Tectonic modification of the Mojave Desert region during Laramide shallow-angle subduction

SCEC Community
Rheology Model
Workshop
9/9/2017

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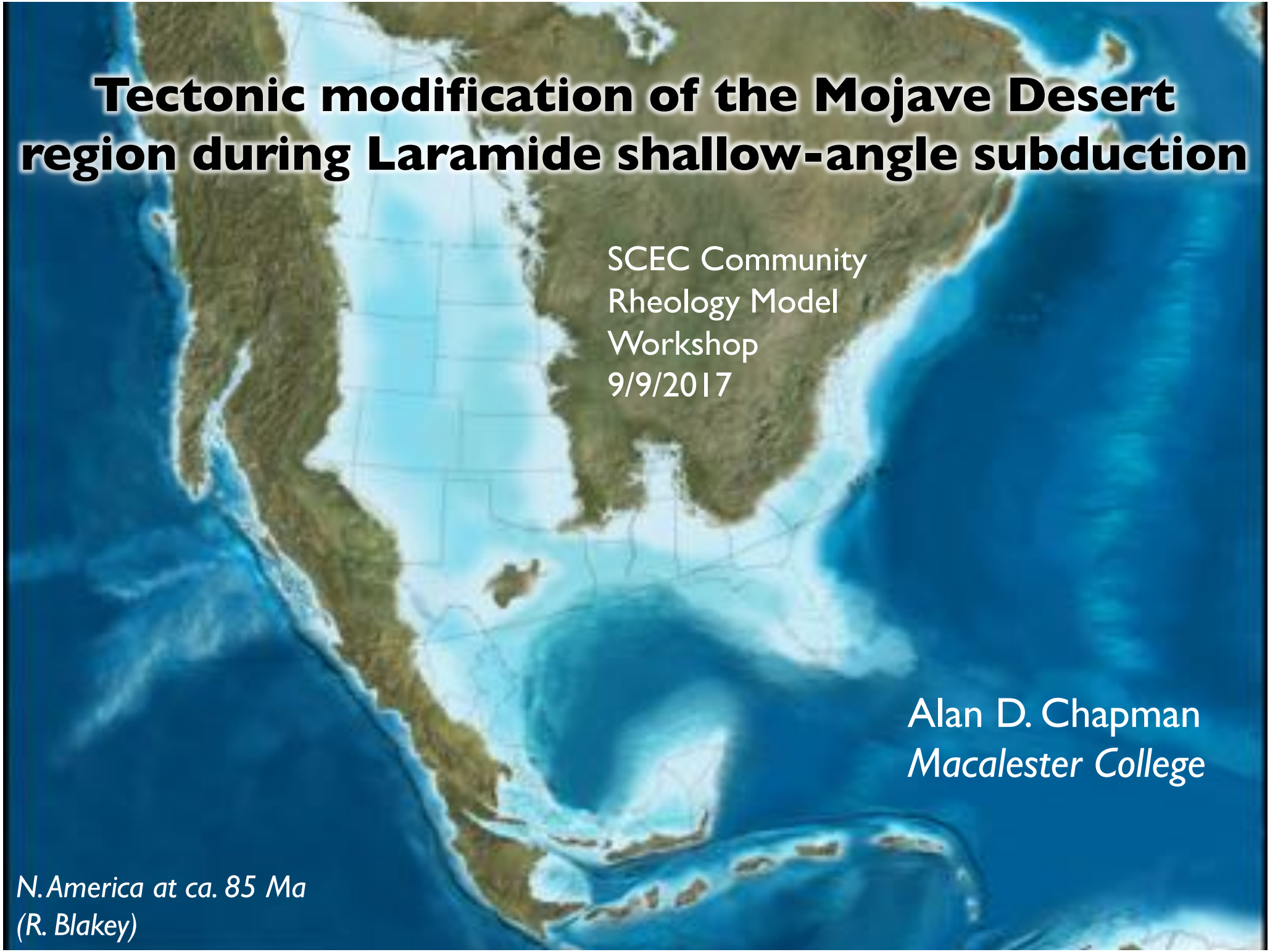
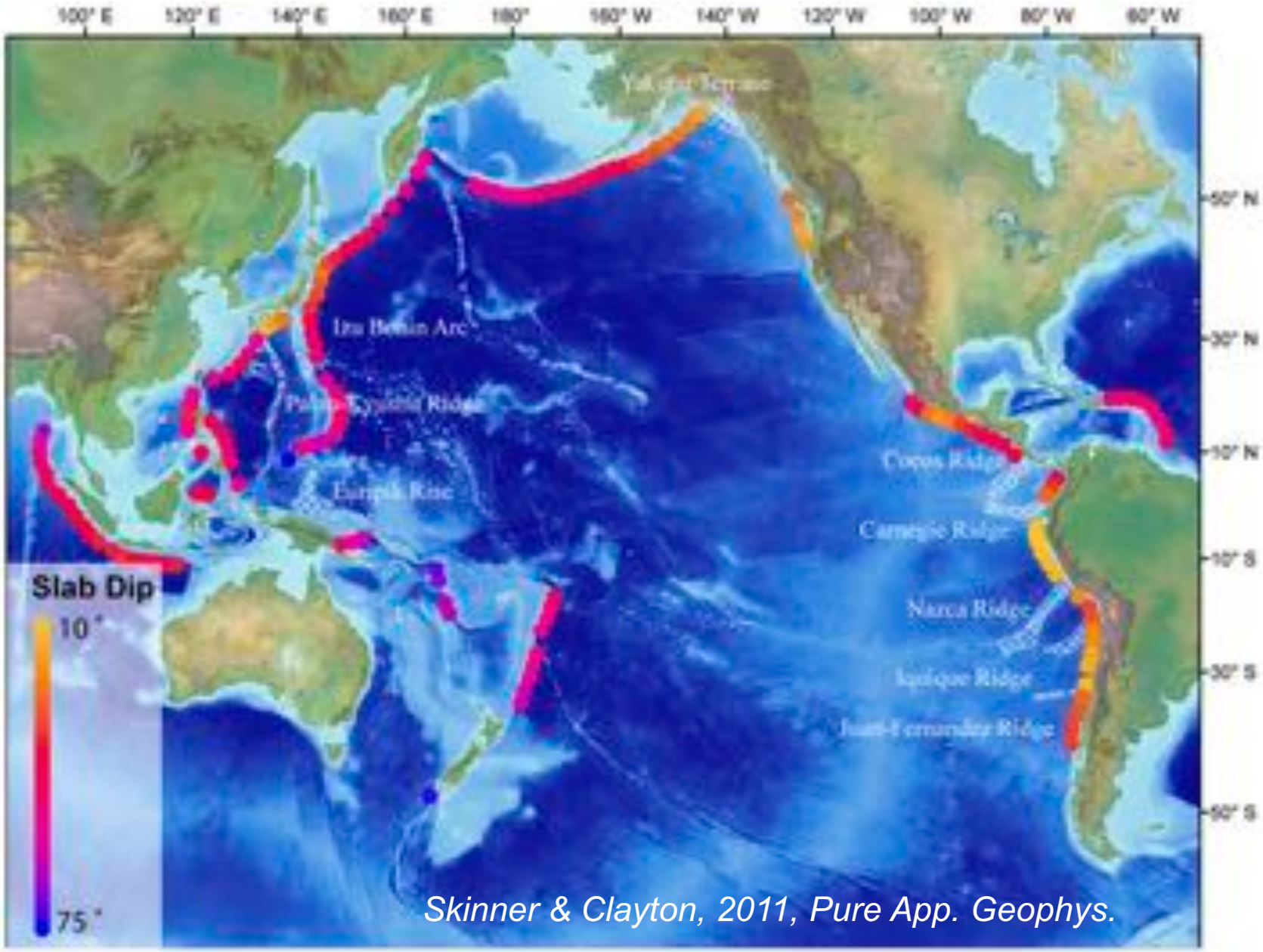
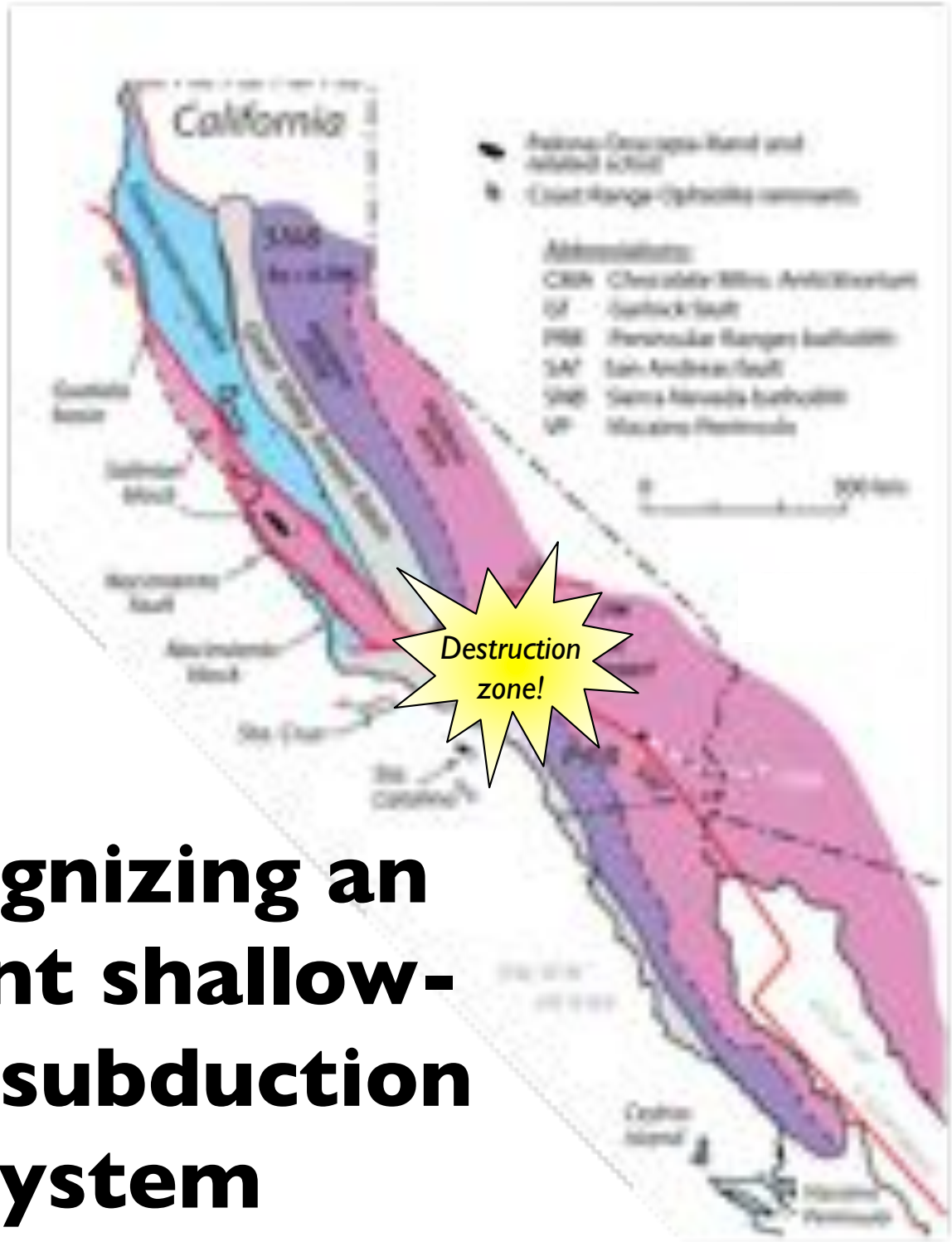


