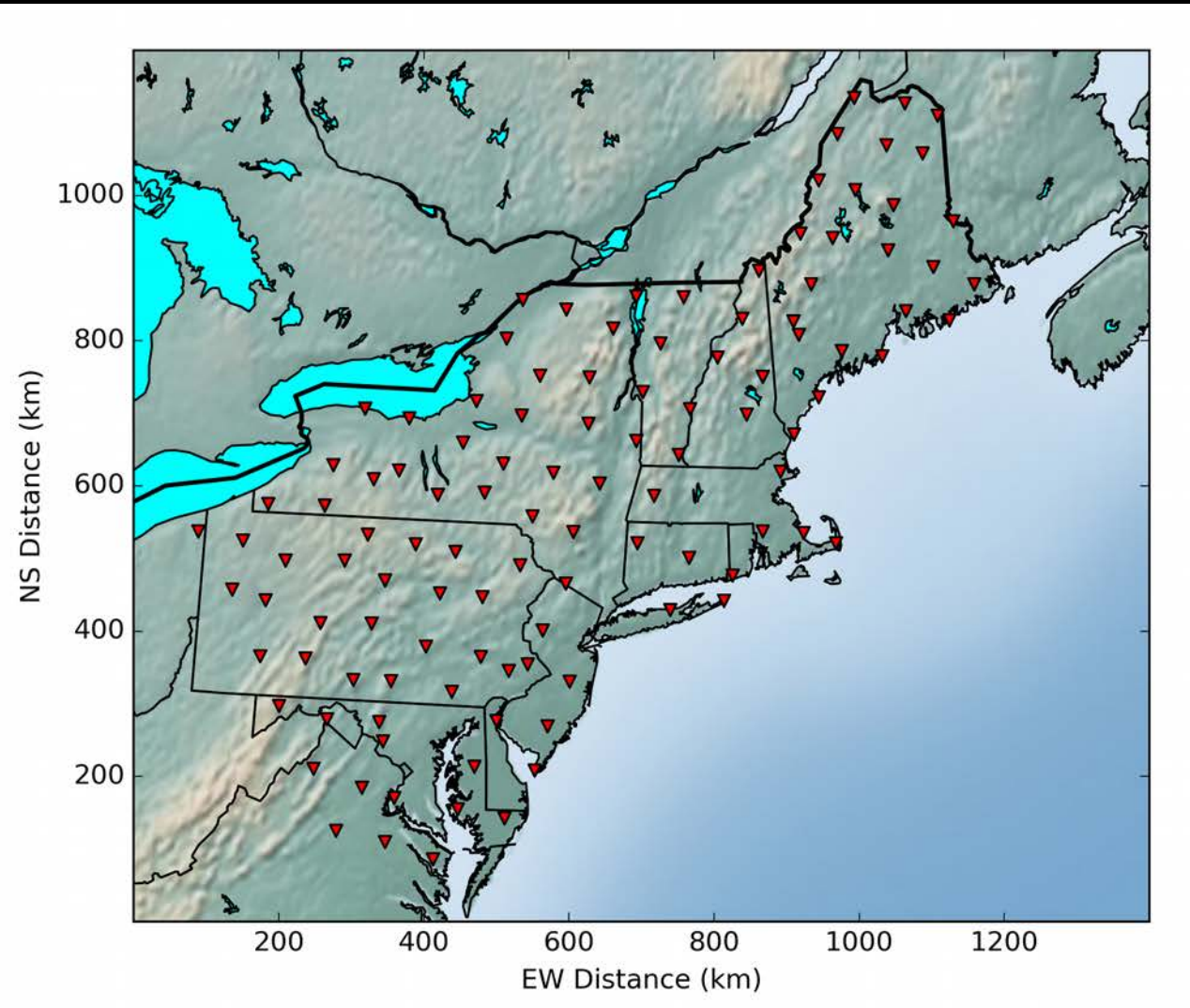


~100 Ma - Present: Edge Convection

