

The NMSZ: Insights from seismic reflection data and modeling

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Main points

- Comparison of the NMSZ with analog models of stepover structures suggest that the fault pattern is far more complex than has been assumed, implying that only a fraction of the faults are seismically active today.
- Seismic profiles show faults with Eocene or younger(?) motion within the graben structure but outside of the NMSZ.
- There is evidence for kms of strike-slip motion along the southern arm of the NMSZ, but the age of this motion is not well constrained.
- Much of the long-term motion on the southern arm of the NMSZ cut through the Reelfoot fault and continued NE. Motion may also extend SW.

Implications

- Justified in having the 5-fault model that spreads the hazard around.
- If anything, the faults in the national maps should be extended farther NE and SW.

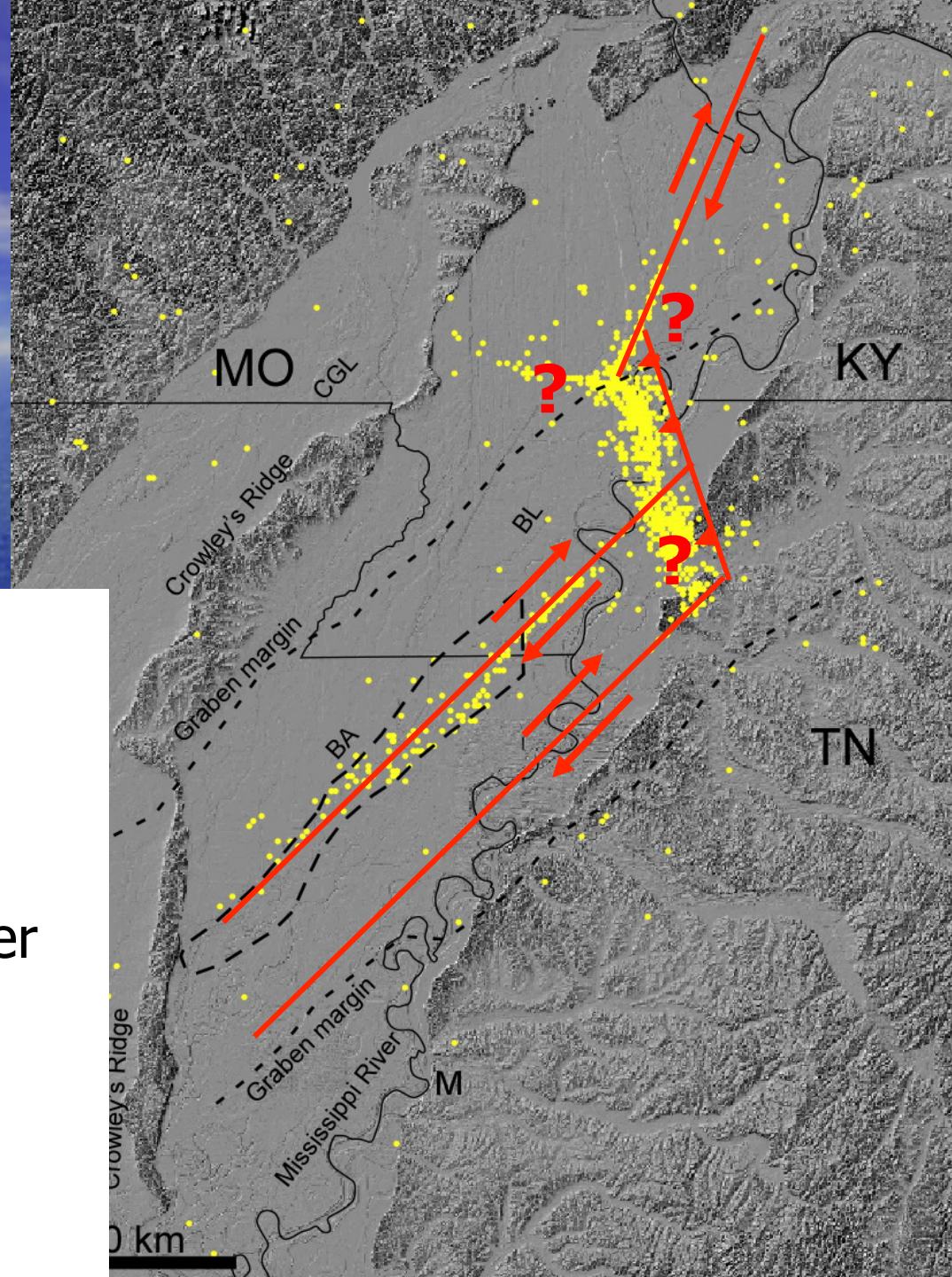
South Reelfoot?

West arm
of seismicity?

trend of north arm?

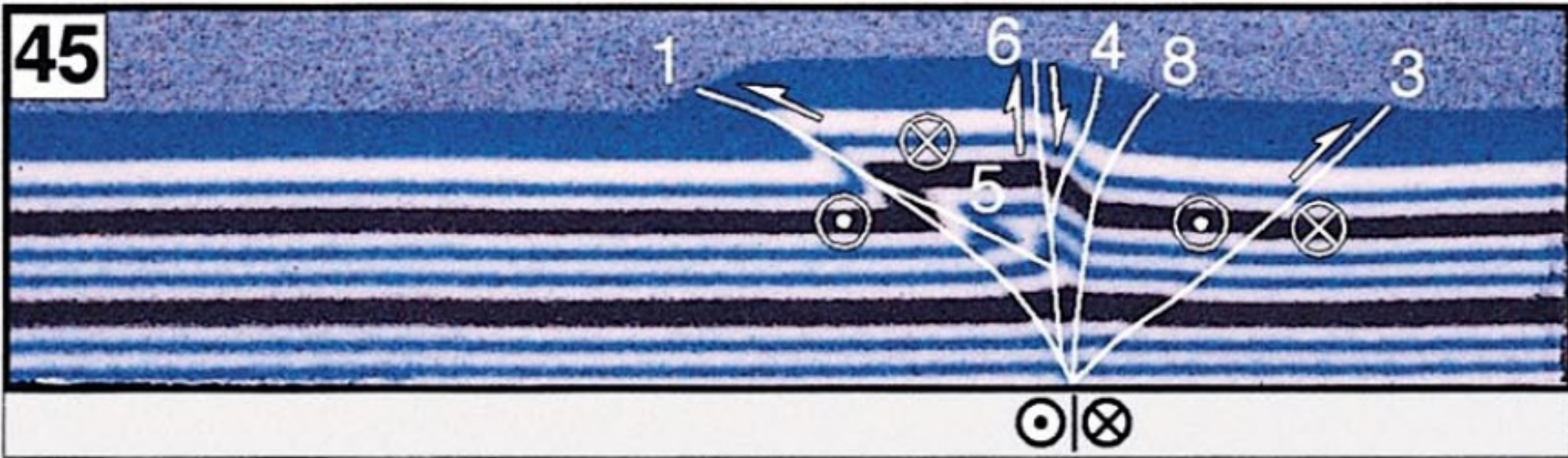
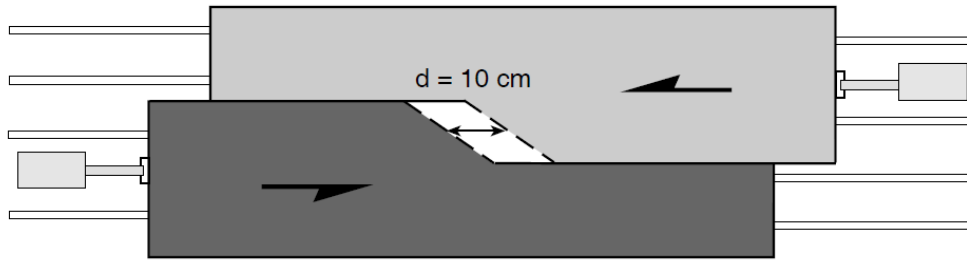
Too simple!