N. America at ca. 85 Ma
(R. Blakey)

Modern shallow-angle subduction



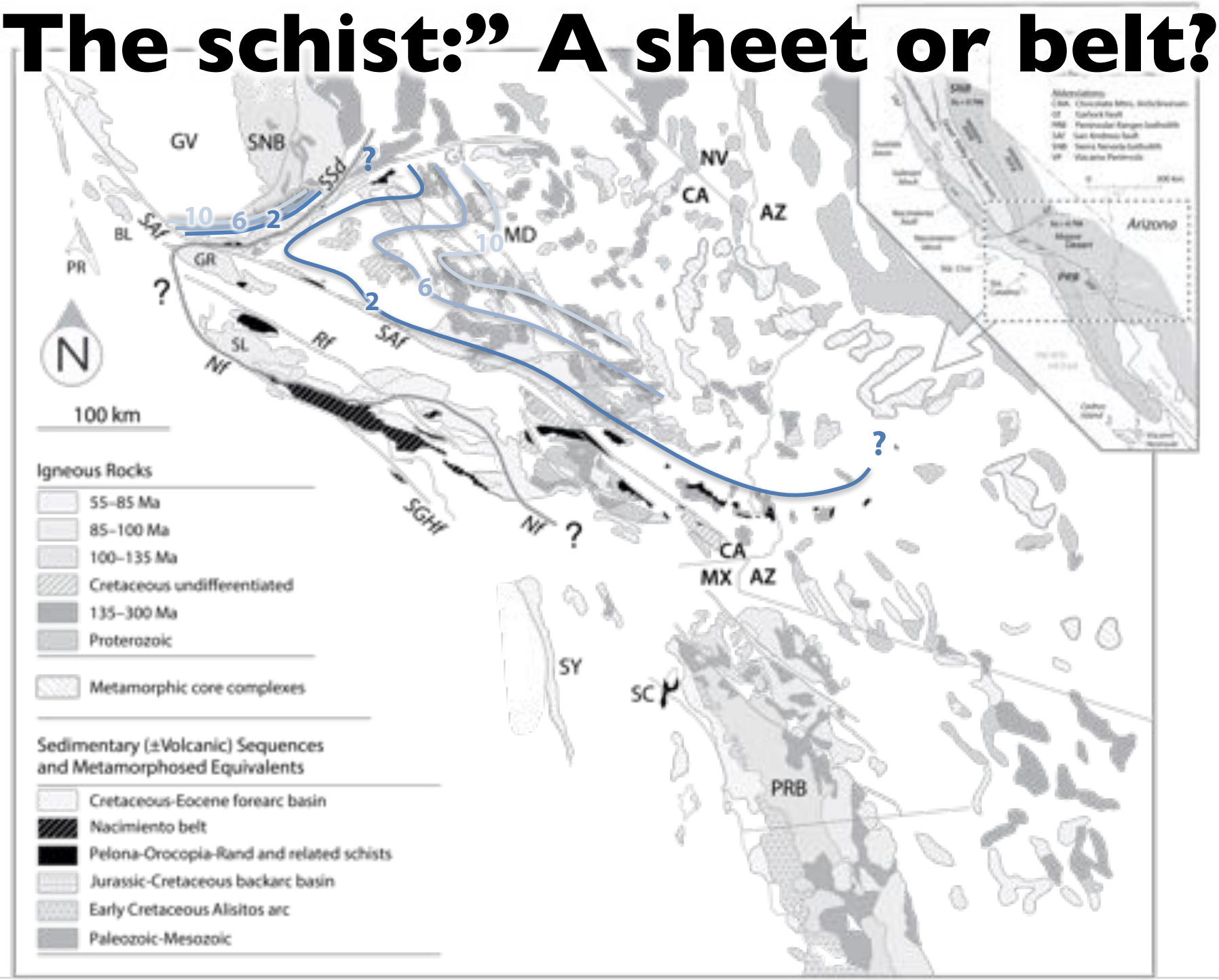
Skinner & Clayton, 2011, Pure App. Geophys.



