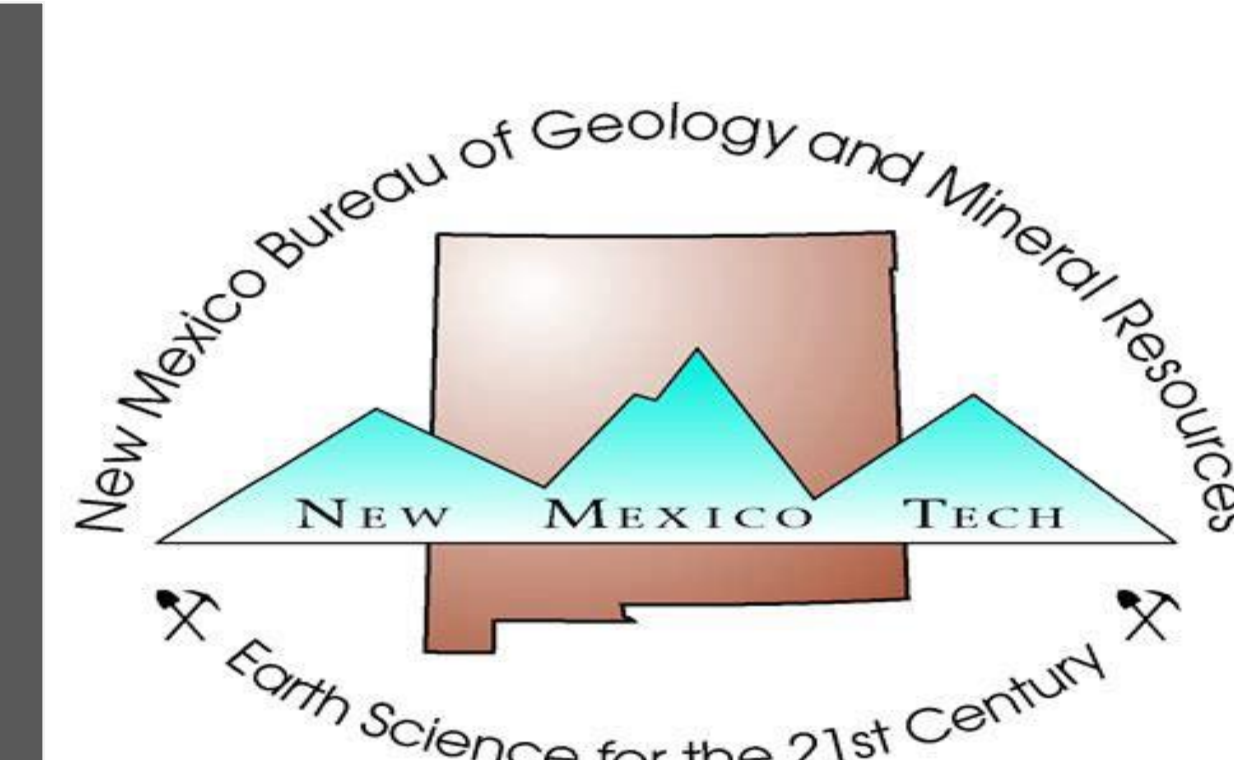


Geometry of Major Normal Faults in the Sevilleta National Wildlife Refuge, Rio Grande Rift, Constrained By Total Bouguer Gravity Anomaly Data