Using more realistic stepover
models explains many
features of NMSZ



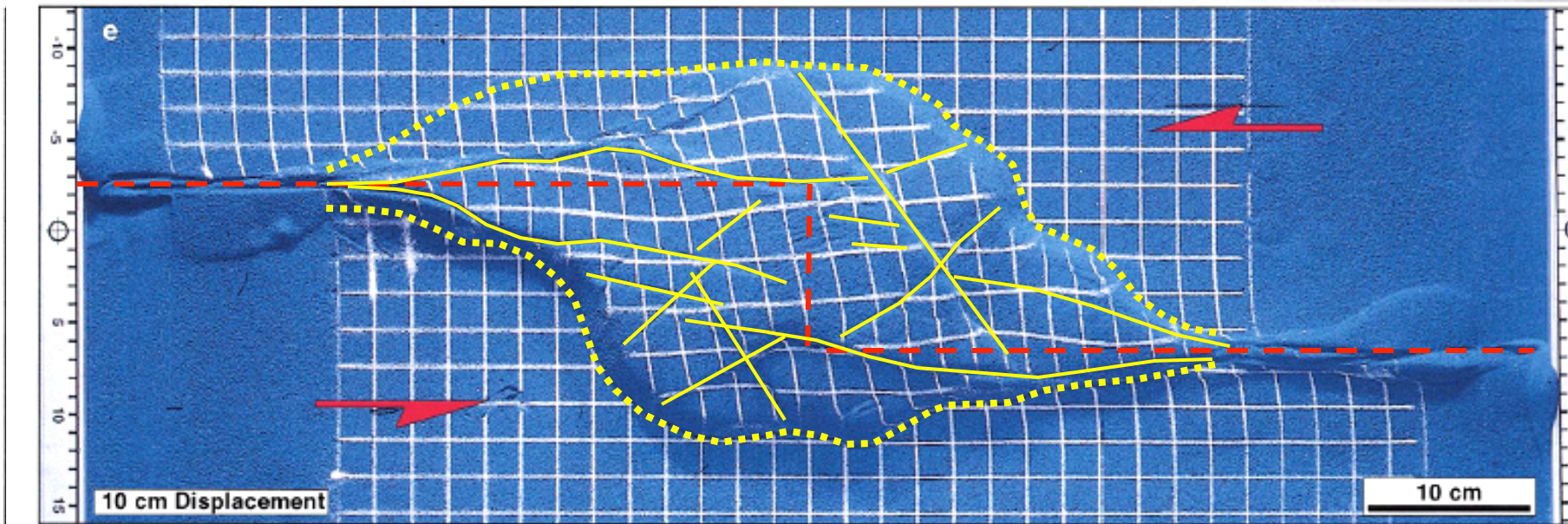
Stepover models

a. Predeformation



McClay, K., and Bonora, M., 2001, *Analog models of restraining stepovers in strike-slip fault systems*, AAPG Bulletin, v. 85 p. 233-160.

McClay and Bonora, right-angle stepover

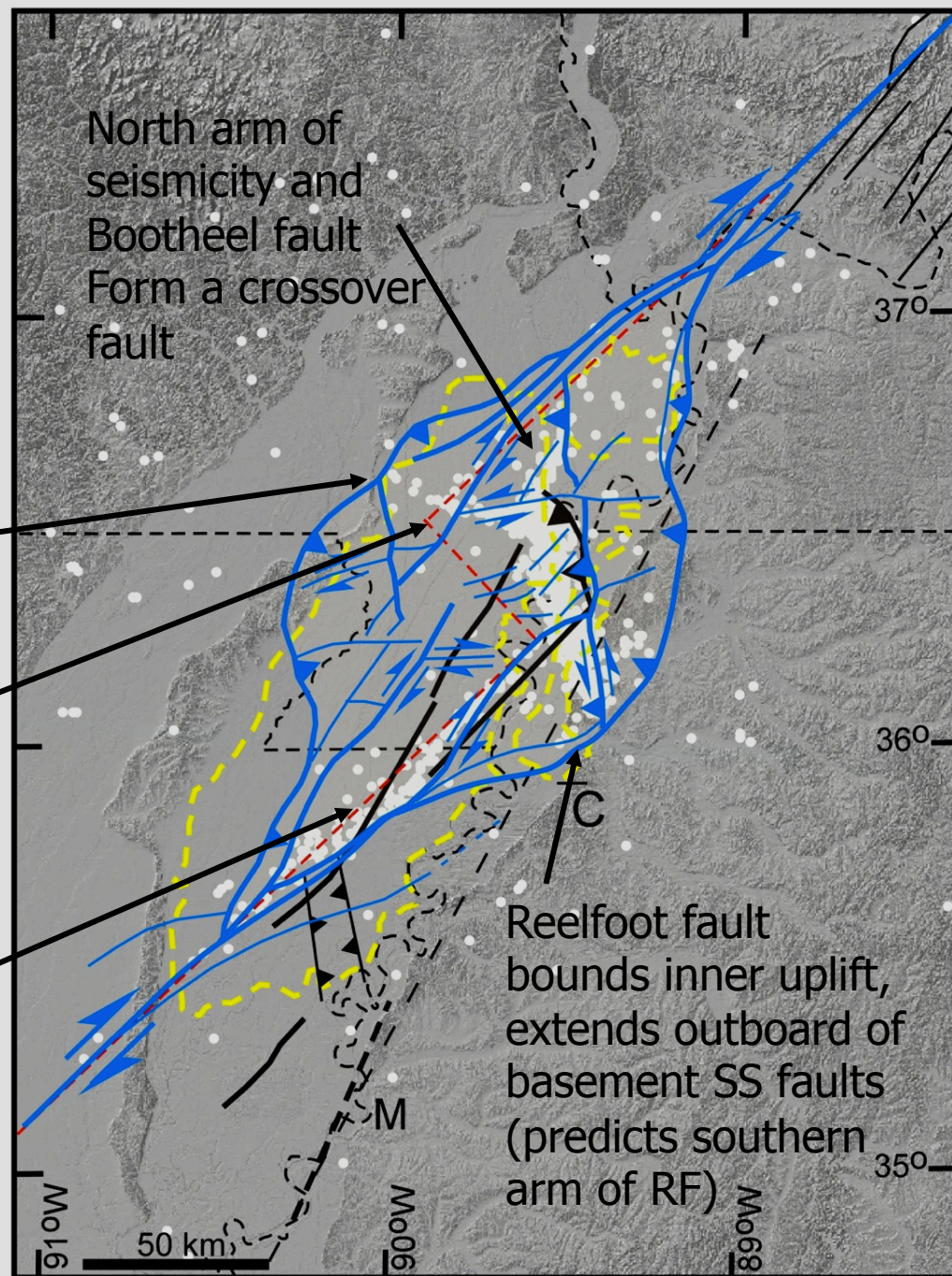


Comparison of stepover model with NMSZ seismicity

Zone of deformation extends well outside of main strike-slip faults, encompasses seismicity

