Upper mantle structure beneath the eastern Colorado Plateau and Rio Grande rift revealed by Bouguer gravity, seismic velocities and xenolith data

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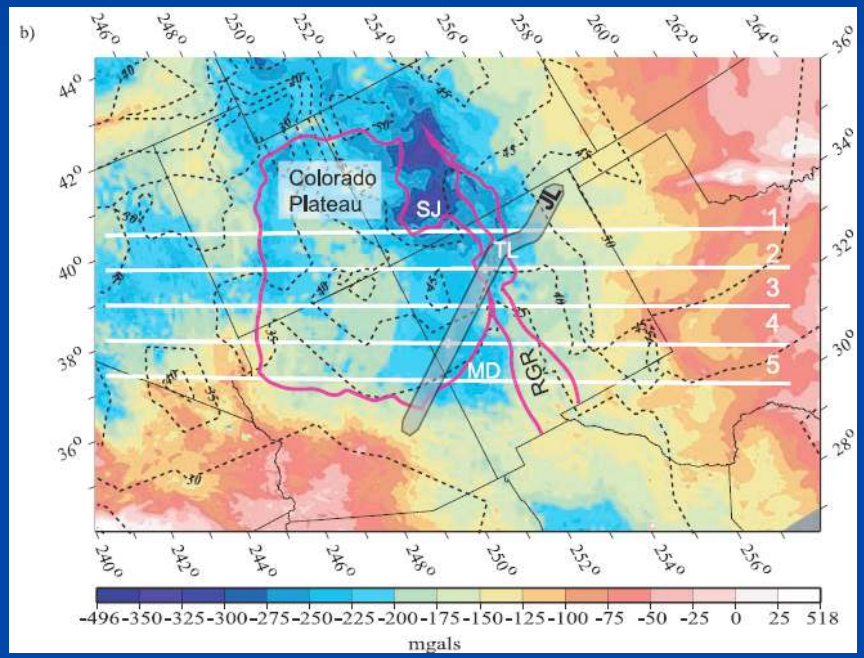
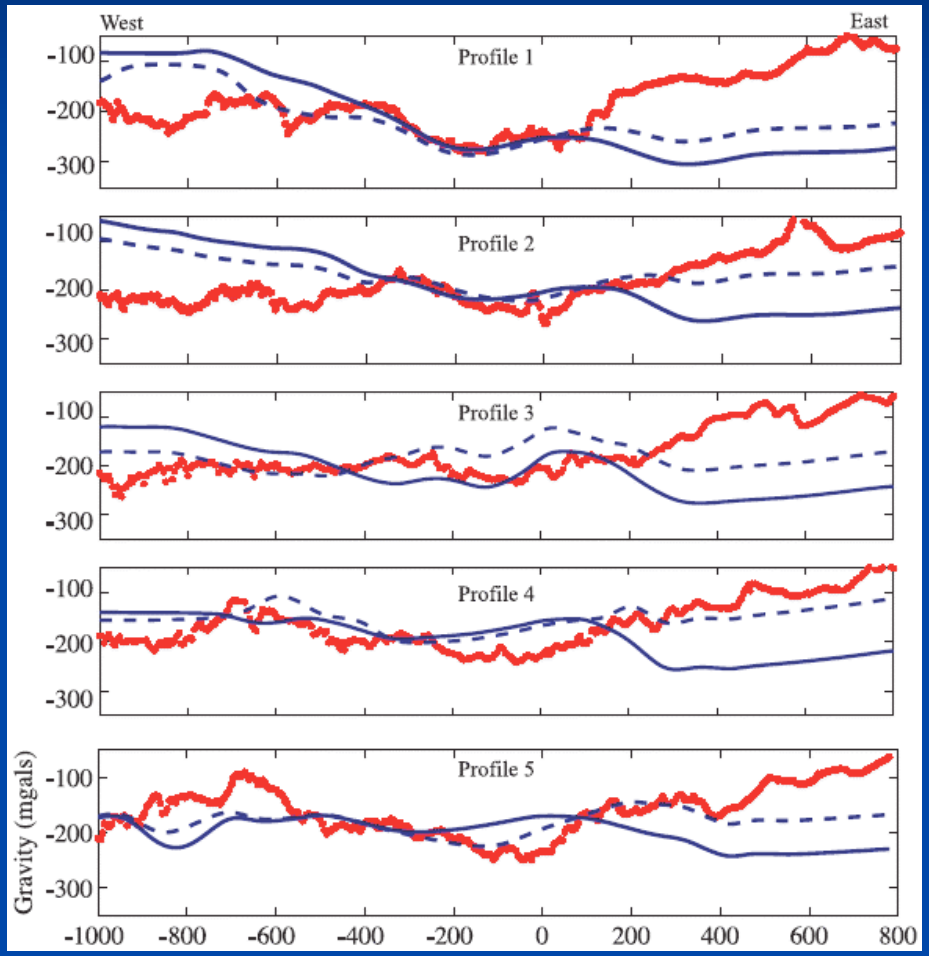
Motivation