Antonio Chavez¹; Richard Chamberlin²; Phil Miller²; Alex Rinehart¹

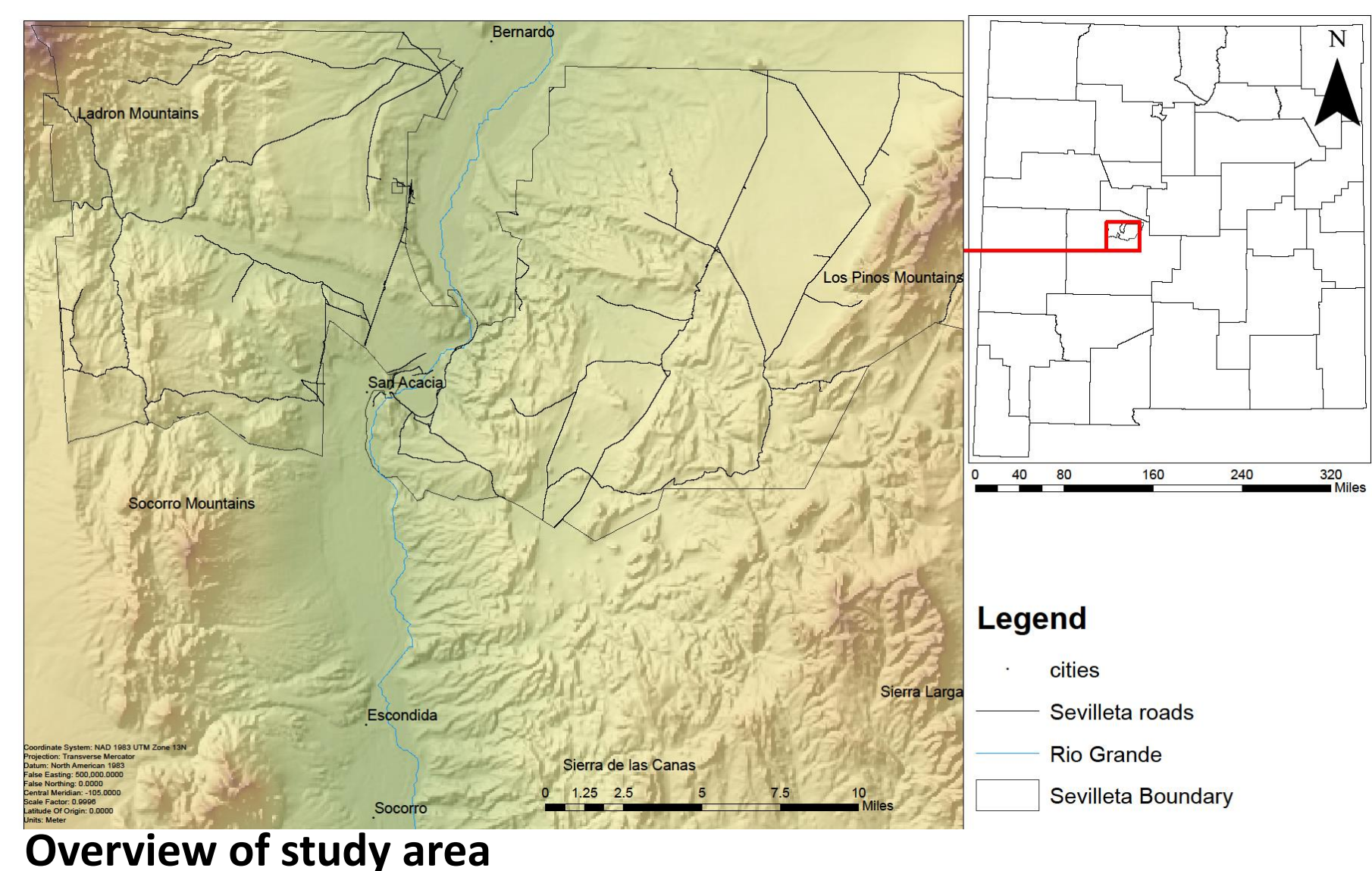
¹Earth and Environmental Science Department, New Mexico Institute of Mining and Technology, Socorro, NM, 87801 ,

²New Mexico Bureau of Mineral Resources, New Mexico Tech, 801 Leroy Place, Socorro, NM, 87801