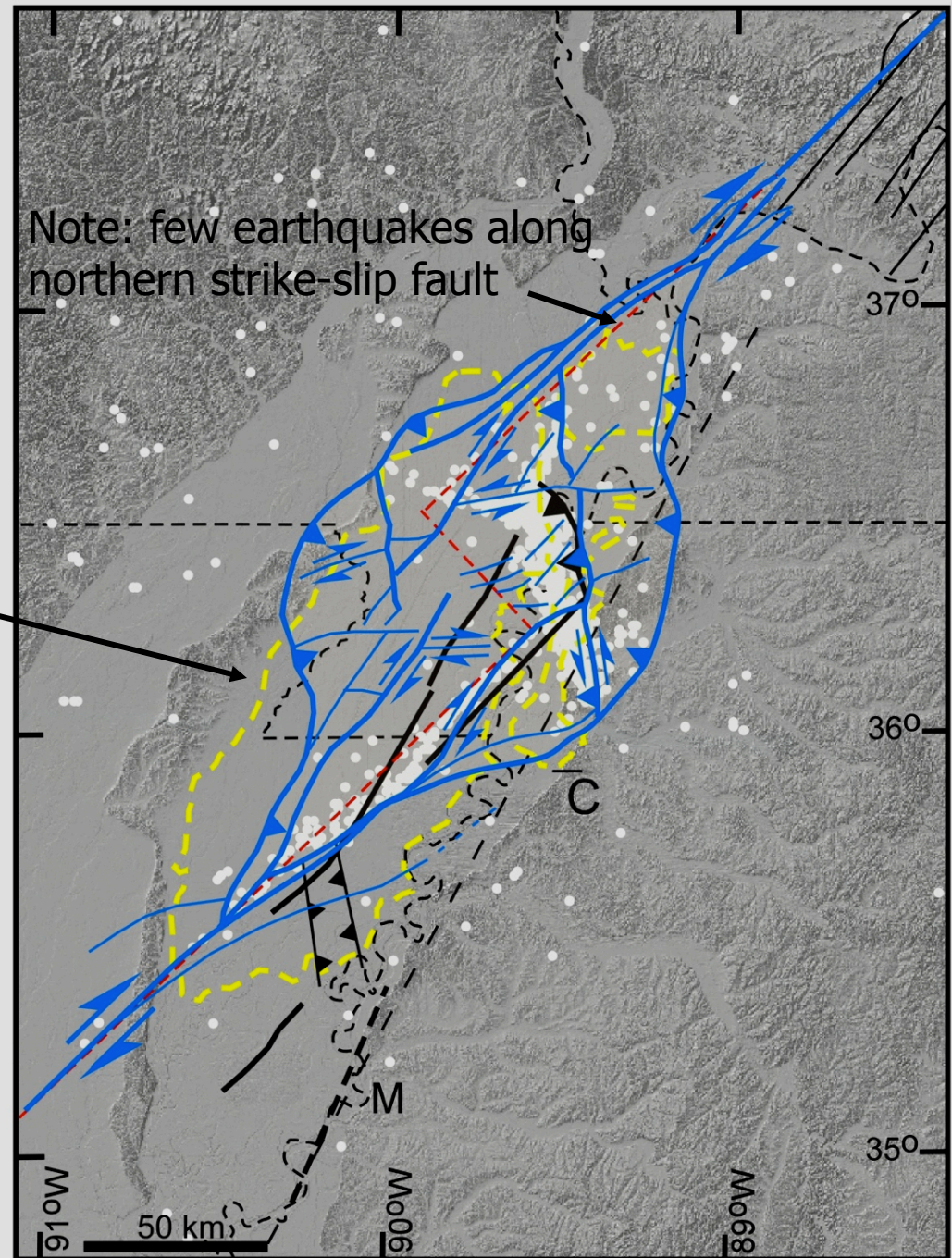
Antithetic fault predicts west arm of seismicity

Outward bowing of SS fault?



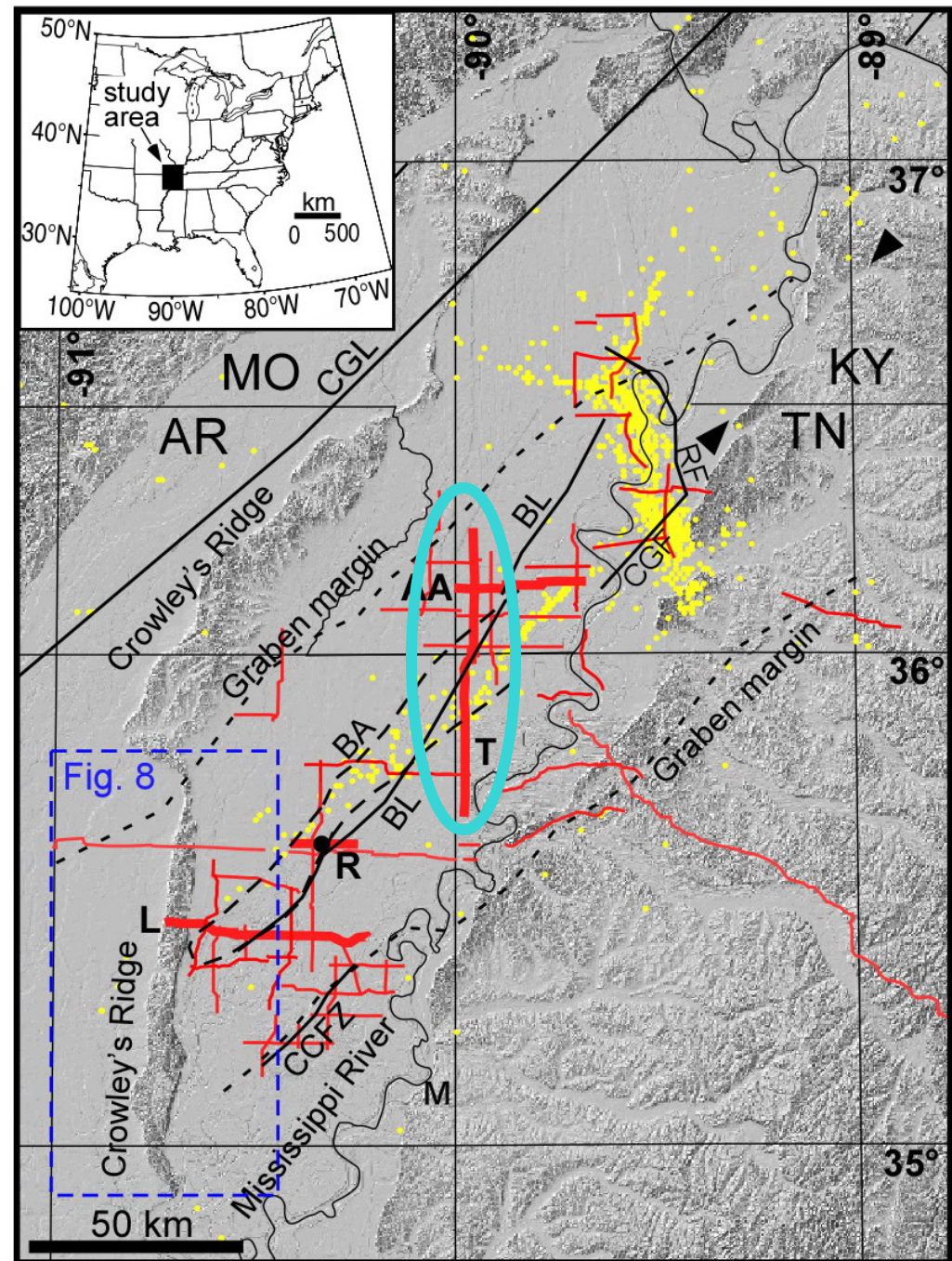
Comparison of stepover model with active faults