Recognizing an ancient shallow-angle subduction system

Chapman, 2017, IGR

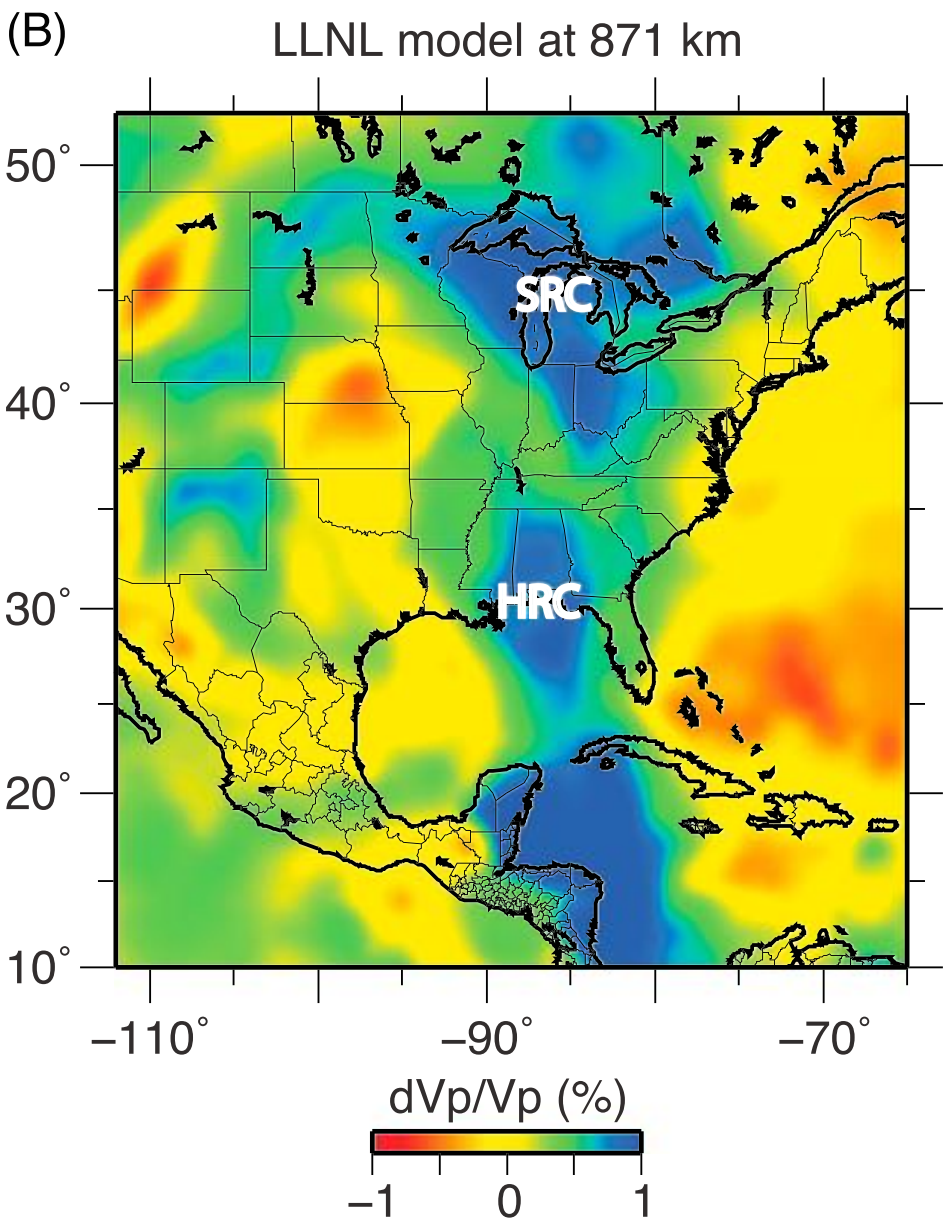
"The schist:" A sheet or belt?