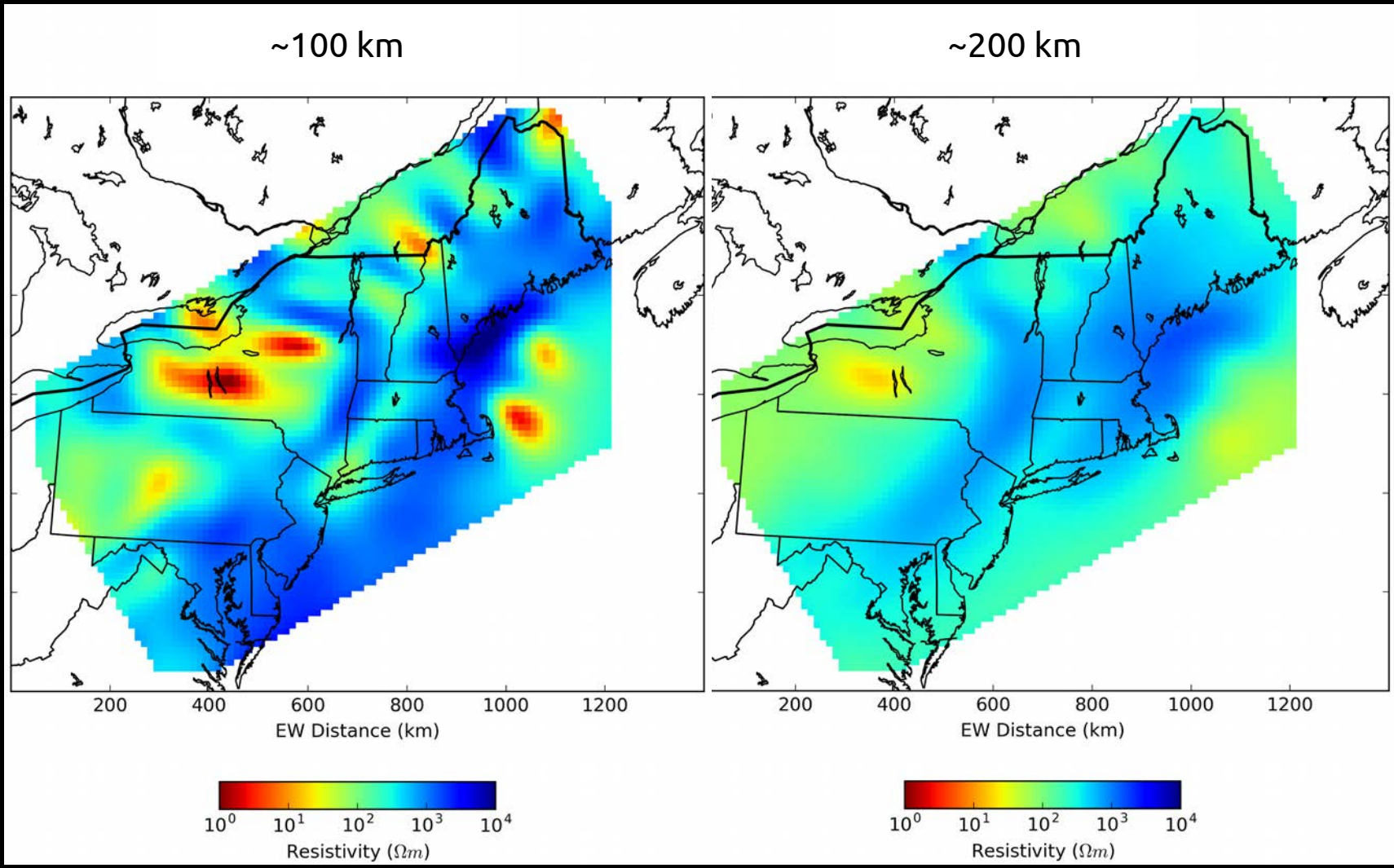


Murphy & Egbert, EPSL, 2017

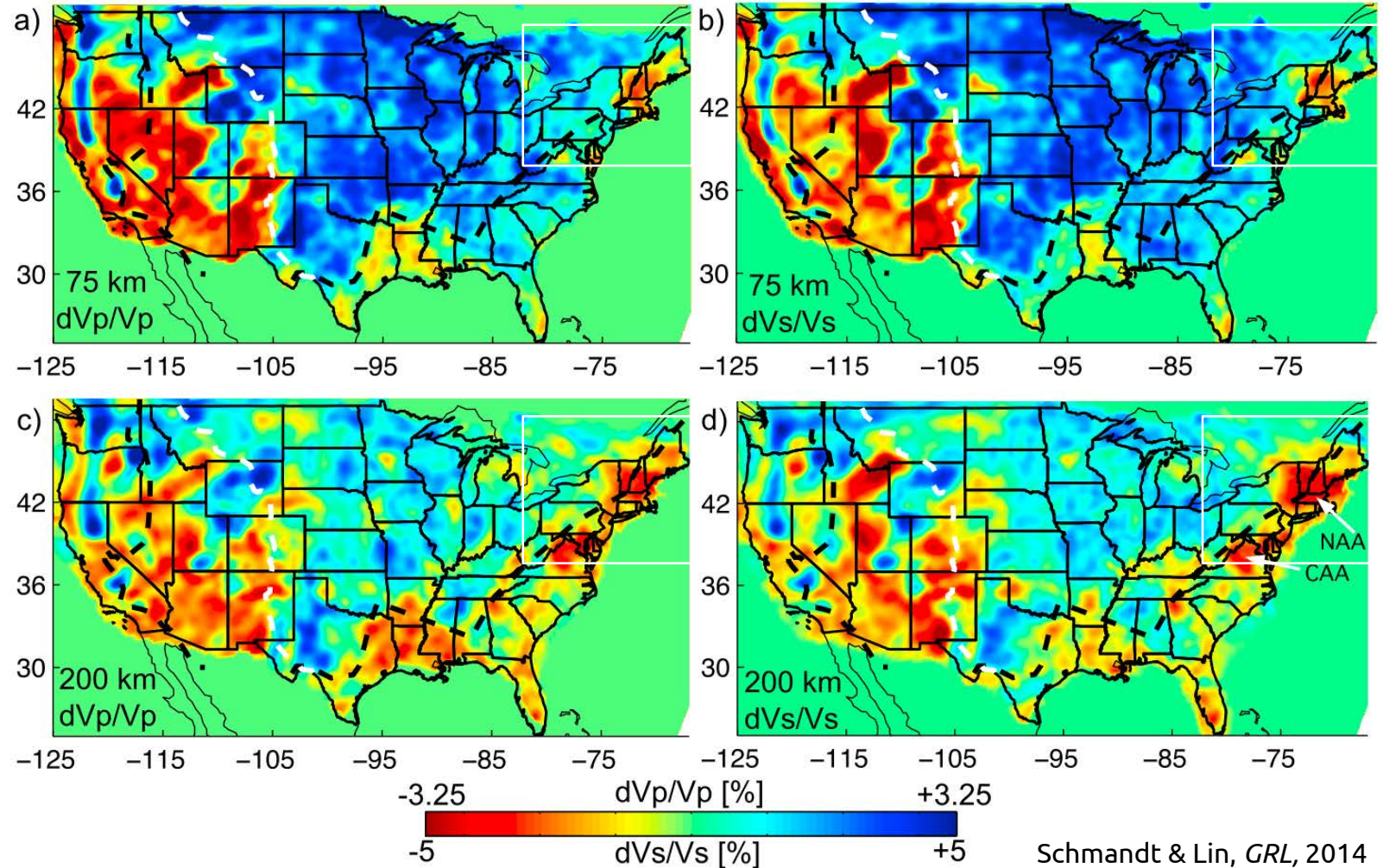