Liquefaction is concentrated along southern arm of stepover

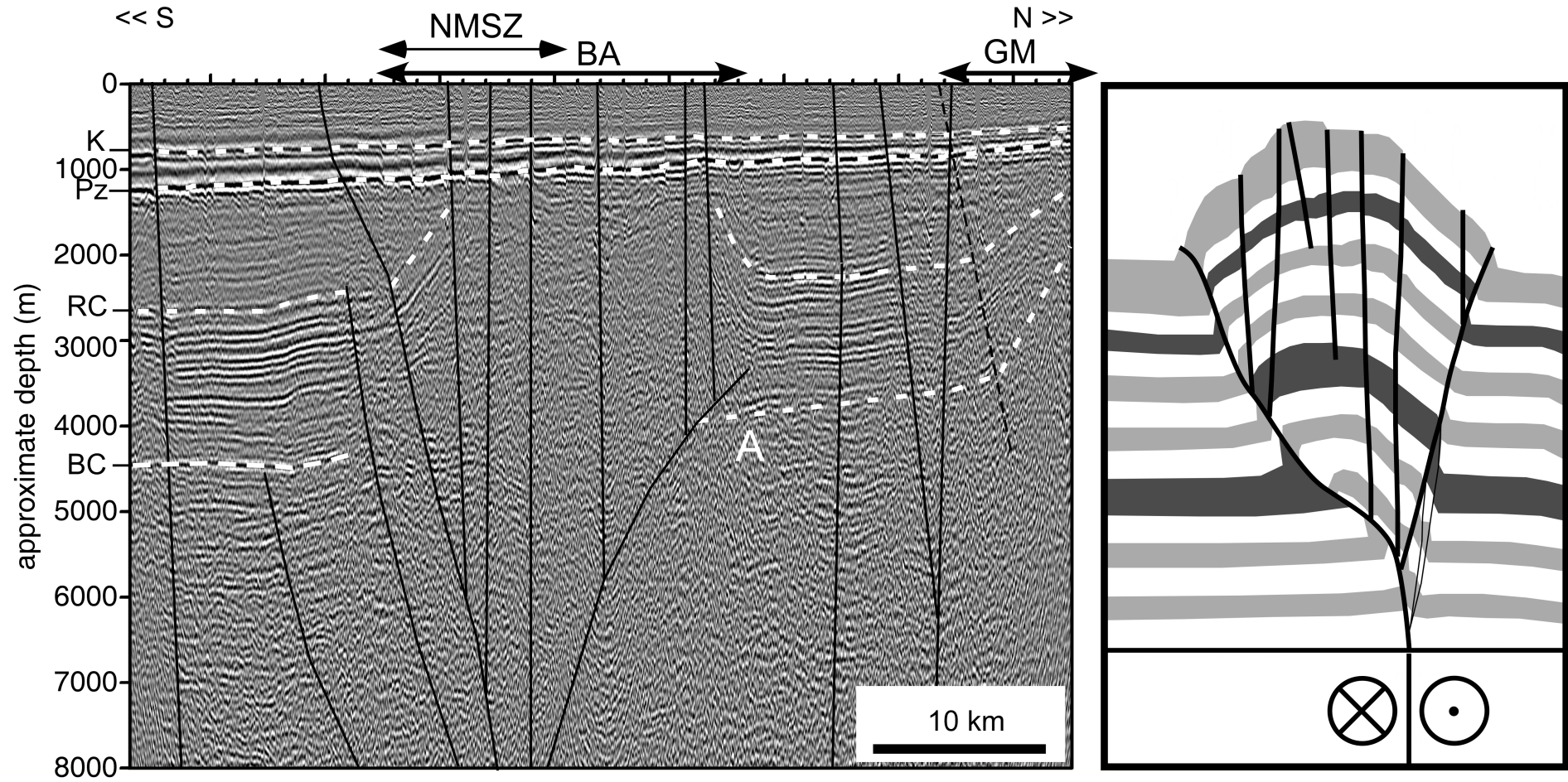


Blytheville arch =
Strike-slip flower structure

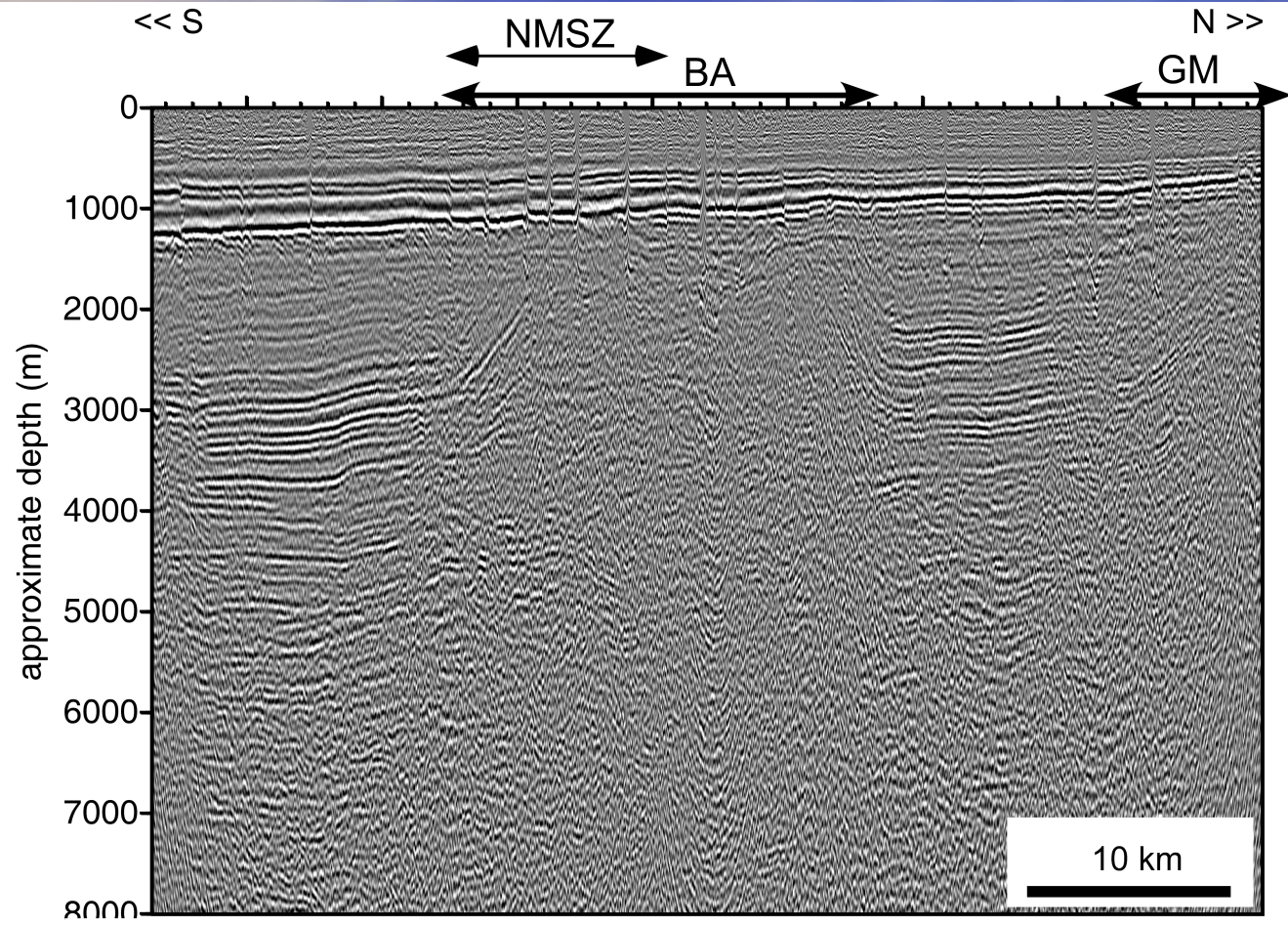
Implies substantial (kms) of
Paleozoic strike-slip motion
along central arm of NMSZ