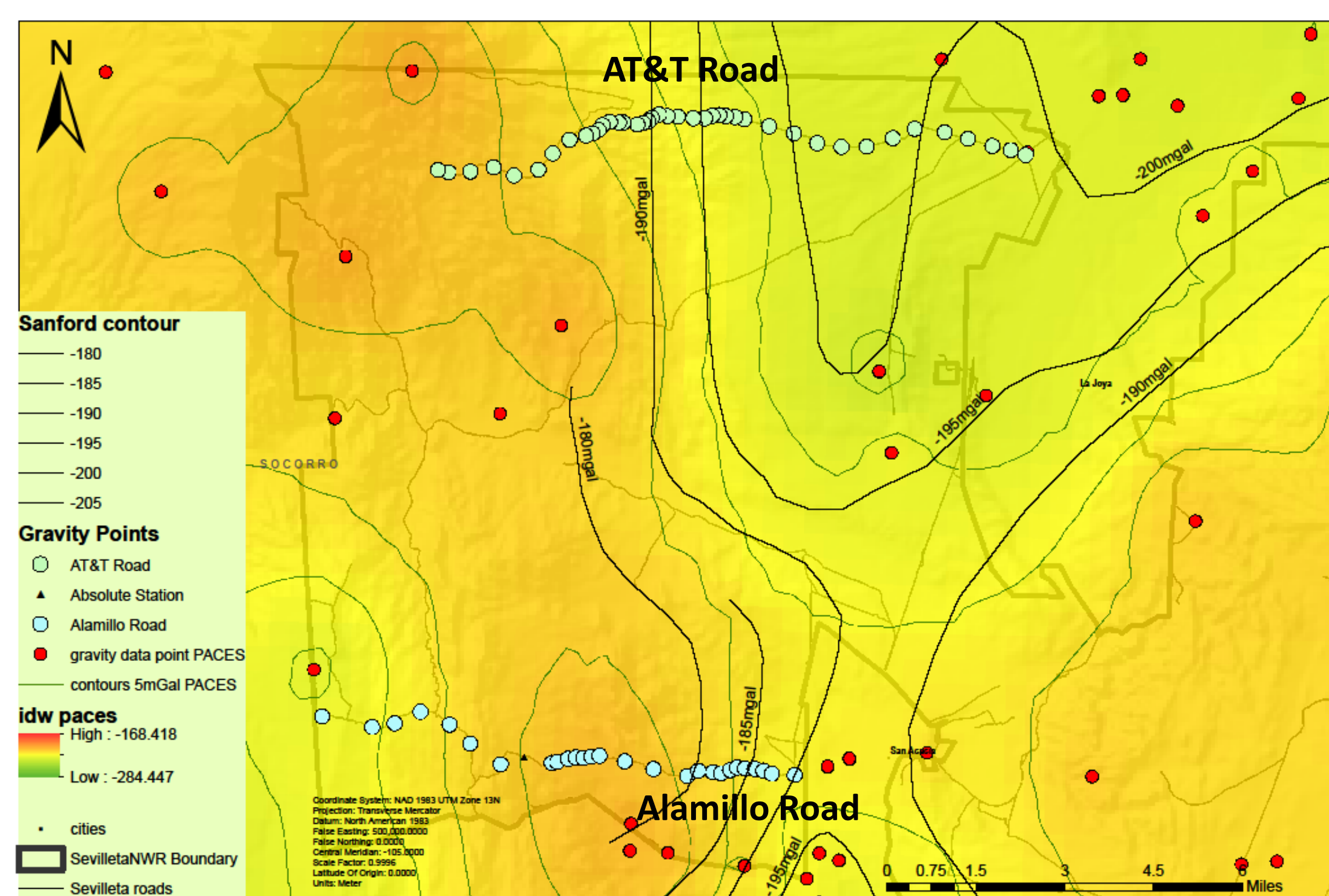
Introduction

- Fault geometries of Rio Grande rift (RGR) are under much debate
- Sparse or non-georeferenced historical gravity data limits interpretations
- Ricketts et al., 2015:
 - Proposes deep-seated listric faulting with inset domino-style faults
- Chamberlin and Love, 2016:
 - Proposes deep-seated initially high angle normal faults
 - Low angle faults formed by planar-rotation, and then cut by younger high angle faults

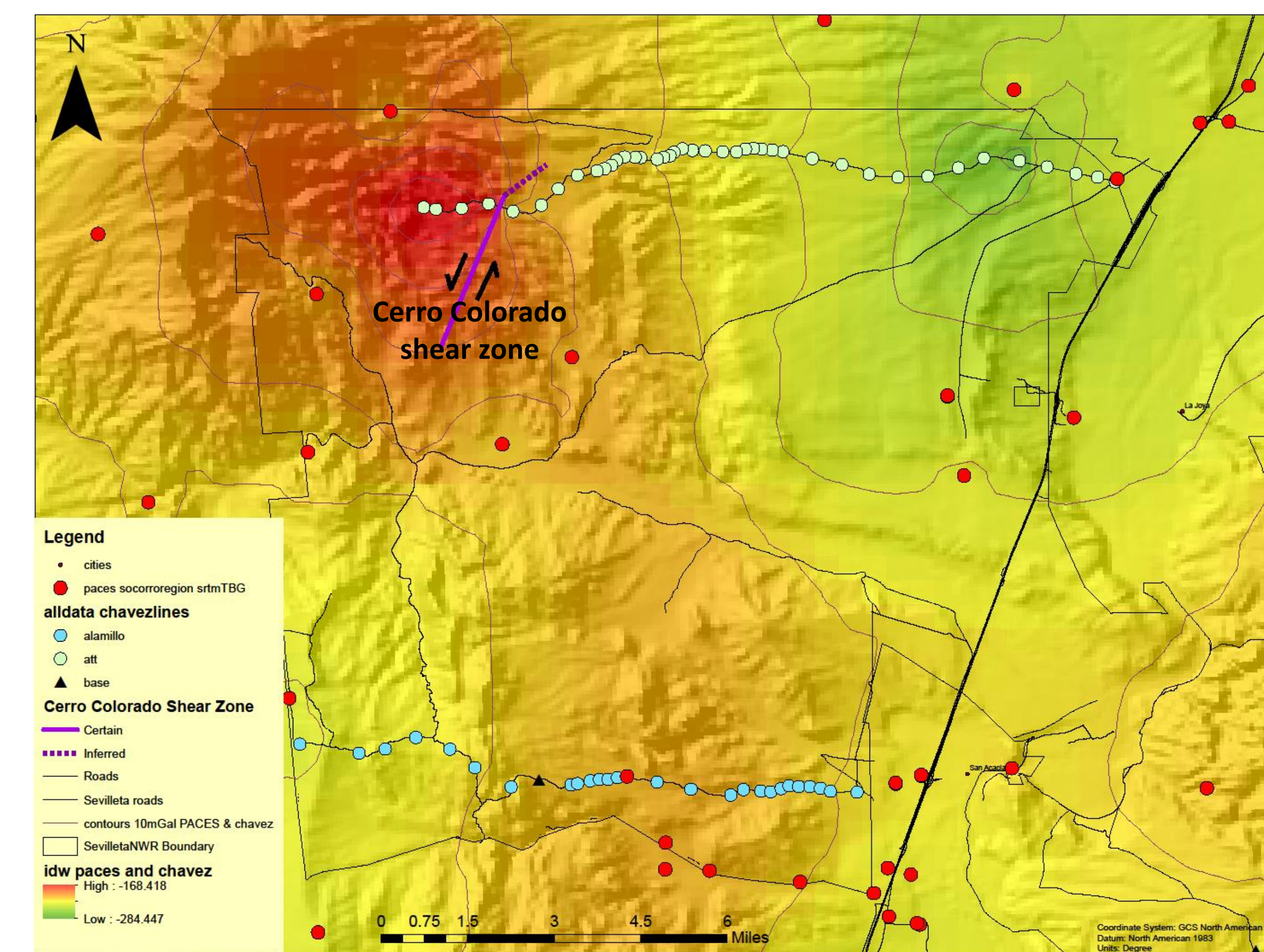


Overview of study area

Total Bouguer gravity anomaly from PACES and Sanford (1978), showing new stations