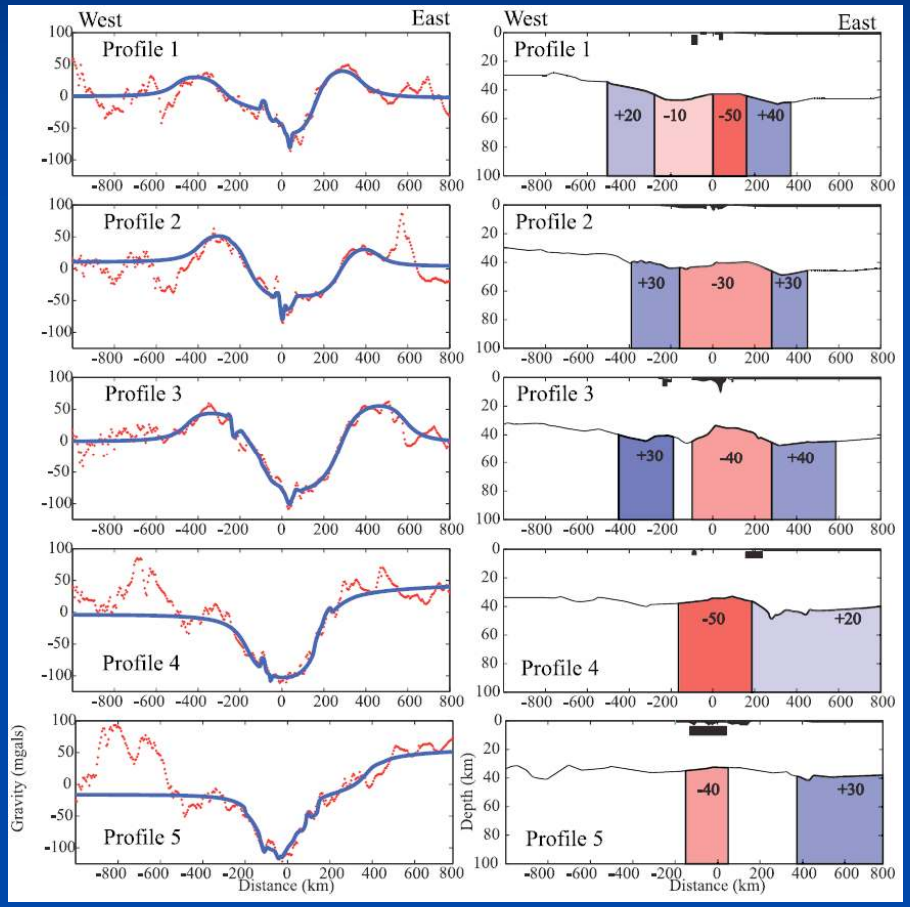
- Bouguer anomalies under the Colorado Plateau and Rio Grande Rift
- Most interested in the longer wavelength low gravity anomaly under east edge of plateau and the rift which can't be compeltely explained by uplift