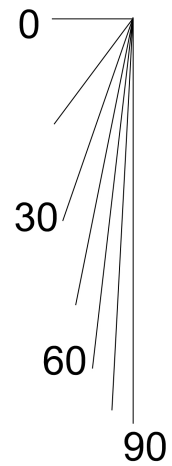
Note faults outside of BA



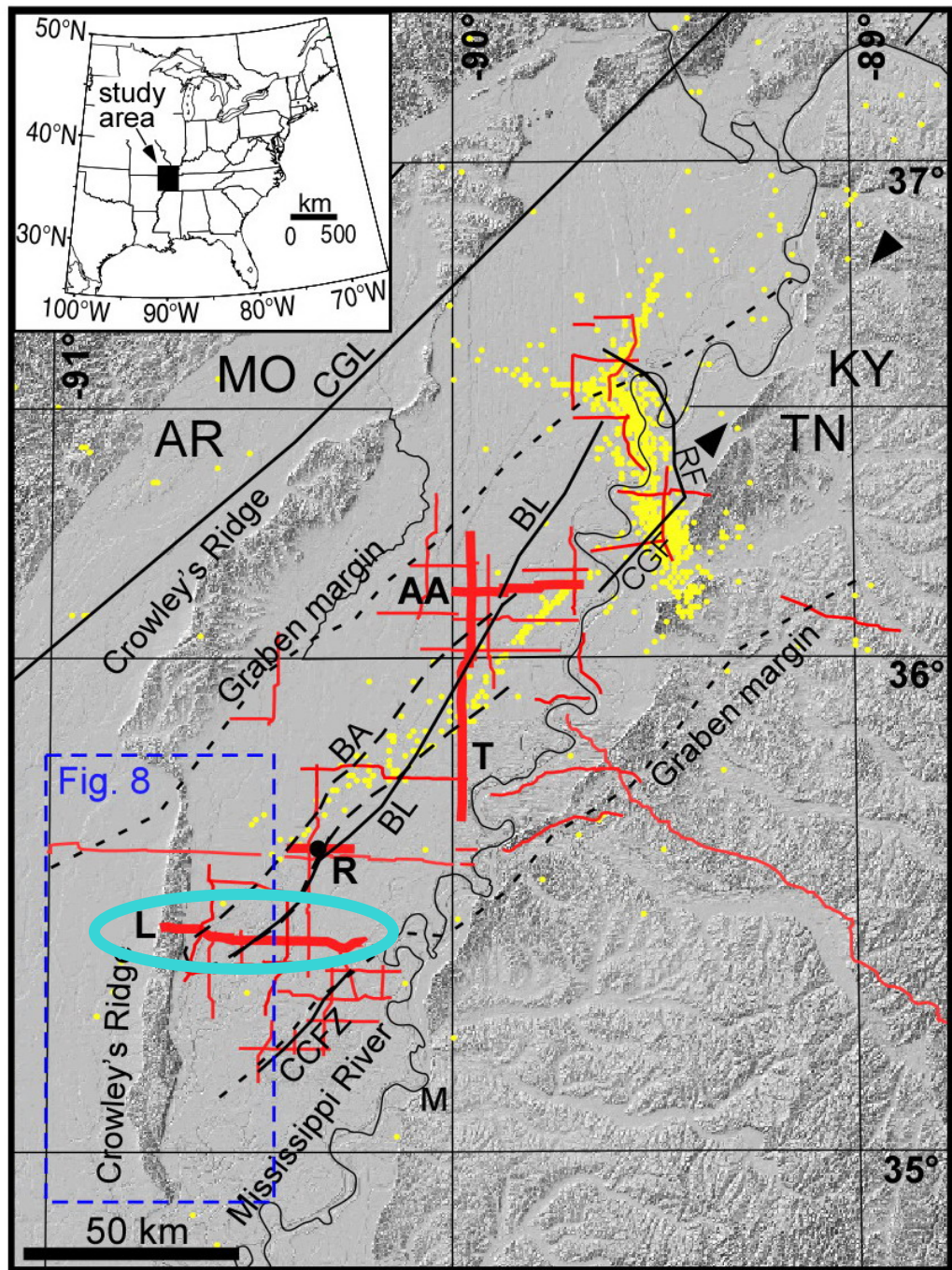
5x vertical exaggeration



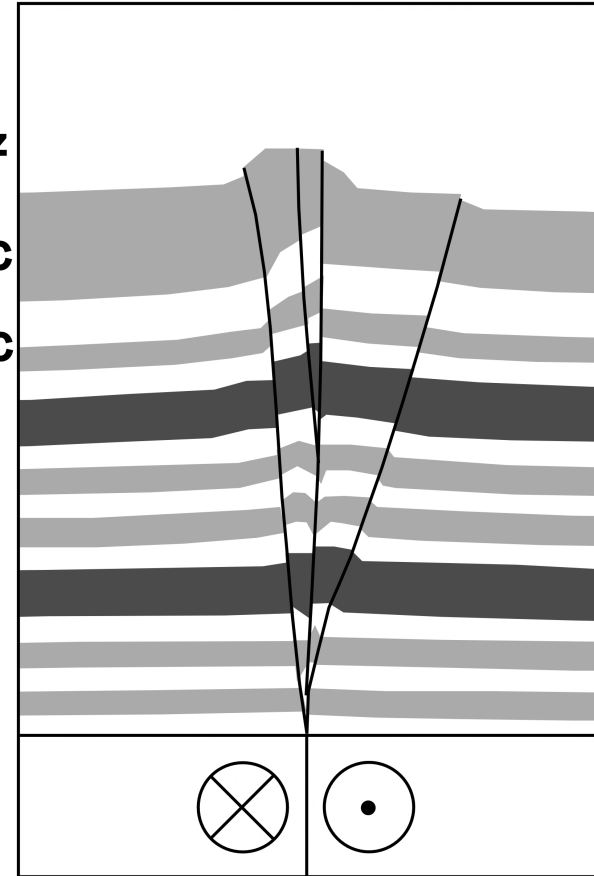
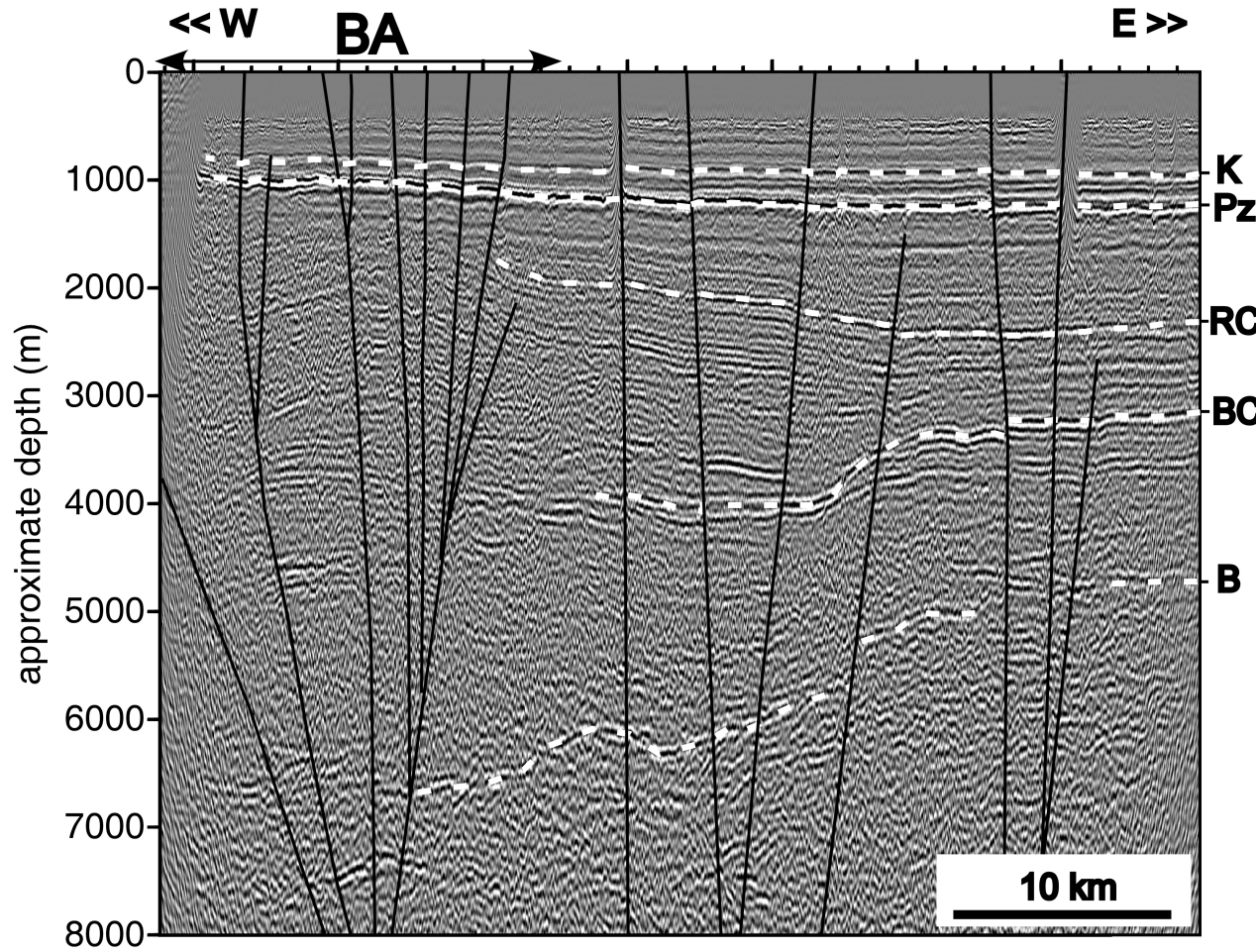
Dip Angle
(degrees)