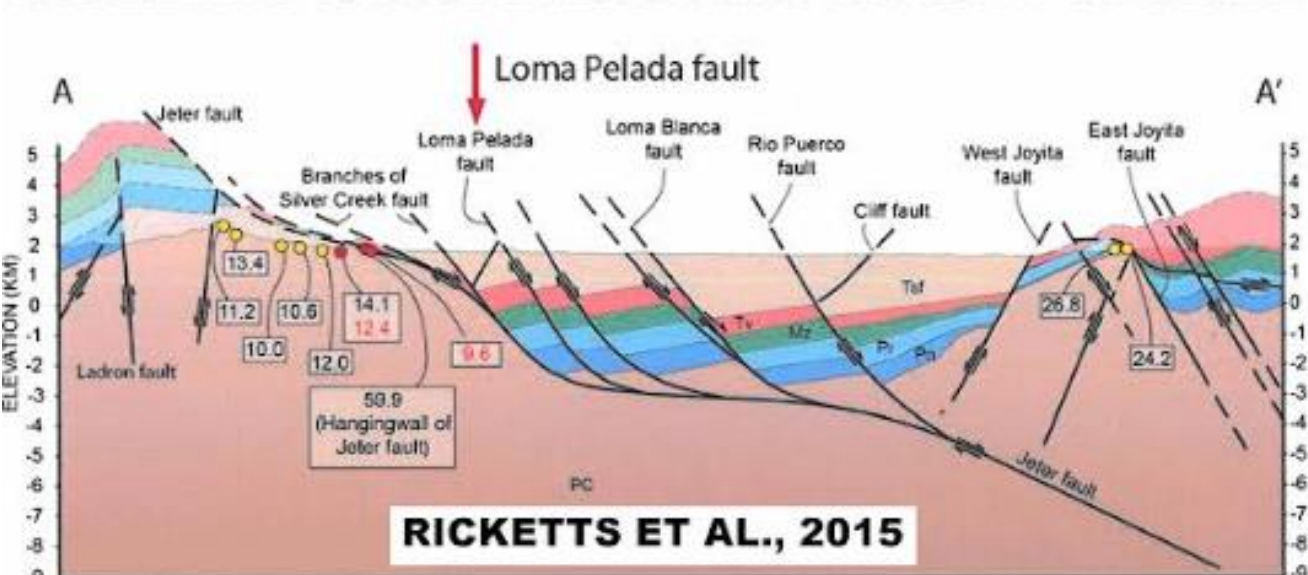


Updated map of total Bouguer gravity anomaly using historical data and data from our study