Northeastern United State MT



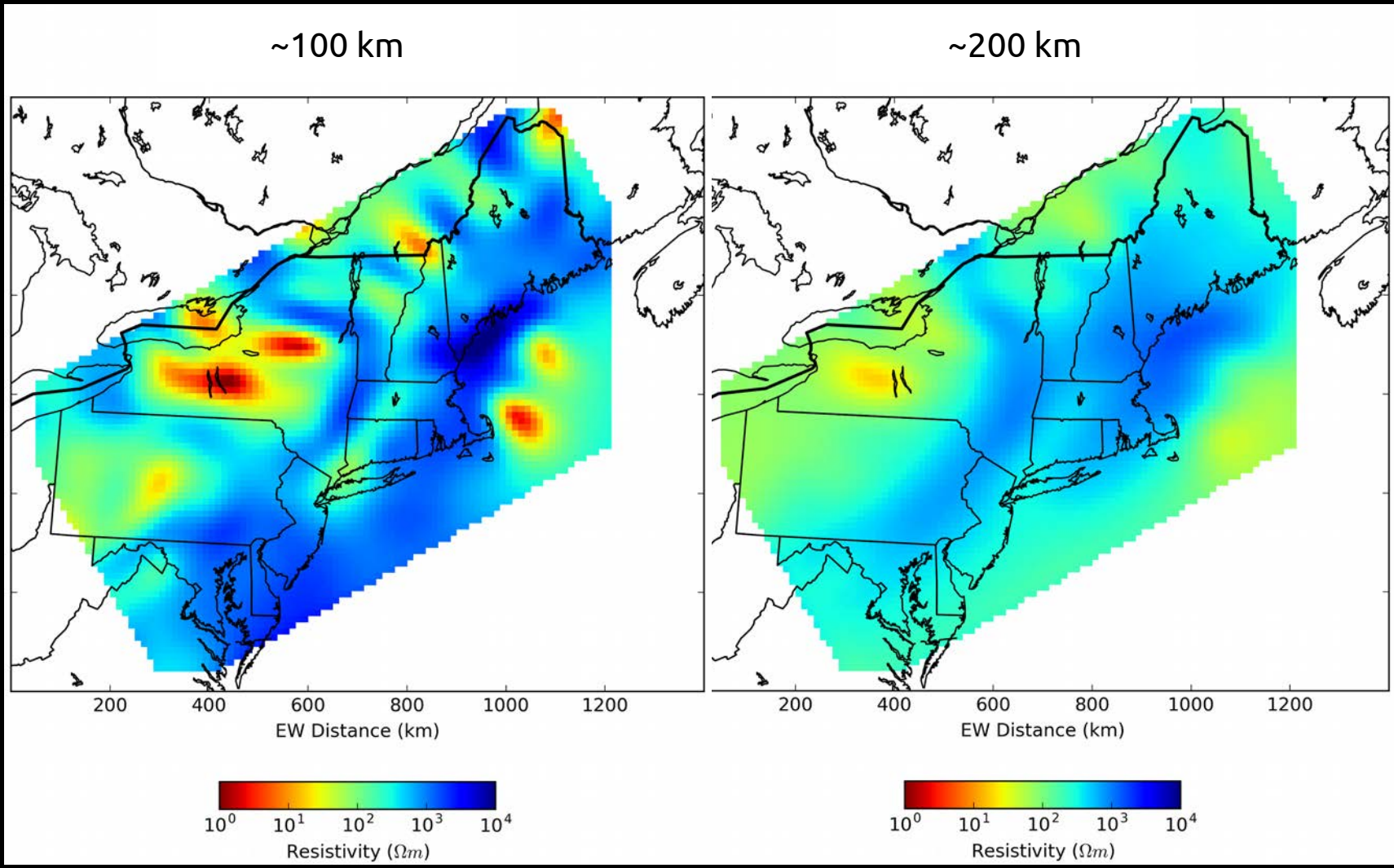
Northeastern United State MT