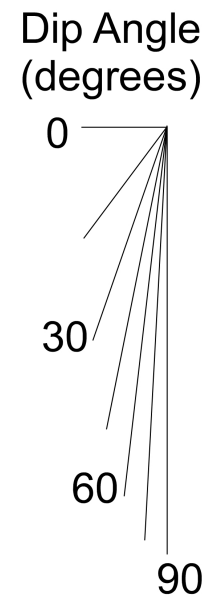
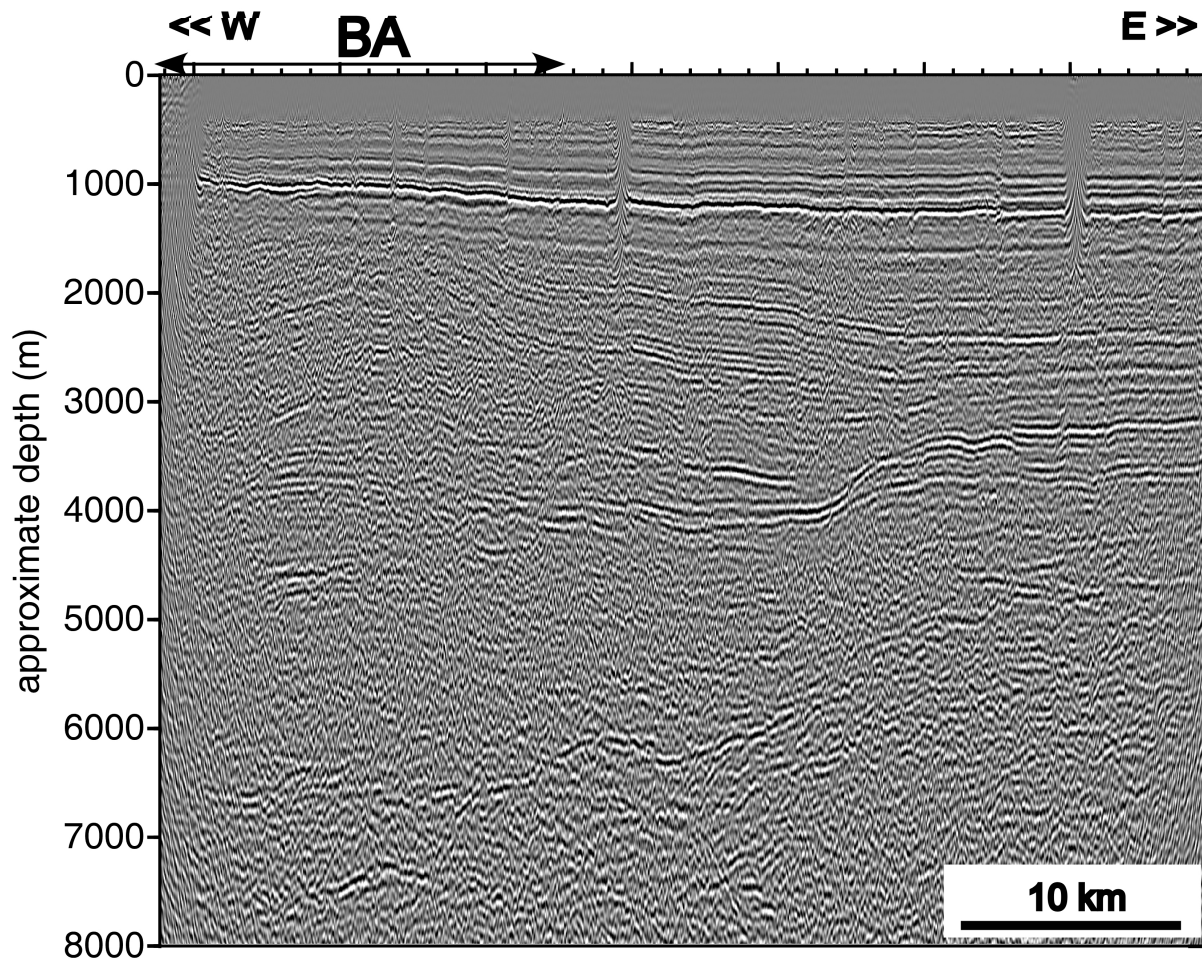
5x vertical exaggeration