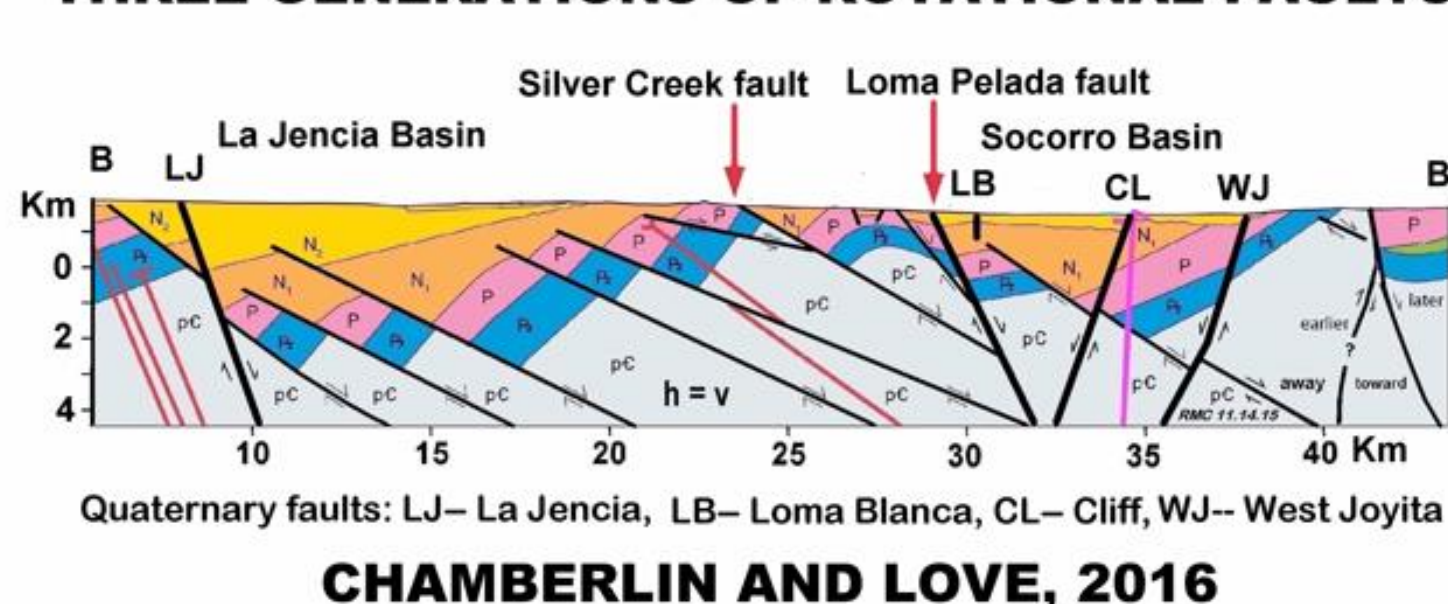


Goal of this study is to provide geophysical constraints on fault geometry