Data and Methods



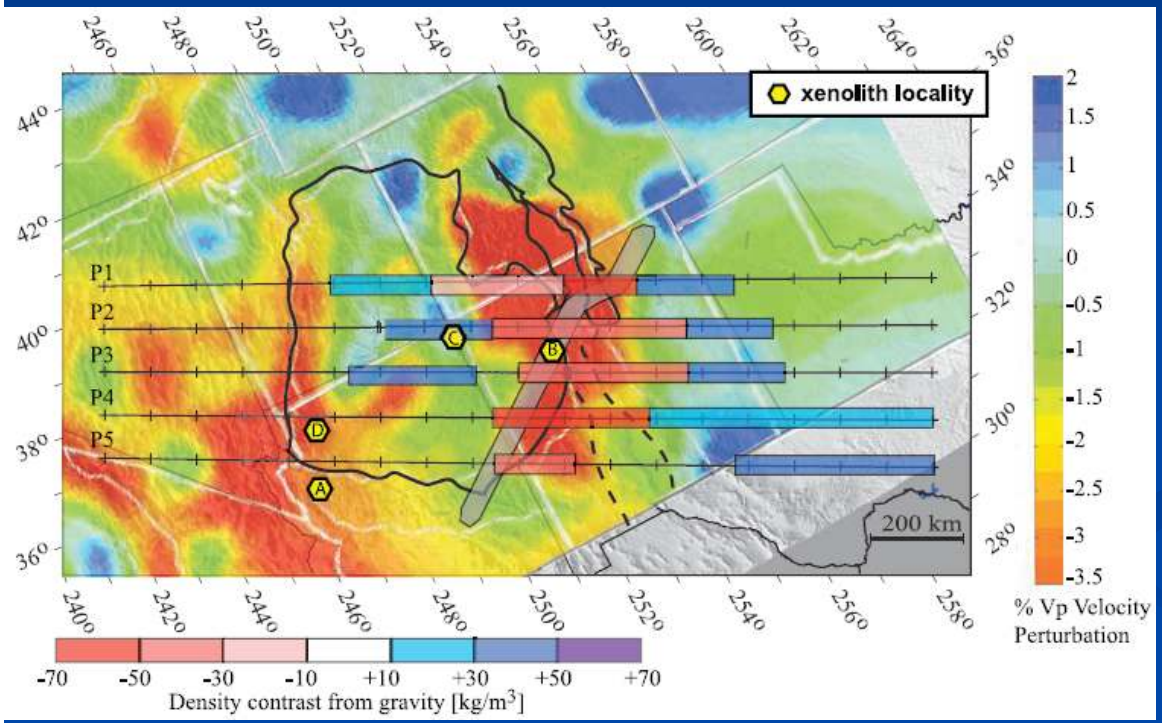
- Use LA RISTRA teleseimic array, a compilation, and CRUST 2.0 2X2 crustal model for the crustal thickness data
- Crust thickness cannot explain all the Bouguer anomaly
- Remove the contribution of crust thickness and background trend of density from the data

Data and Methods Continued



- Forward model density anomalies in upper crust and upper mantle
- Upper crust: high pass gravity data, match up what can to geological information
- Also tried lower crust, but upper mantle more reasonable density contrasts