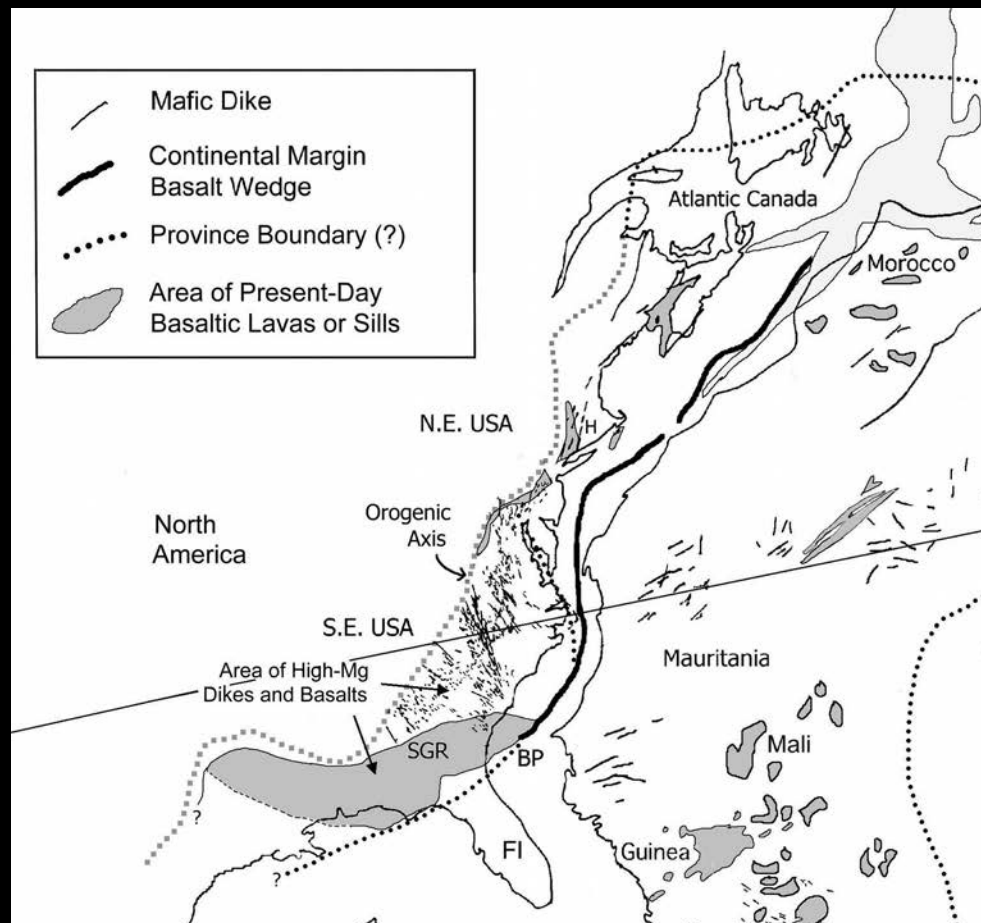
Northeastern United States Seismics