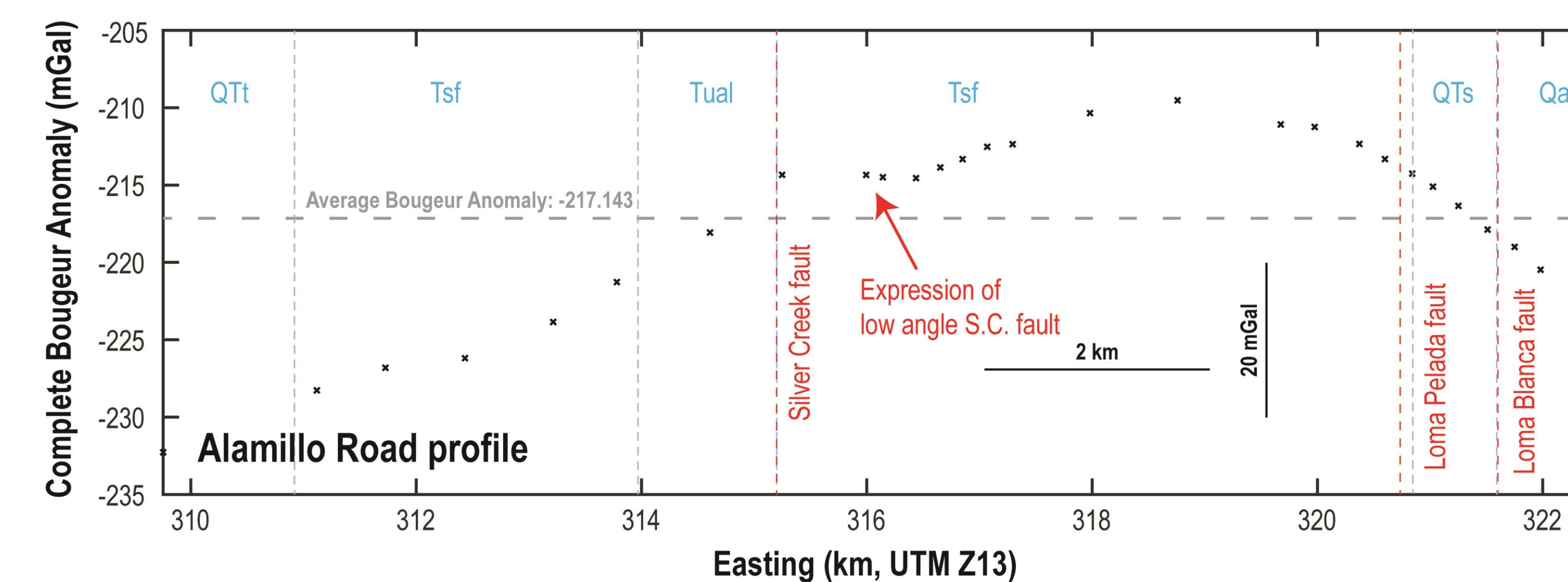
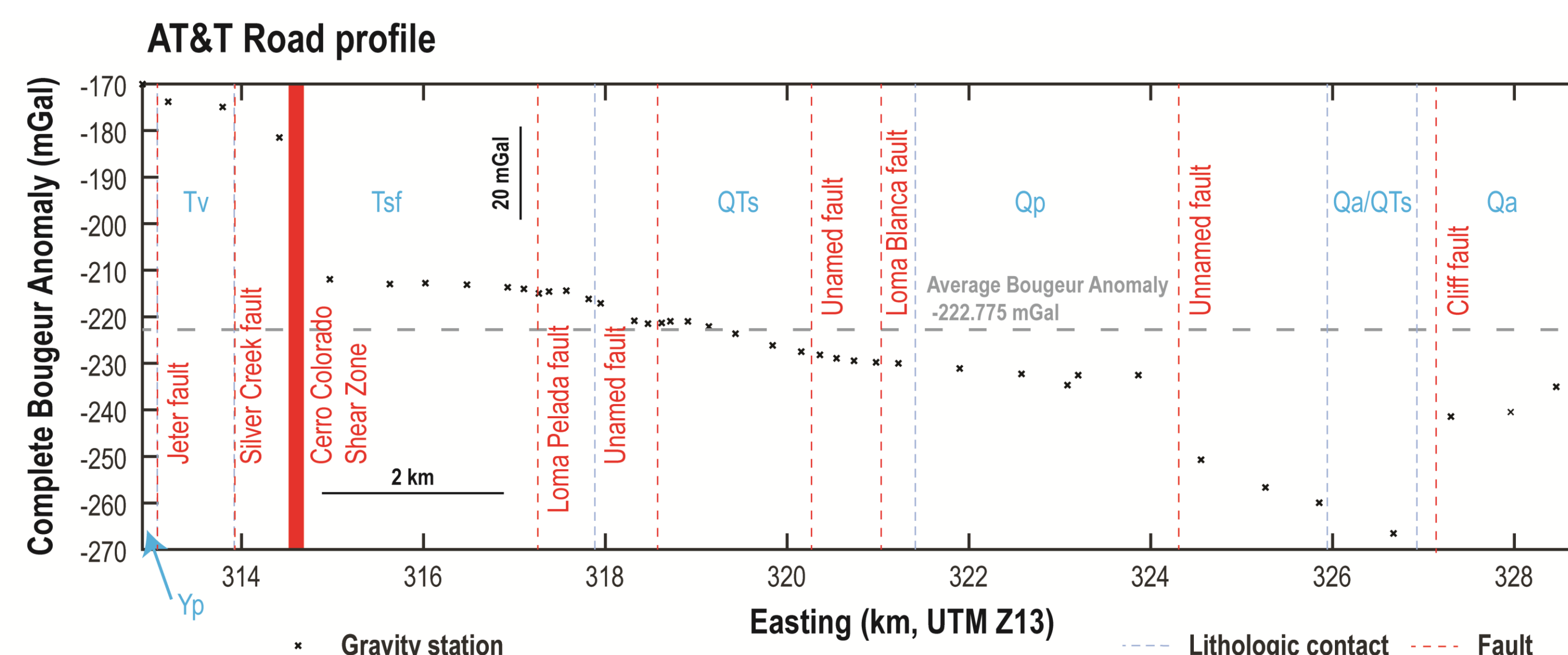
ROLLING HINGE-LISTRIC FAULT MODEL