Results



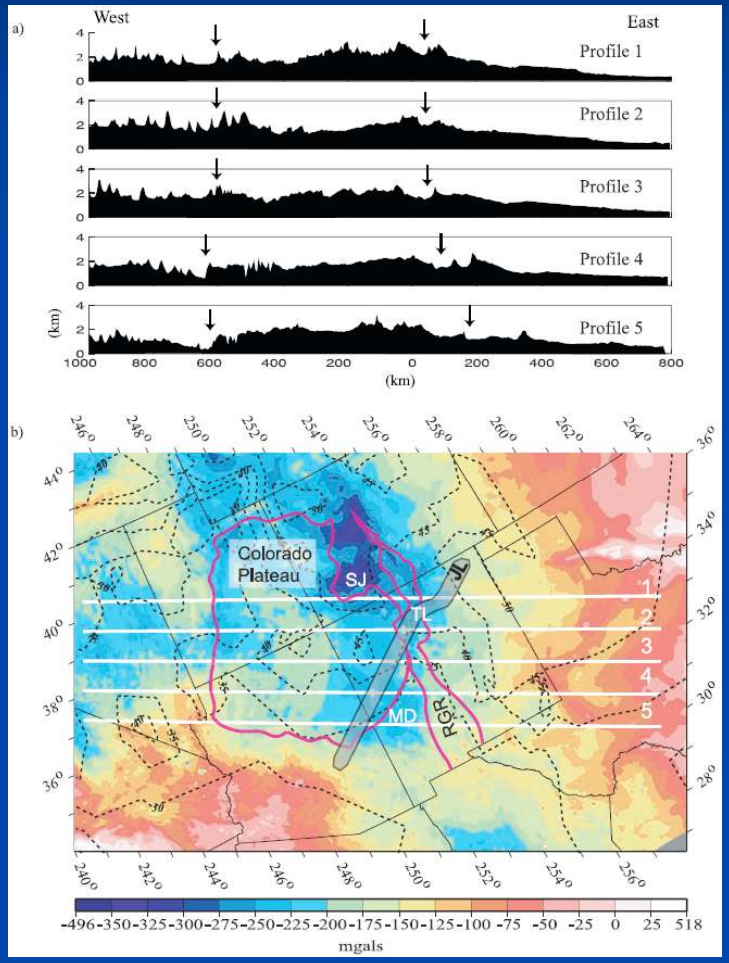
- Also compare density model with densities estimated from xenolith data and with seismic velocity data
- Low density anomaly:
  - Broader at north, narrower and stronger at south
  - Oblique to and offset from Rio Grande Rift