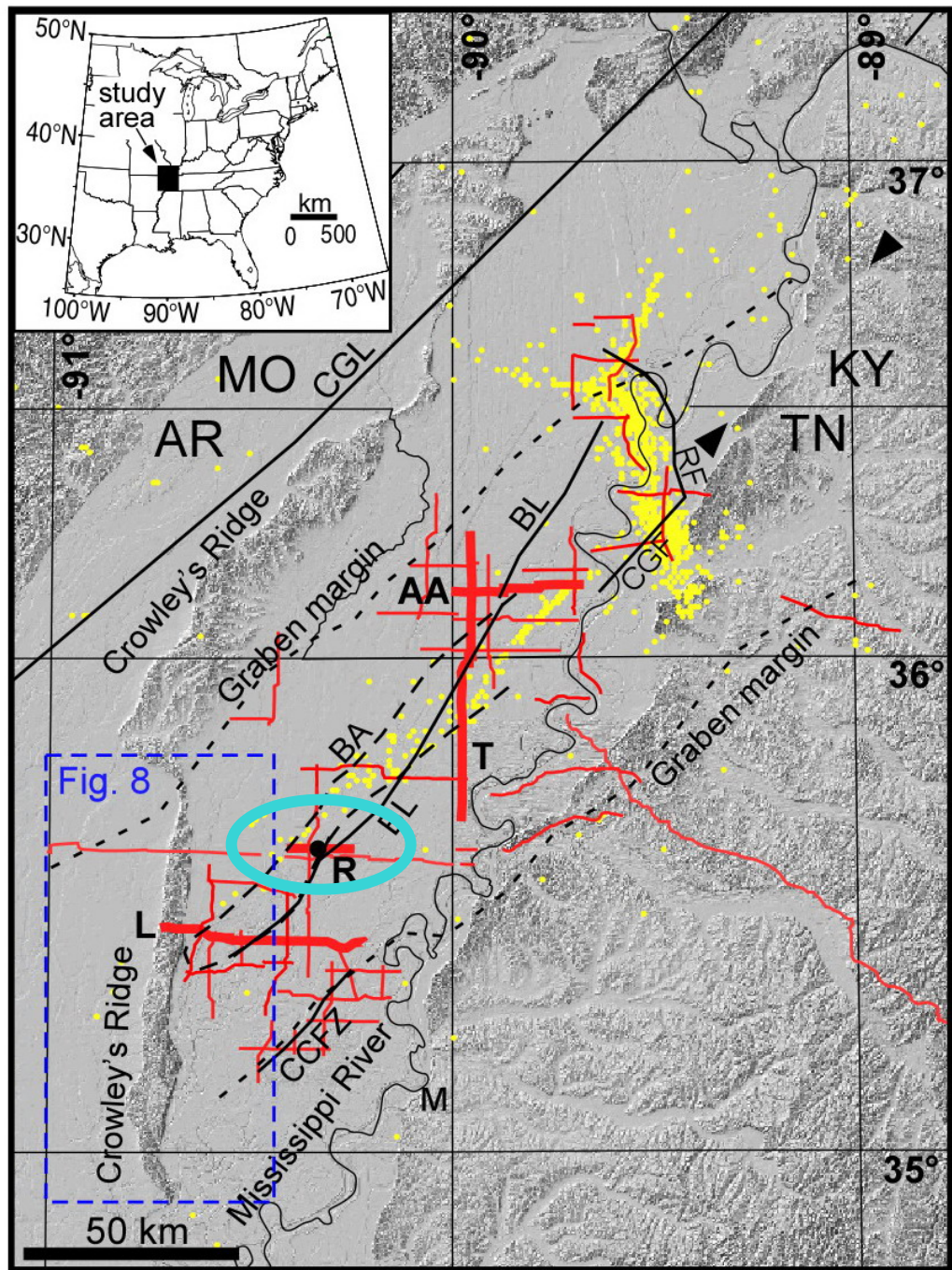
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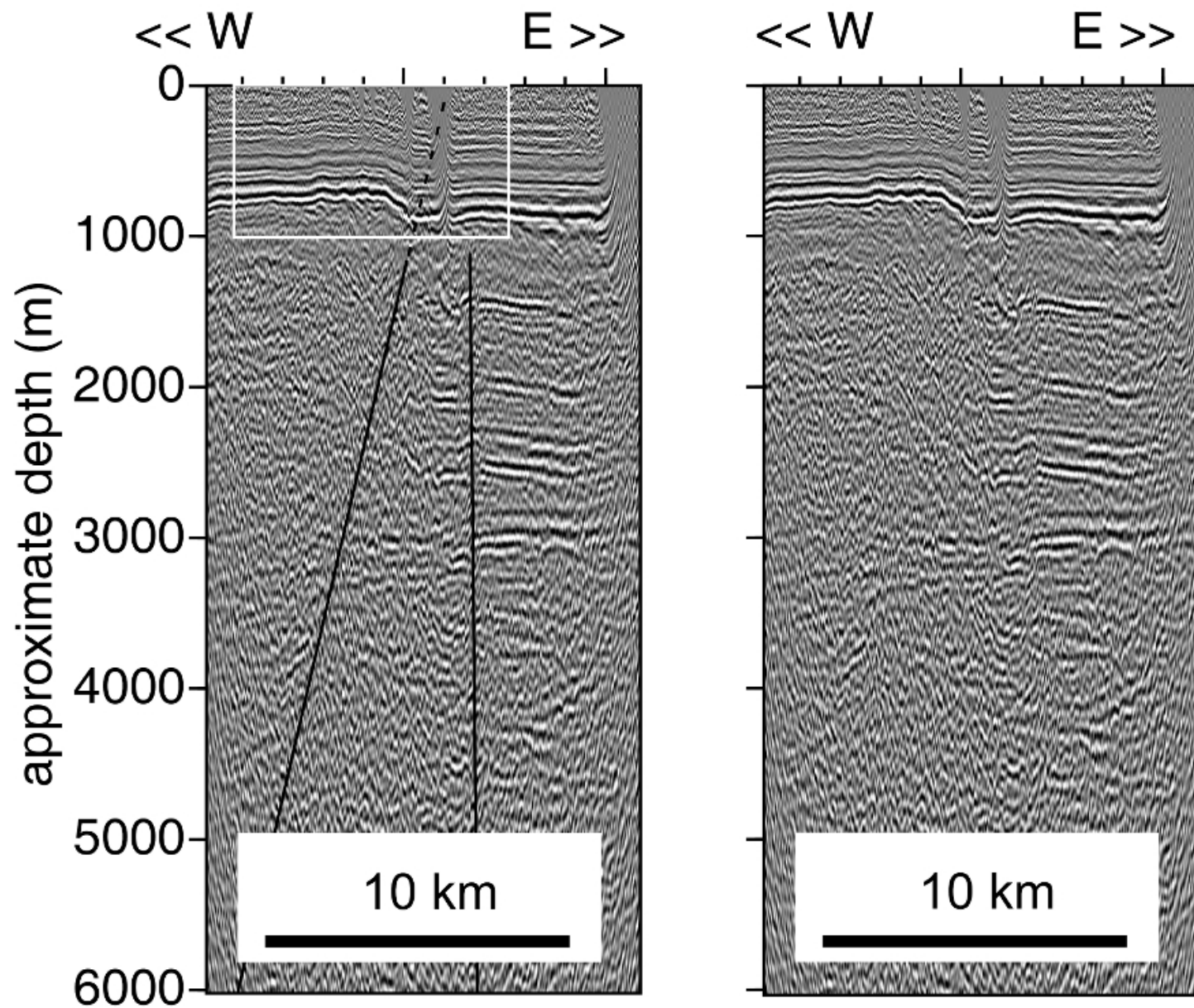


5x vertical exaggeration

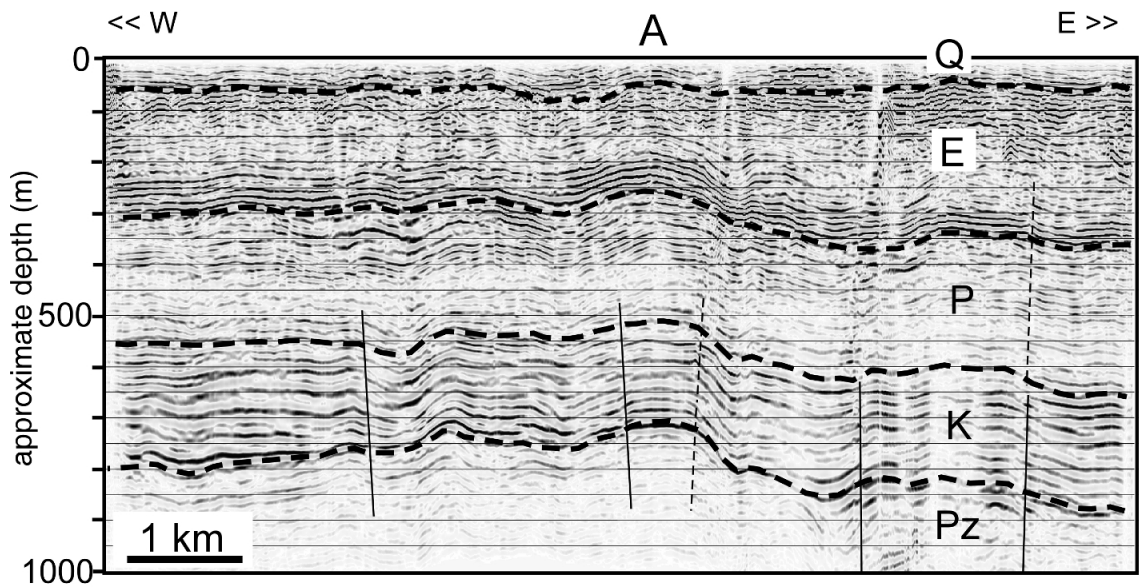
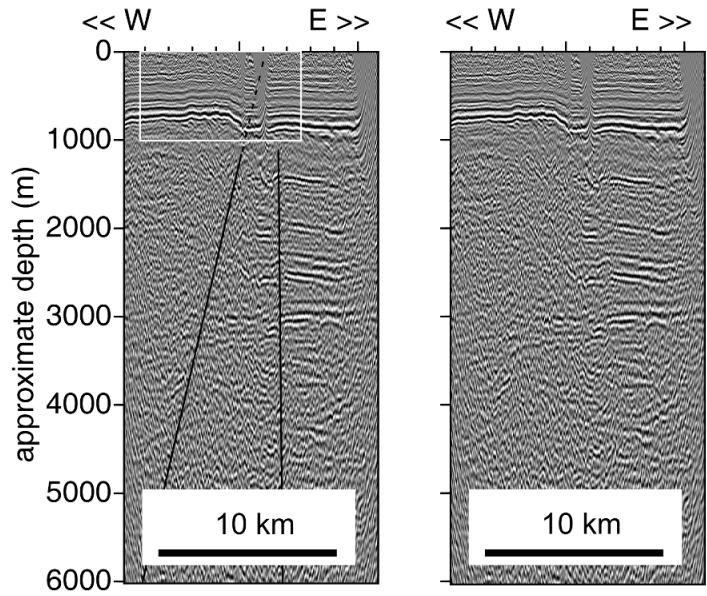


