
SMiRT
New Ground Attenuation - East
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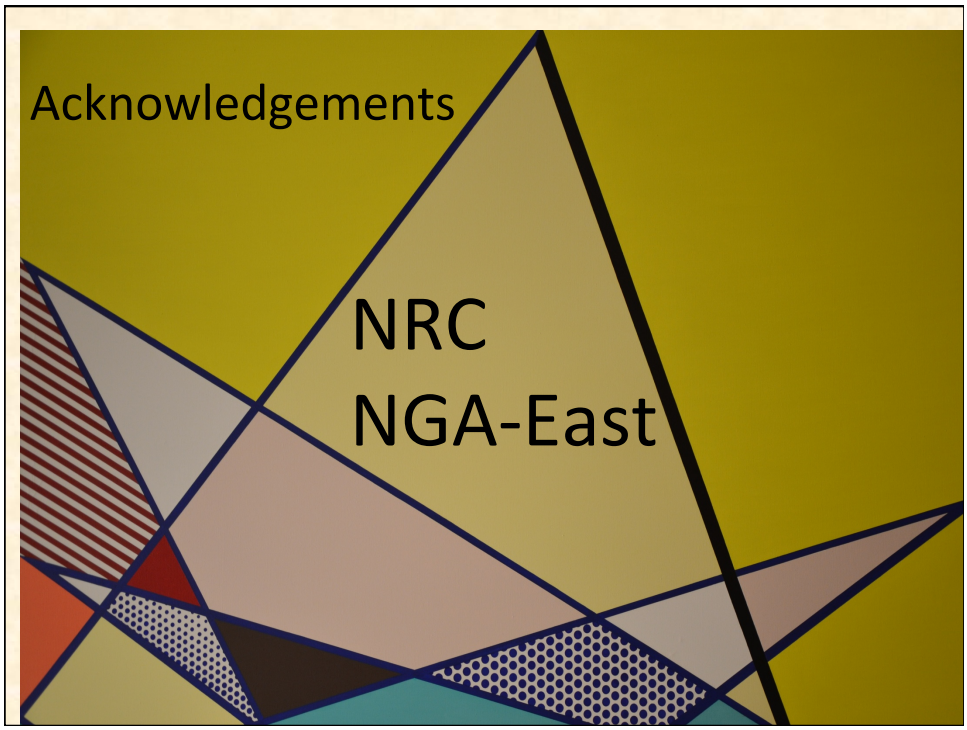
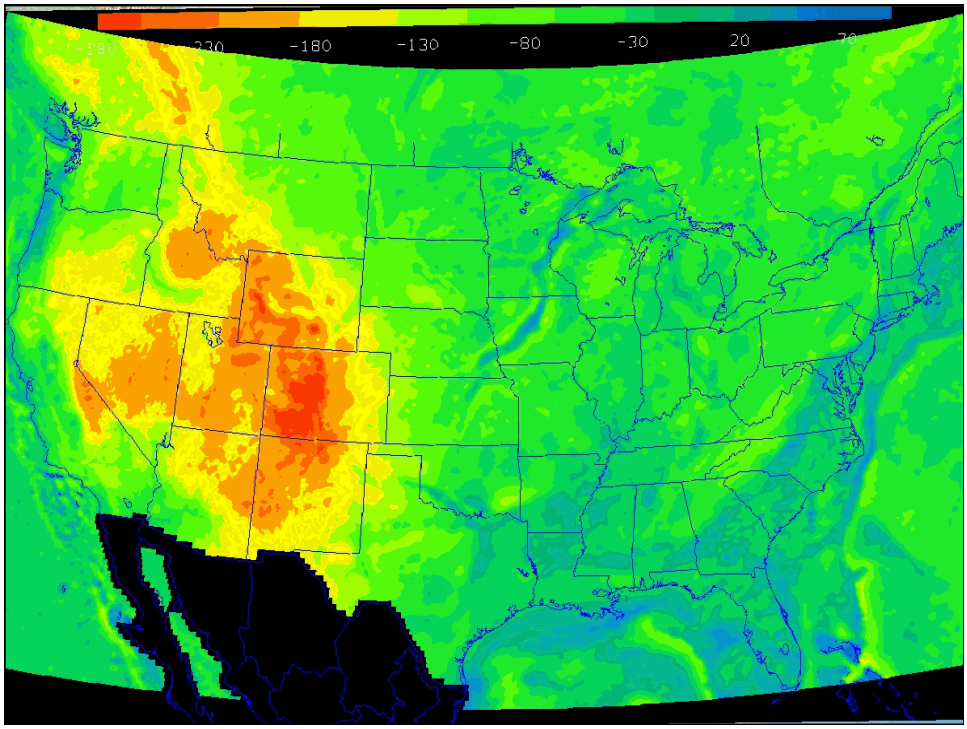
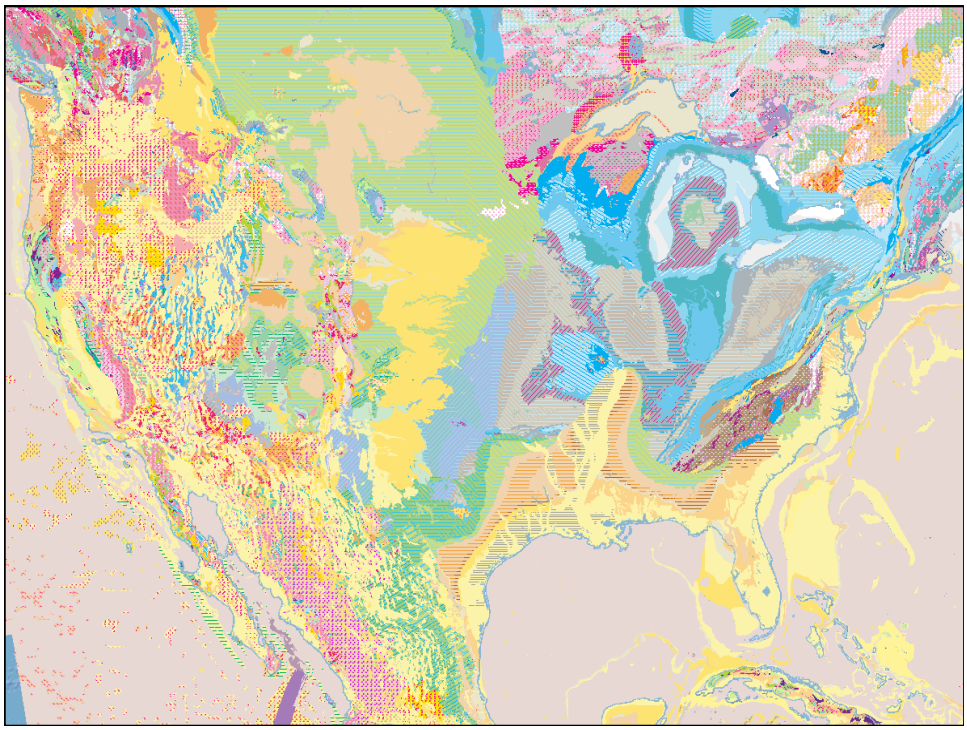
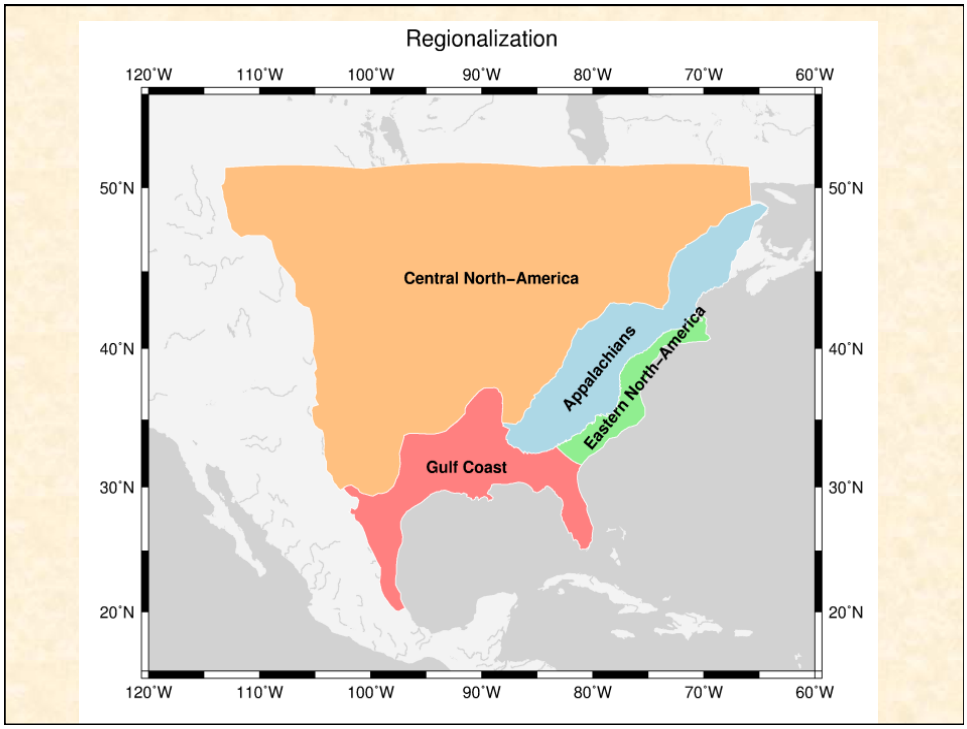
USGS Menlo Park
Aug. 23, 2013
San Francisco, CA