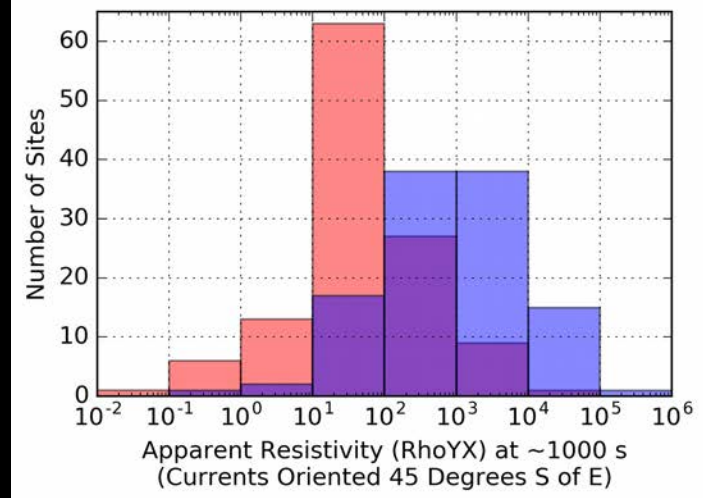
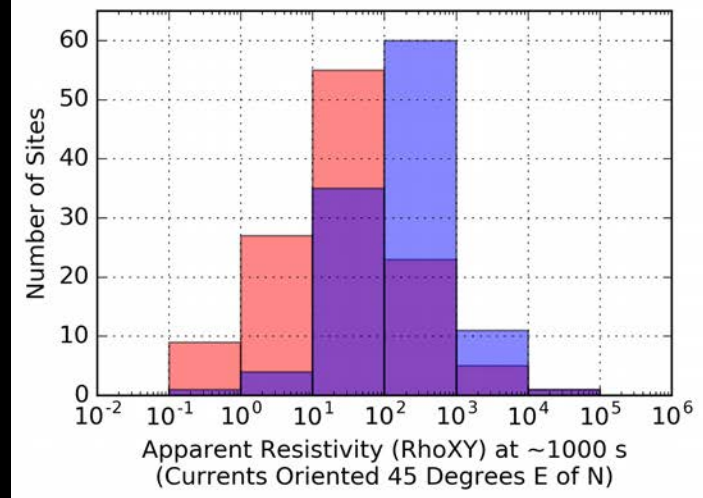
Northeastern United State MT