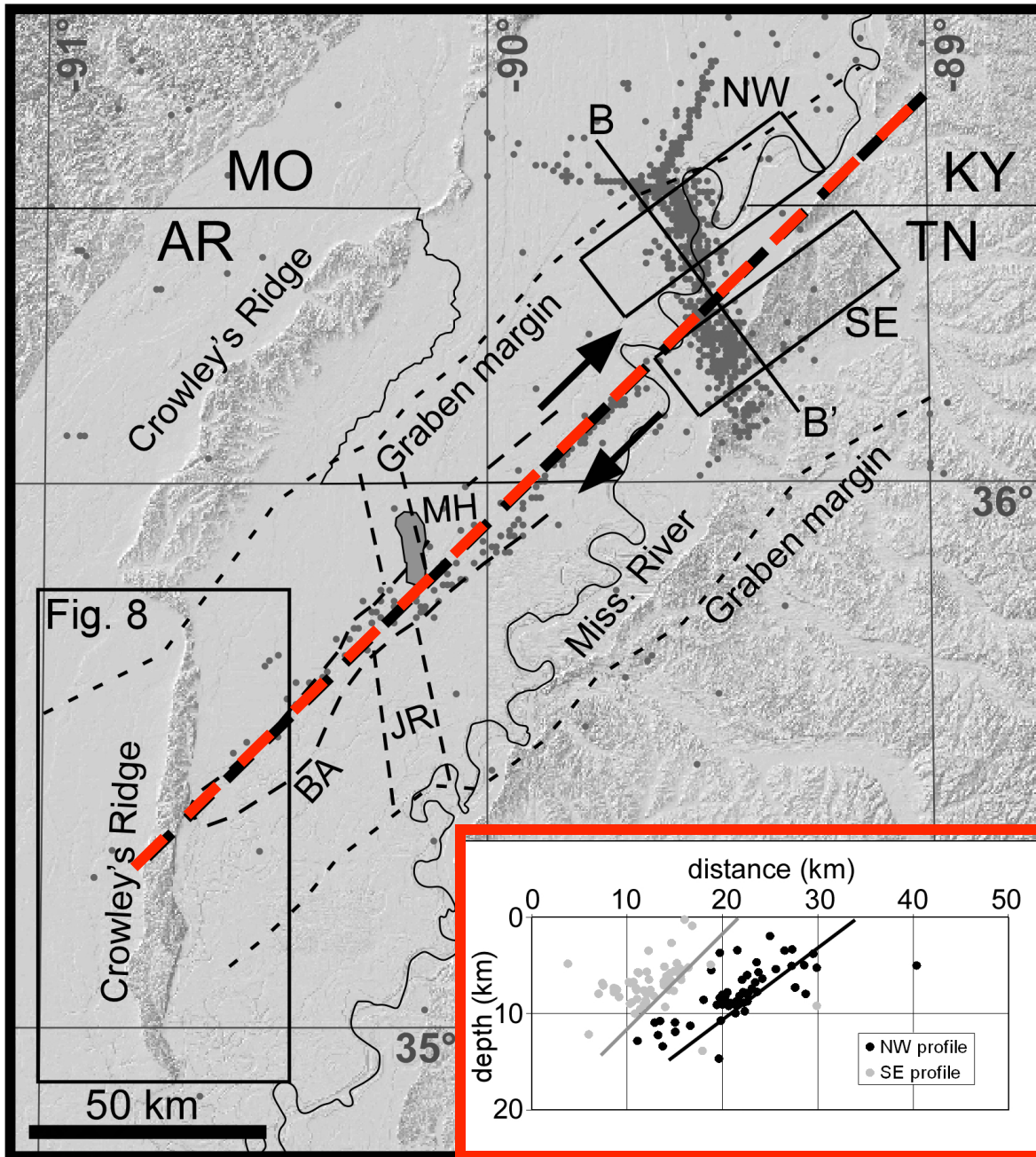
5x vertical exaggeration

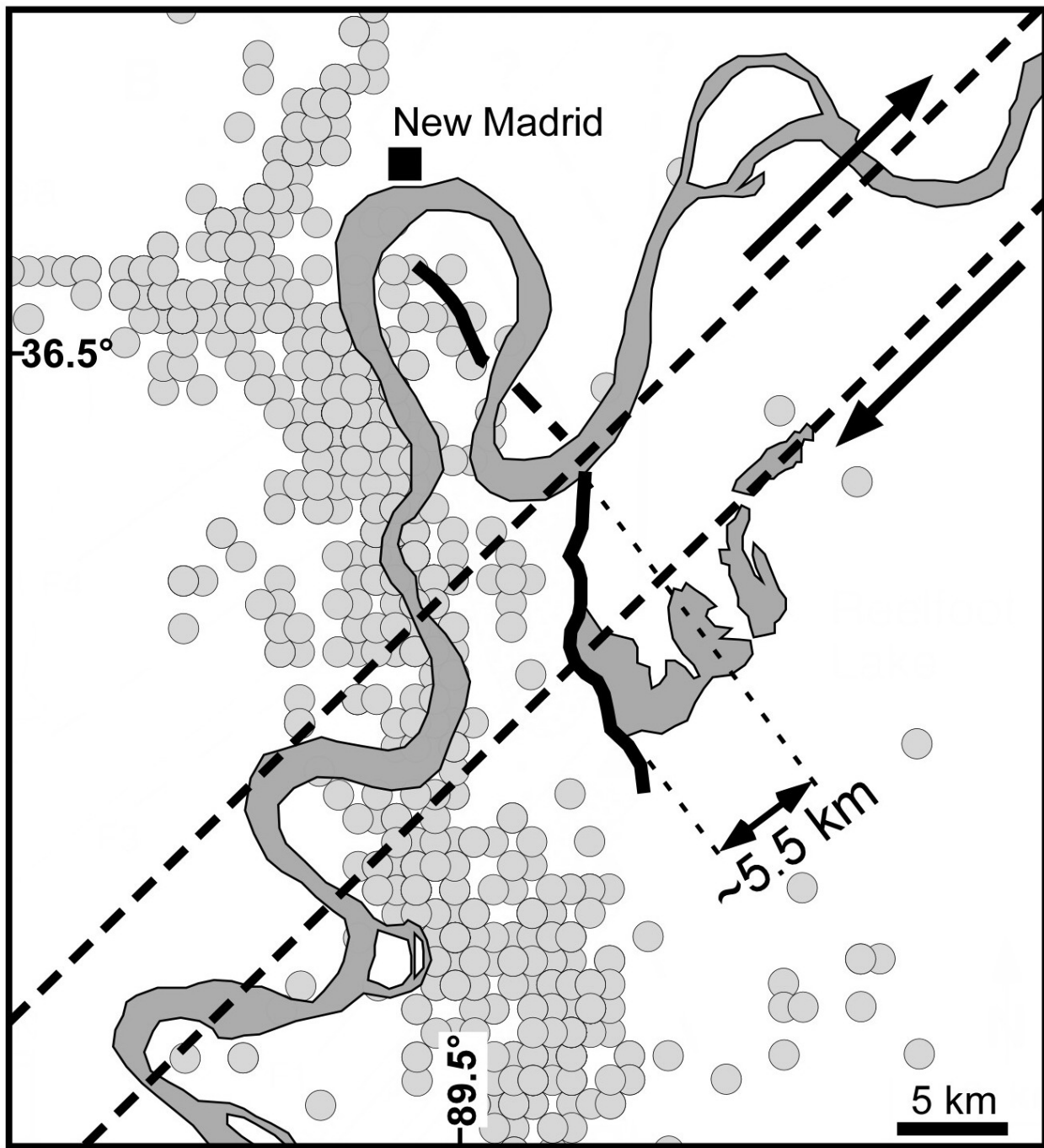




5x vertical exaggeration







- Is there displacement of southern part of Crowley's Ridge?