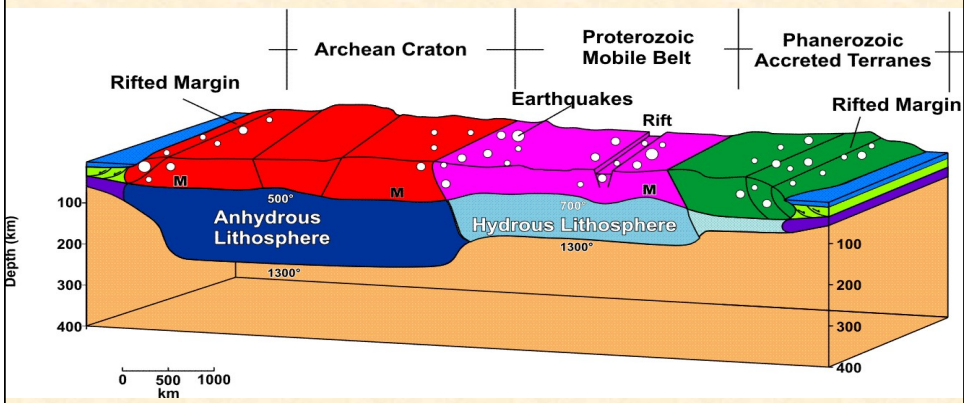

Acknowledgements
NRC
NGA-East


-280
-230
-180
-130
-80
-30
20
70



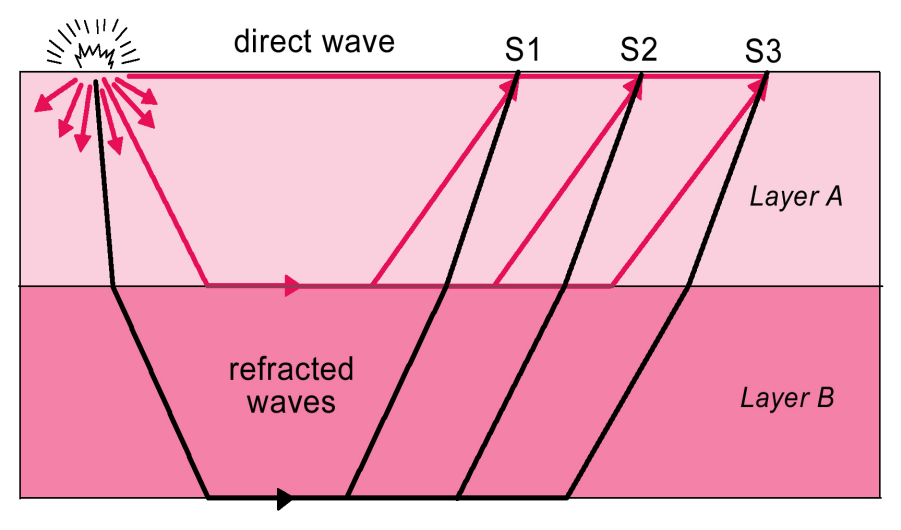


Intraplate EQ and the Crust

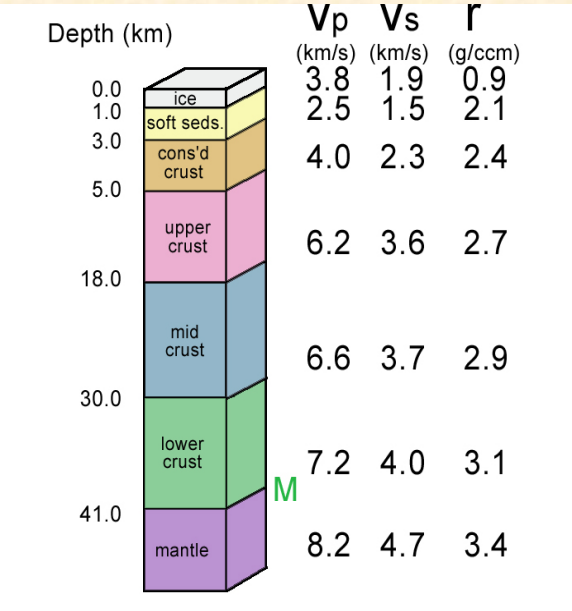


Mooney et al., 2012

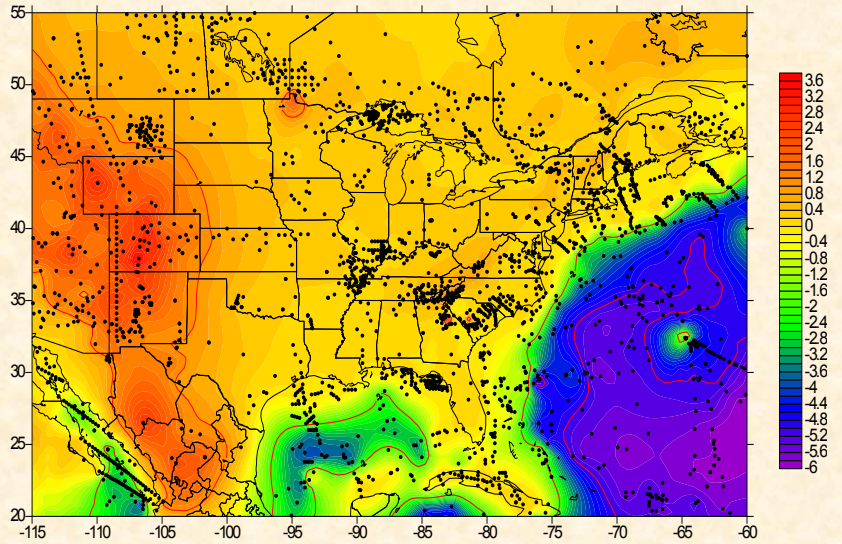
Measuring Crustal Velocities and Thickness



Typical Stable Continental Crust: Platform



Dots: Crustal Seismic Determinations



Locations of the 2603 entries in the CENA Seismic Velocity-Depth Database (as of January, 2013)