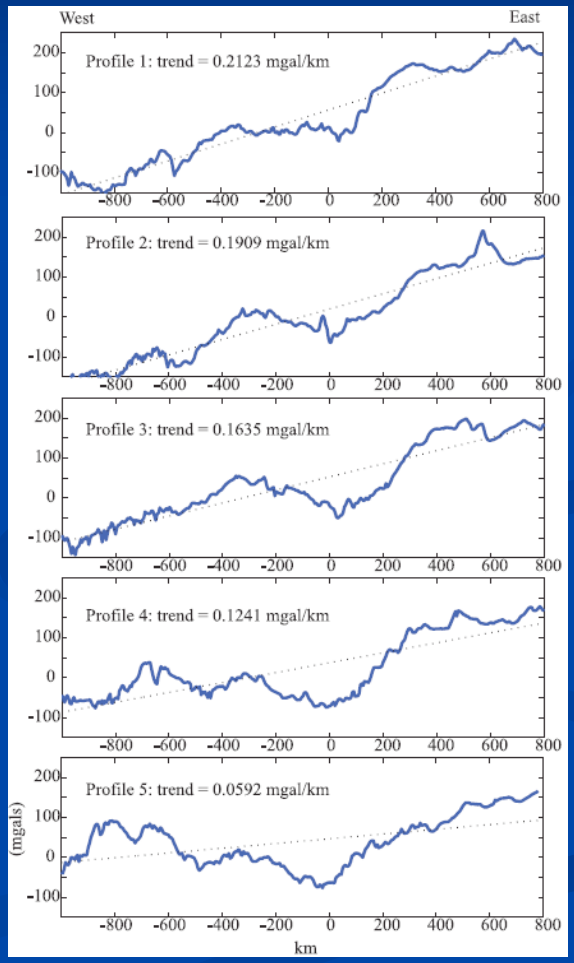
Implications

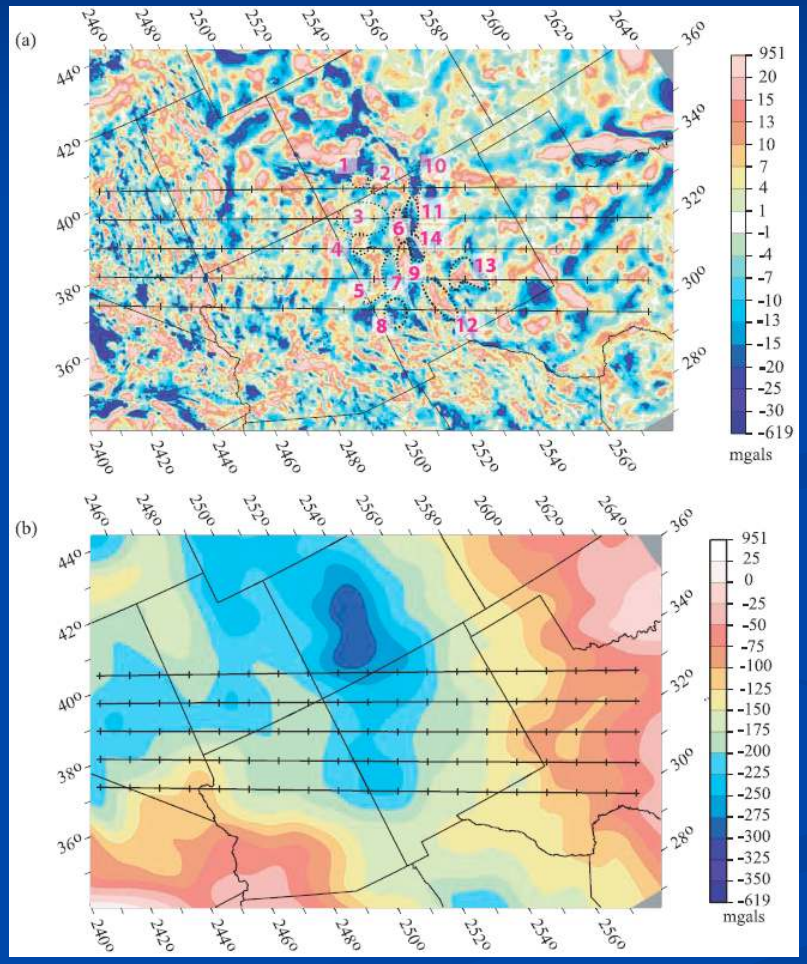
- Middle Tertiary ignimbrite flare-up and late tertiary magatism
  - Basalt extraction
  - Partial melt
  - High heat flow
- Broad upwarping of asthenosphere beneath thinned lithosphere
- Puzzle of relationship with Rio Grande Rift

Additional Thoughts

- Puzzle of relationship with Rio Grande Rift
- Depth
- Heat flow


a)
West
East
Profile 1
Profile 2
Profile 3
Profile 4
Profile 5
(km)
(km)
b)
Colorado Plateau
SJ
JL
TL
MD
RGR
1
2
3
4
5
-496 -350 -325 -300 -275 -250 -225 -200 -175 -150 -125 -100 -75 -50 -25 0 25 518
mgals


West
East
Profile 1: trend = 0.2123 mgal/km
Profile 2: trend = 0.1909 mgal/km
Profile 3: trend = 0.1635 mgal/km
Profile 4: trend = 0.1241 mgal/km
Profile 5: trend = 0.0592 mgal/km
(mgals)
km


(a)
2460
2480
2500
2520
2540
2560
2580
2600
2620
2640
360
440
420
400
380
360
340
320
300
280
1
2
3
4
5
6
7
8
9
10
11
12
13
14
951
20
15
13
10
7
4
1
-1
-4
-7
-10
-13
-15
-20
-25
-30
-619
mgals
2400
2420
2440
2460
2480
2500
2520
2540
2560
(b)
951
25
0
-25
-50
-75
-100
-125
-150
-175
-200
-225
-250
-275
-300
-325
-350
-619
mgals