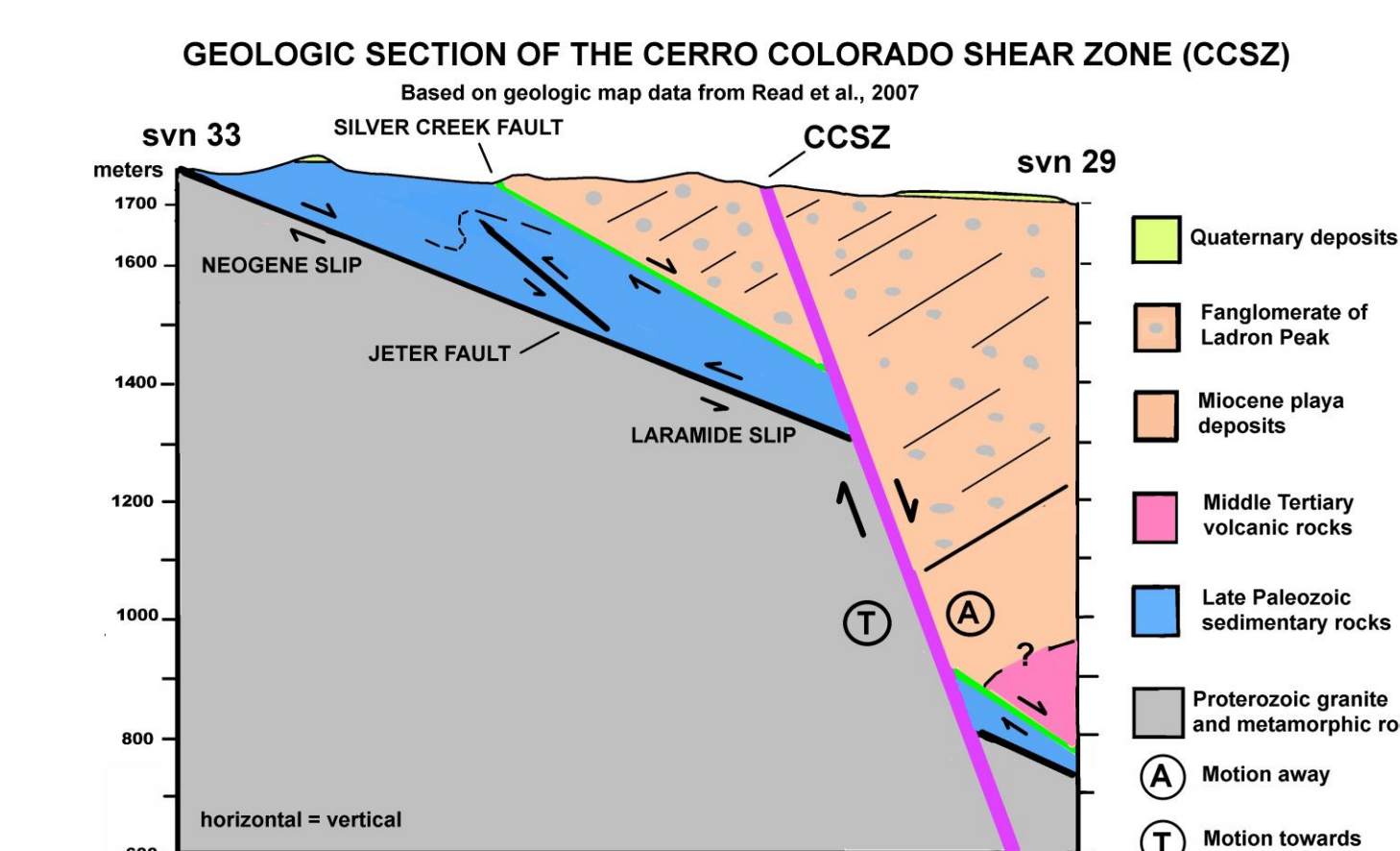
DOMINO-BLOCK MODEL THREE GENERATIONS OF ROTATIONAL FAULTS



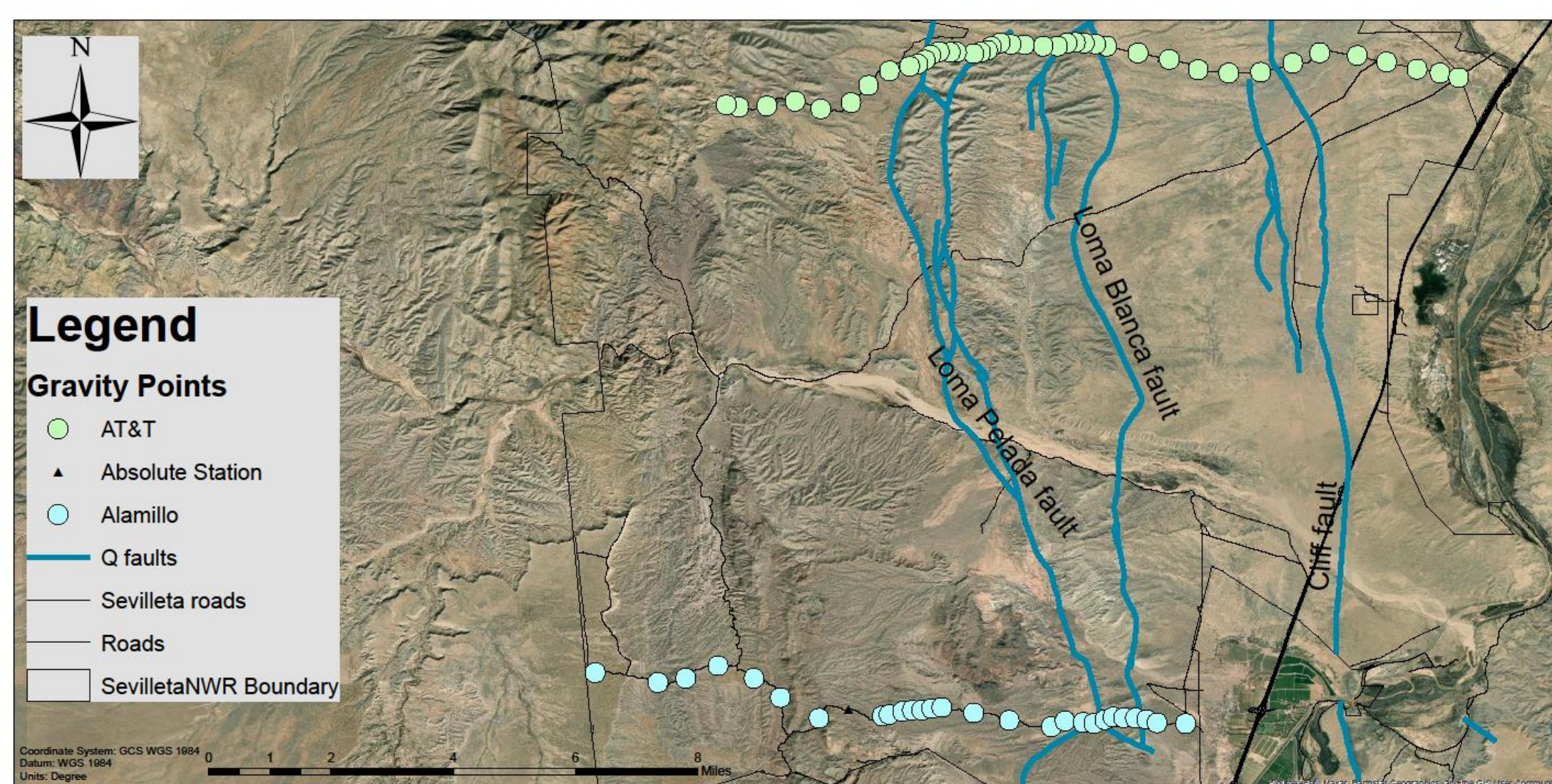
Total Bouguer gravity anomaly profiles



Geologic Section of the Cerro Colorado Shear Zone

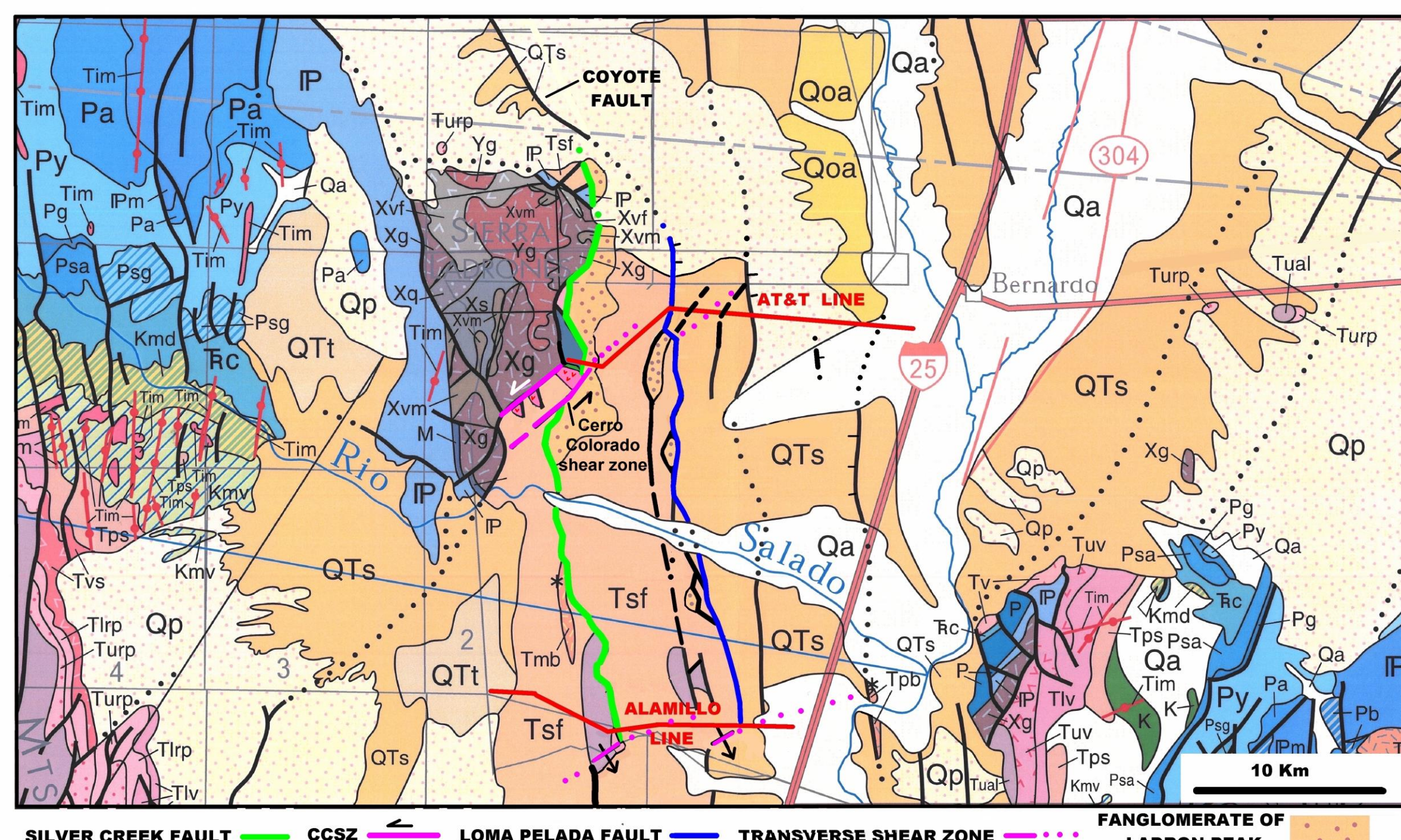


Study Area



Index map of gravity station locations and location of Quaternary faults (USGS).

GEOLOGIC MAP OF THE SEVILLETA NWR REGION SHOWING NEW GRAVITY LINES MODIFIED FROM NMBGMR, 2003



Conclusions

- AT&T Road**
- Cerro Colorado shear zone with high-angle normal displacement caused a 40 mGal step.
 - Fault expression subdued, consistent with low-angle normal faults.
 - Resolved graben at Cliff fault.
- Alamillo Road**
- Subtle east dip west of low-angle Silver Creek fault consistent with predictions of Chamberlin and Love (2016).
 - Predicted gravity profile in Chamberlin and Love (2016) largely confirmed.

Gravity profiles support Chamberlin and Love (2016), but do not prove it.

Methods



- Gravimeter is a ZLS Burris Gravity Meter with 5 μ Gal resolution
- Added 74 new relative gravity stations spaced at 0.25 to 1 km
- Re-occupied a subset of stations multiple times to correct for drift and to tie to NGA absolute benchmarks.
- GPS coordinates were collected with a Trimble RTX to a 10-cm horizontal and 5-cm vertical accuracy at each station

References

Chamberlin, R. M., and D. W. Love (2016). Block diagrams and cross sections illustrating geologic and tectonic evolution of the Sevilleta national wildlife refuge, Rio Grande rift, central New Mexico, Open-File Rept. 579, New Mexico Bureau of Geology and Mineral Resources, Socorro, New Mexico.

Ricketts, J. W., K. E. Karlstrom, and S. A. Kelley (2015). Embryonic core complexes in narrow continental rifts: The importance of low-angle normal faults in the Rio Grande rift of central New Mexico, *Geosphere* 11, no. 2, 425-444.

Read et al. (2007) Geologic Map of the Ladron Peak Quadrangle, Socorro County, New Mexico

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