(Elevations in km contoured from data points only)

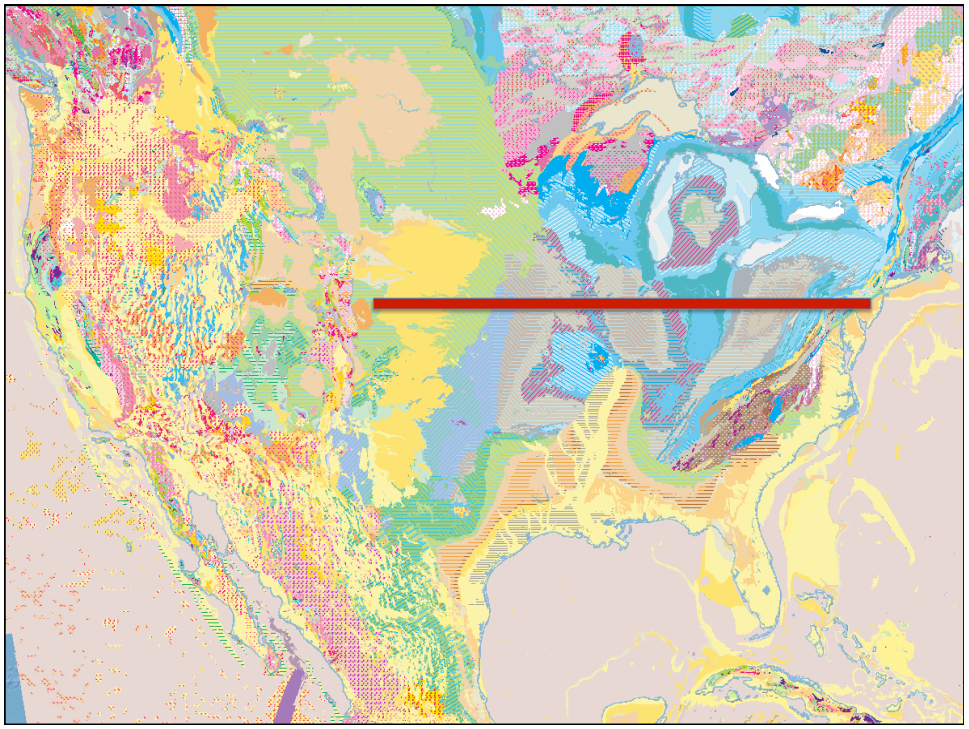
We have expanded on two previous reports:

1. Geological Society of America Memoir 172, 1989, "Geophysics of the Conterminous US", Pakiser and Mooney.

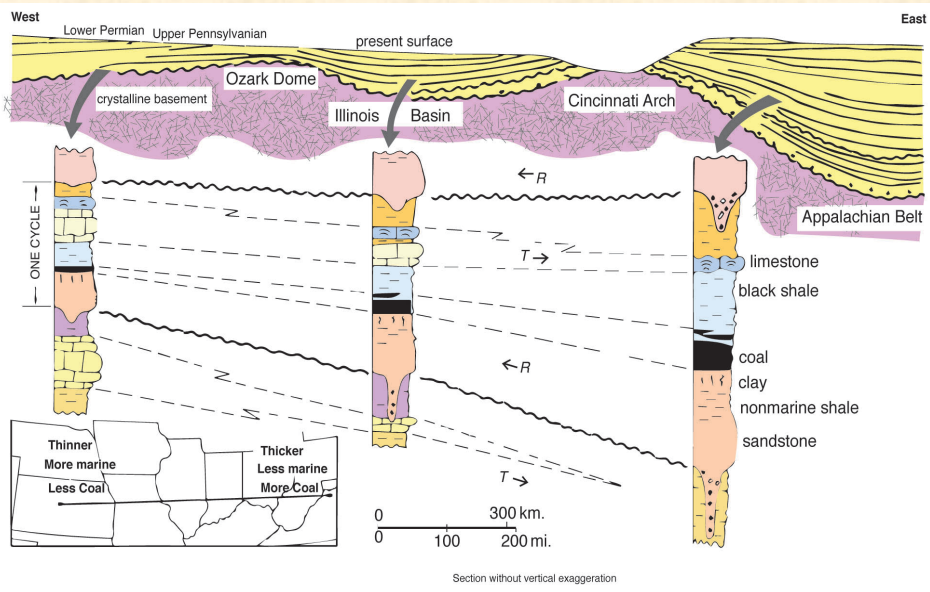
2. Crustal Structure of North America, BSSA, Chulick and Mooney, 2002

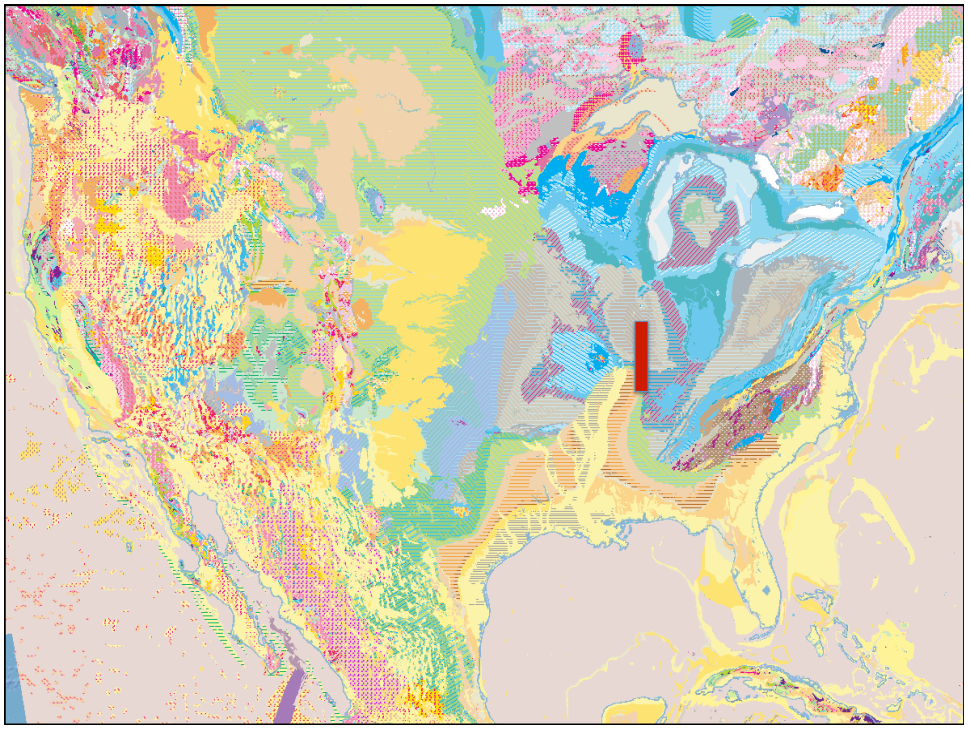
Central and Eastern North America:
Seismic Velocity in the Crust