Margin-Wide Link to CAMP?

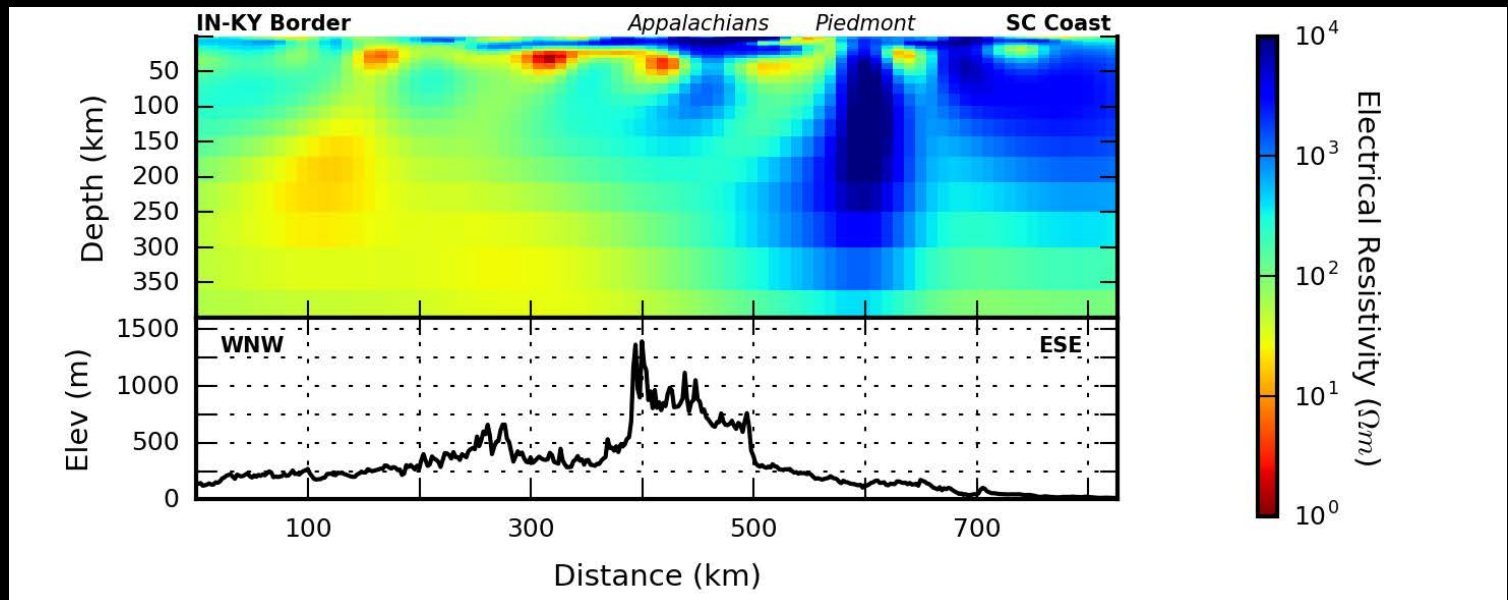


Greg McHone
 (http://www.auburn.edu/academic/science_math/res_area/geology/camp/)



Conclusions

- Anomalous, highly resistive, cold, thick lithosphere beneath Piedmont/Coastal Plain in Southeastern United States... Link to CAMP?
- Highly resistive lithosphere may extend beneath coastal New England... margin-wide link to CAMP?



So much for the boring “passive” margin!