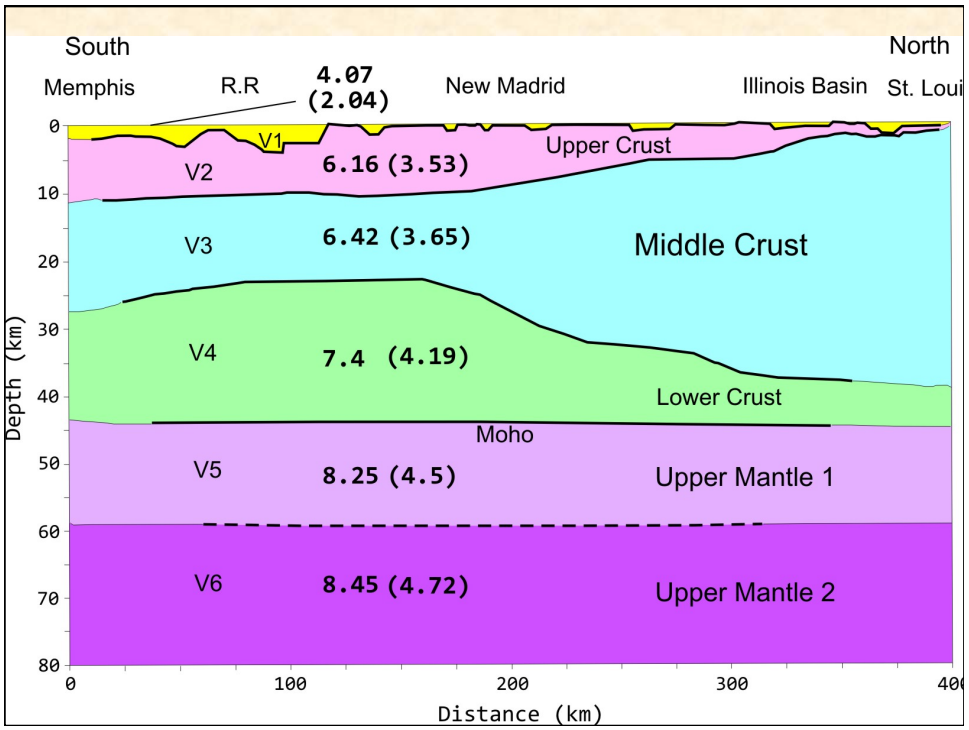
Profiles	2002 (Chulick & Mooney, BSSA)	Jan 2013
P-wave	792	2,603
S-wave	100	464
Total	818	2,603
Moho Depth	604	1,419



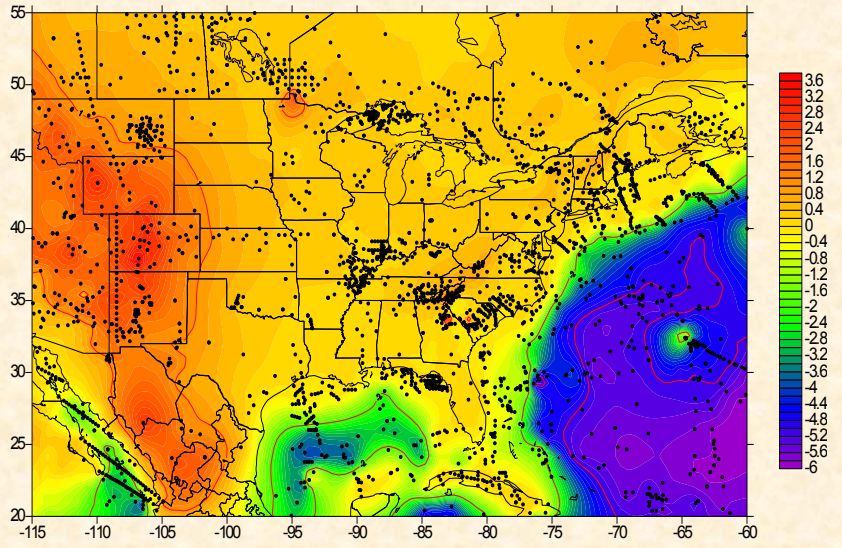
Central to Eastern US






South
North
Memphis
R.R
4.07
(2.04)
New Madrid
Illinois Basin
St. Loui
V1
Upper Crust
V2
6.16 (3.53)
V3
6.42 (3.65)
Middle Crust
V4
7.4 (4.19)
Lower Crust
Moho
V5
8.25 (4.5)
Upper Mantle 1
V6
8.45 (4.72)
Upper Mantle 2
Depth (km)
0
10
20
30
40
50
60
70
80
0
100
200
300
Distance (km)

Dots: Crustal Seismic Determinations



Locations of the 2603 entries in the CENA Seismic Velocity-Depth Database (as of January, 2013)

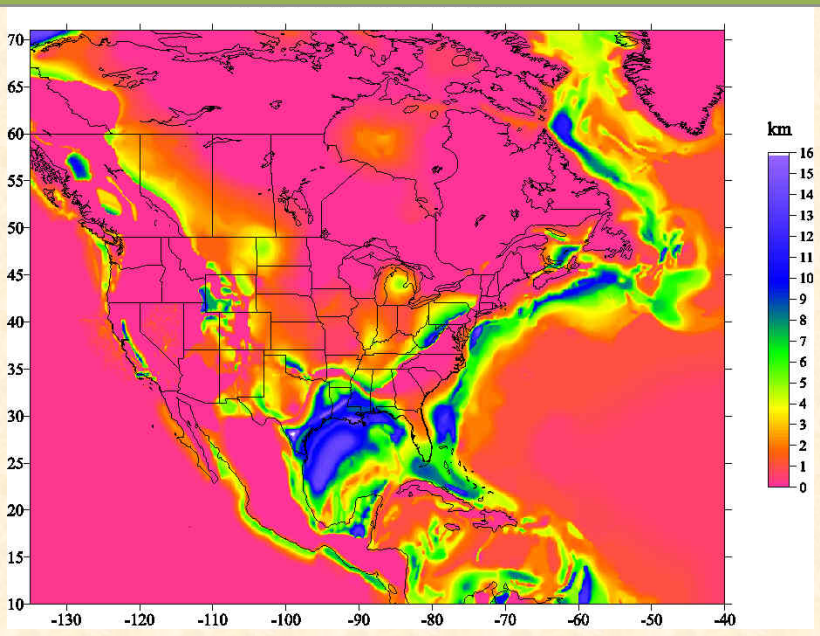
(Elevations in km contoured from data points only)

Data Records Include:

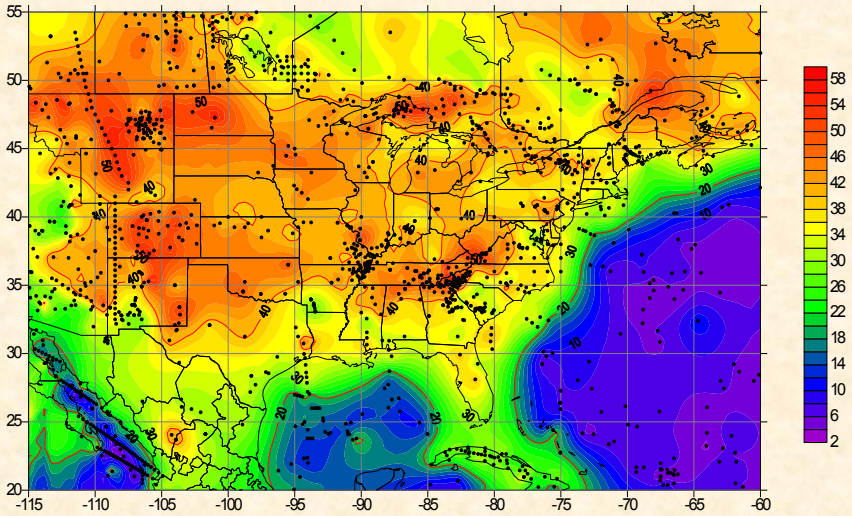
1) Latitude & Longitude of measurement point
2) Structure of entire crust:
   - P-wave velocity
   - S-wave velocity (where available)
   - sediment thickness
   - thickness of crystalline crust
   - detailed description of crustal layering
3) Crustal Type (such as basins, shields, orogens, etc)
4) Tectonic Age
5) Experimental details
6) Seismic Q values (attenuation) separately compiled

Contour Maps

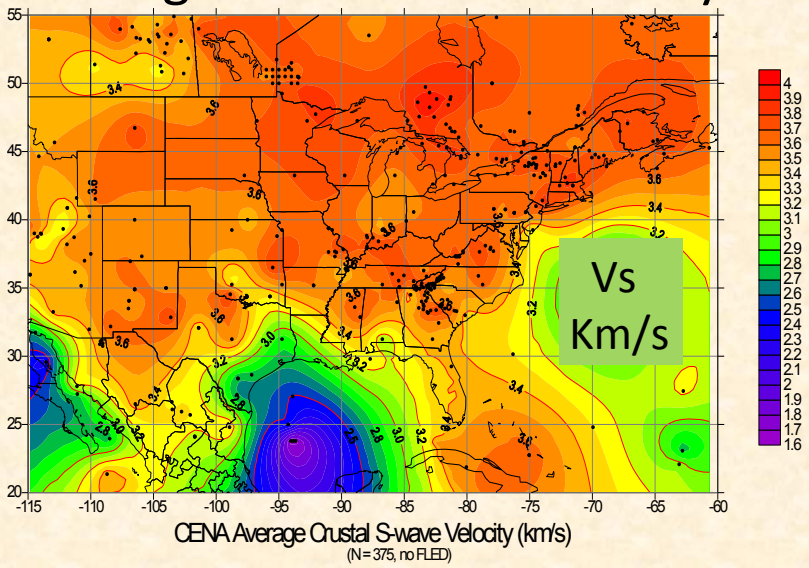
Thickness of Sediments, Mooney and Kaban, JGR, 2010

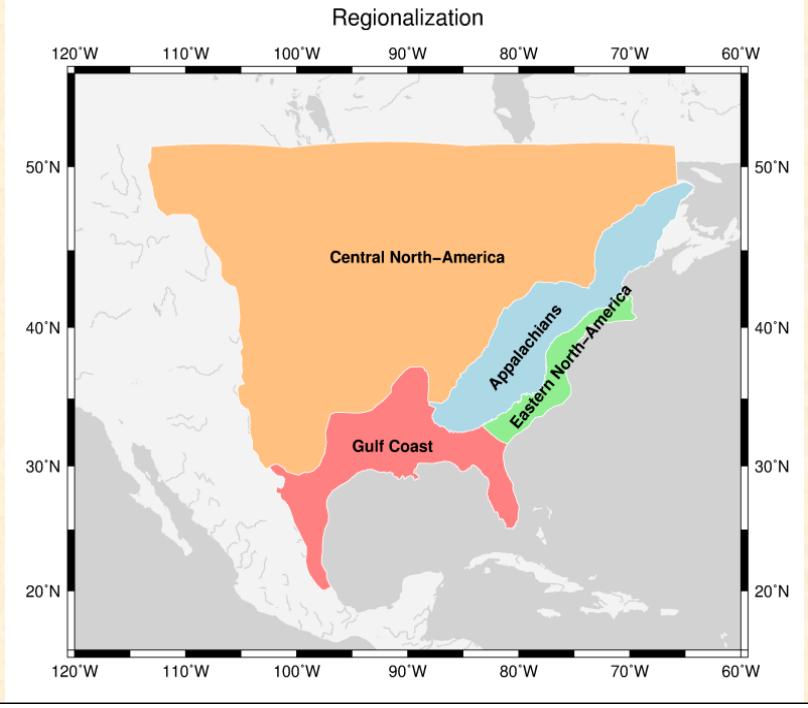


Thickness of the Crust

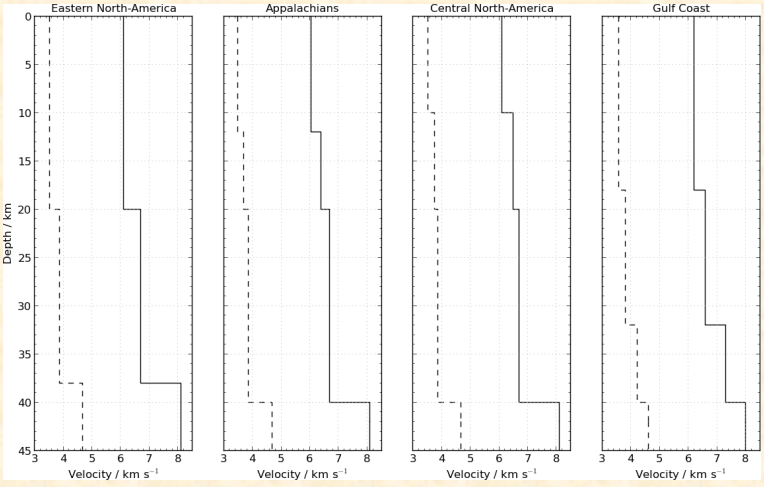


Average Shear Wave Velocity

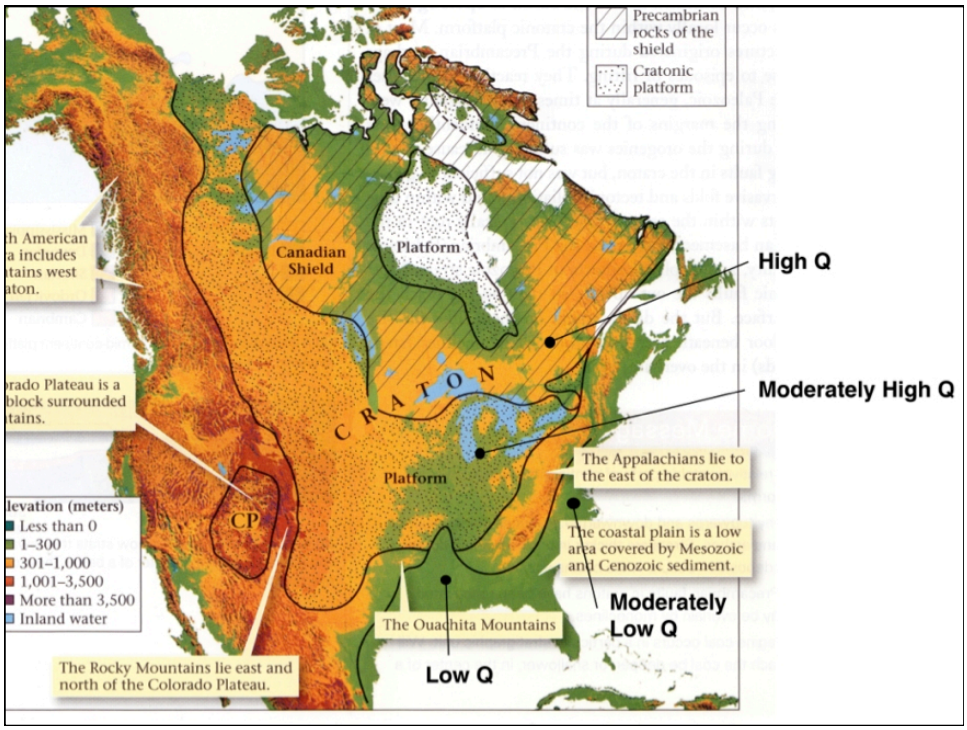




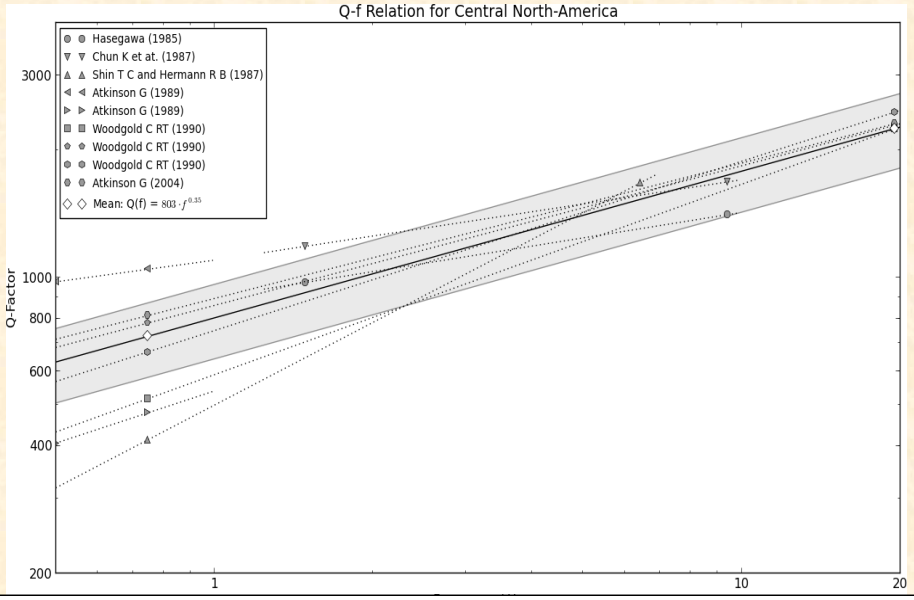
Four Crustal Provinces: Eastern; Appalachian; Central; Gulf



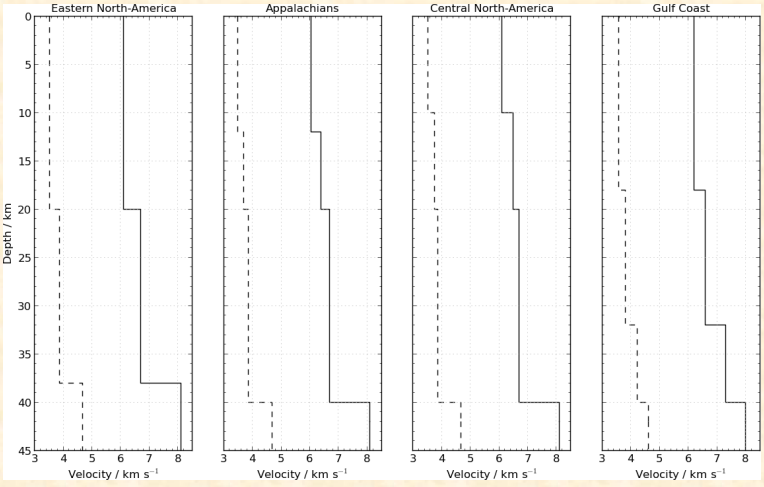
Seismic Attenuation (1 / Qs)

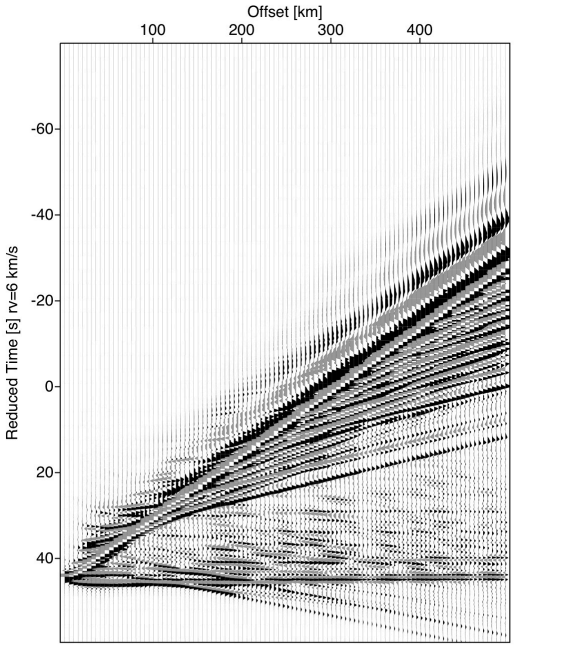


Frequency-dependent Q

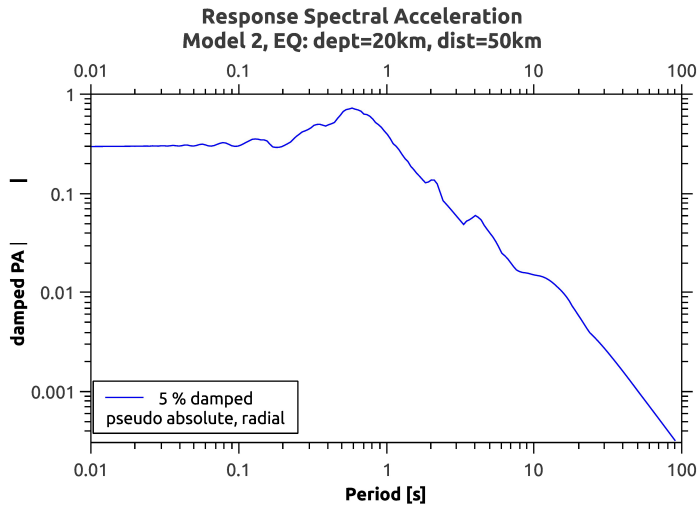


Four Crustal Province: Eastern; Appal.; Central; Gulf

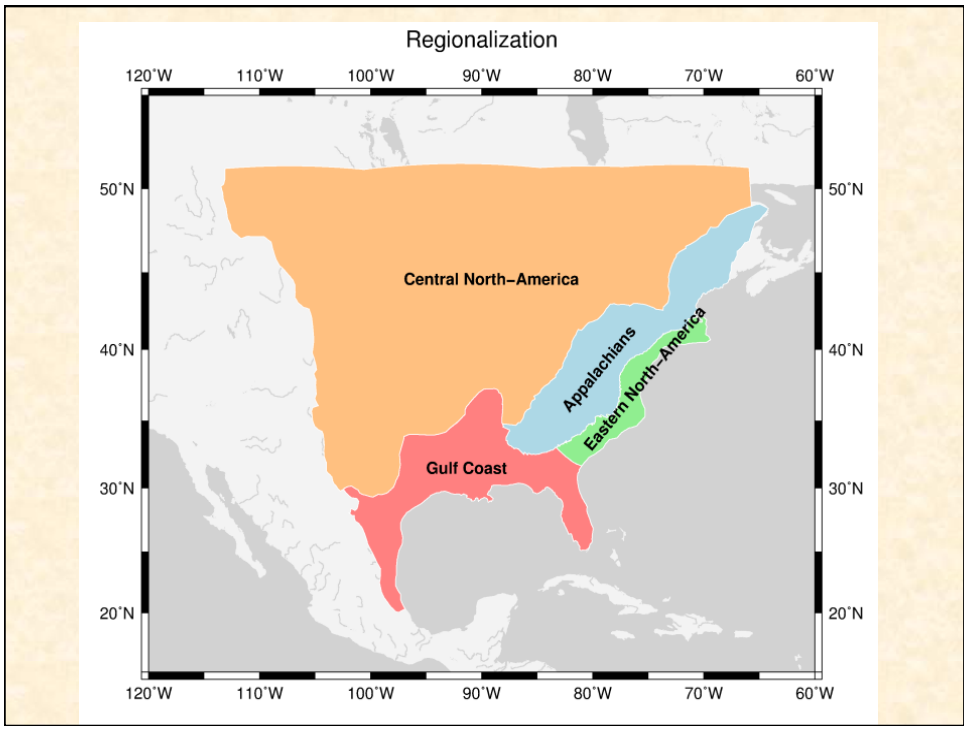




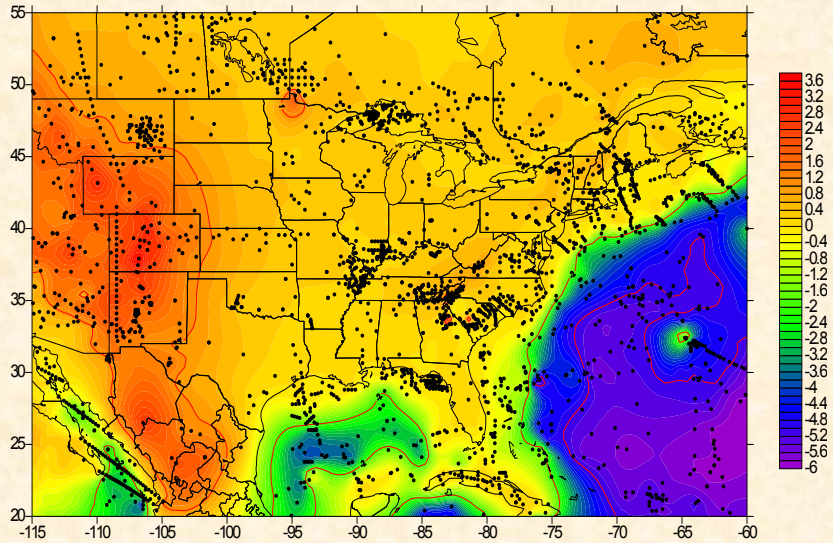
Synthetic Seismogram: Model.3-z




Conclusions


Regionalization
120°W
110°W
100°W
90°W
80°W
70°W
60°W
50°N
40°N
30°N
20°N
Central North–America
Appalachians
Eastern North–America
Gulf Coast

Dots: Crustal Seismic Determinations



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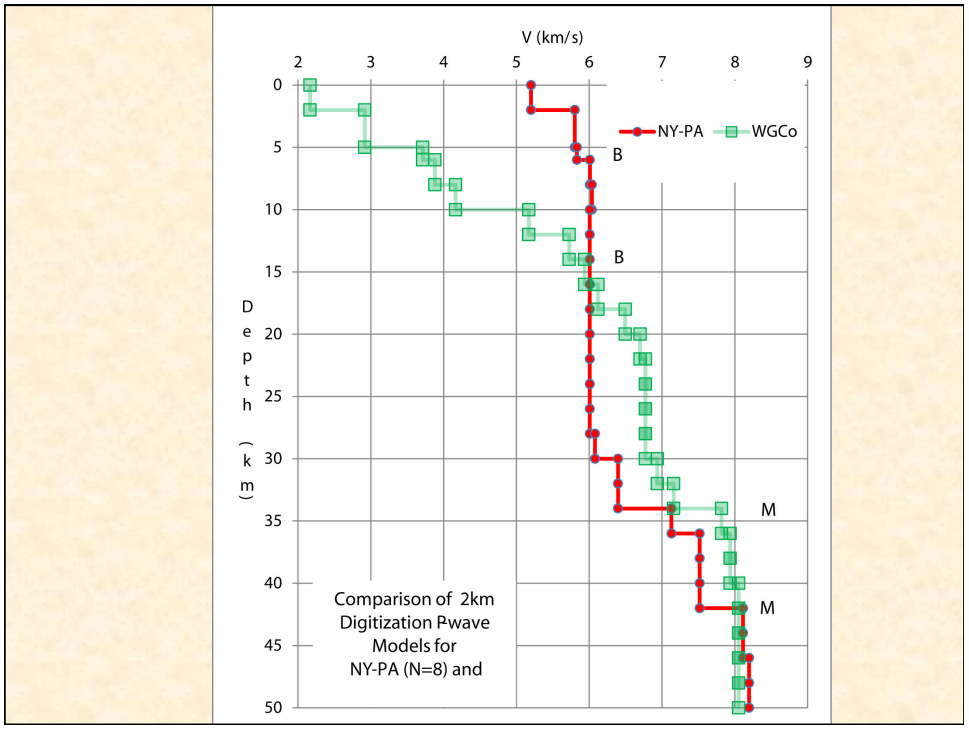
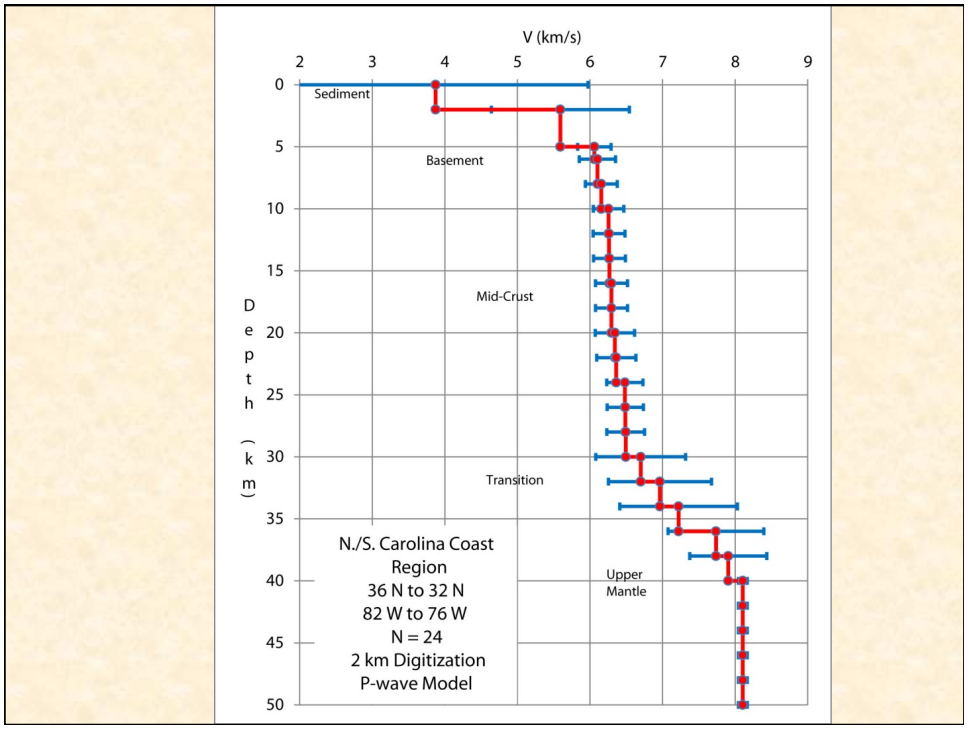
(Elevations in km contoured from data points only)


V (km/s)
2
3
4
5
6
7
8
9
0
5
10
15
20
25
30
35
40
45
50
Depth (km)
NY-PA
WGCo
B
B
M
M
Comparison of 2km Digitization P-wave Models for NY-PA (N=8) and

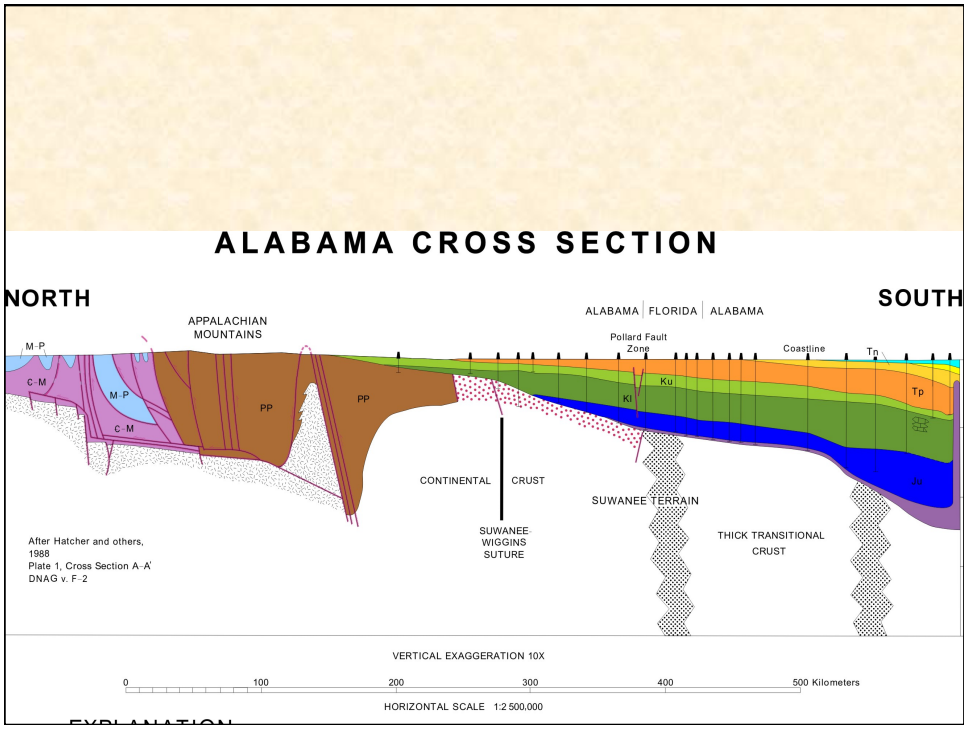

V (km/s)
2
3
4
5
6
7
8
9
0
5
10
15
20
25
30
35
40
45
50
Depth (km)
Sediment
Basement
Mid-Crust
Transition
Upper Mantle
N./S. Carolina Coast Region
36 N to 32 N
82 W to 76 W
N = 24
2 km Digitization P-wave Model

Sample Data Record:

mn	lat lon	vp	vs	t	d	nt	hcc hc	h age	hf az	gl ref	Com gp
289	68.36N	3.10	1.44	1.30	.00	s	24.60	-0.30	.00	EUC-CS	6 R
	11.90E	5.10	3.19	.50	1.30	s	26.40	MCz	51.10	92M.1	EXC
		6.00	3.43	4.20	1.80	c					
		6.40	3.66	11.60	6.00	c					
		6.80	3.74	8.80	17.60	c					
		8.20	5.12	.00	26.40	m					

mn	record number
lat	location in degrees latitude
lon	location in degrees longitude
vp	p(compressional) wave velocity in km/s
vs	s(shear) wave velcity in km/s
t	layer thickness in km
d	depth to top of layer in km
nt	notes on layer type
	s sedimentary/volcanic (lava flows)
	c crystalline (basement)
	m mantle

hcc	total thickness of crystalline (non-sed) crust in km
hc	total crustal thickness in km
h	altitude in km (negative represents water depth)
gl	geographical location of profile
Com	comments list # of layers and profile type
hf	heatflow
age	age of last thermo-tectonic event
az	azimuth of shot profile line with respect to North Pole
ref	reference code
gp	geological province



Thickness of Sediments, Mooney and Kaban, JGR, 2010