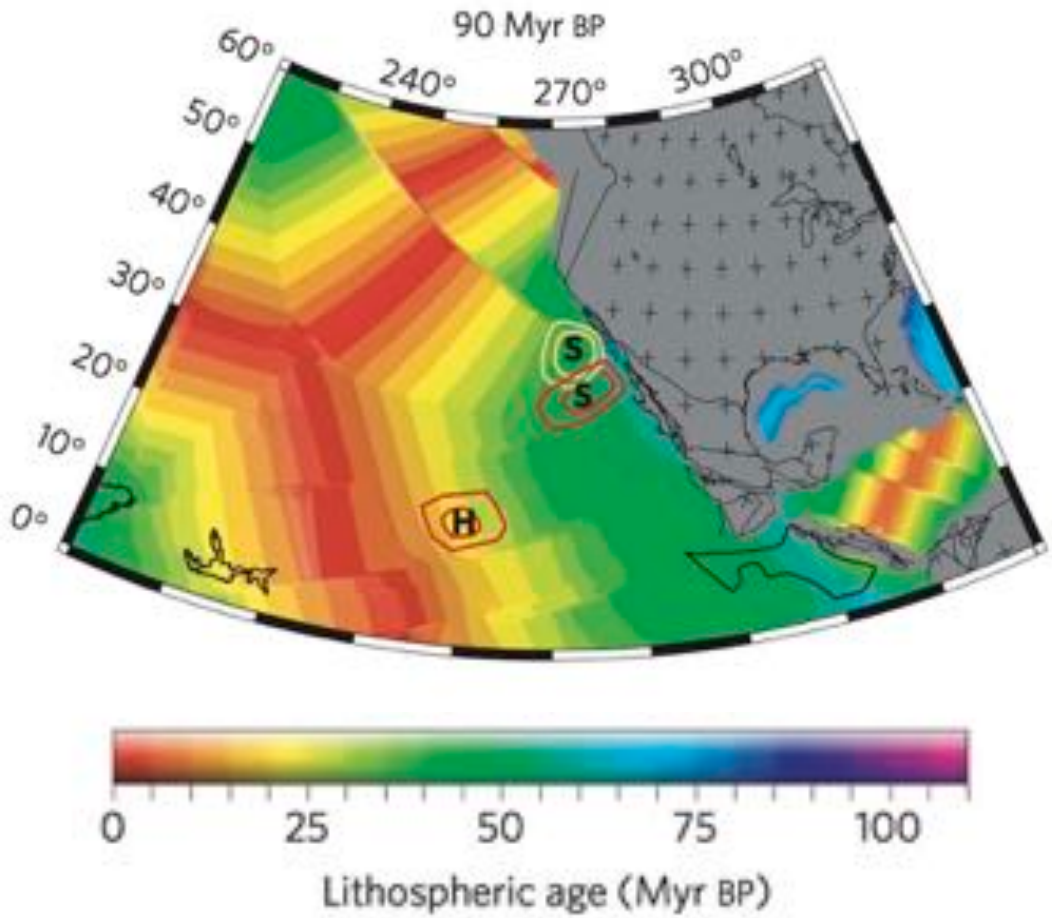


Chapman, 2017, IGR

How did it happen?

oceanic plateau collision

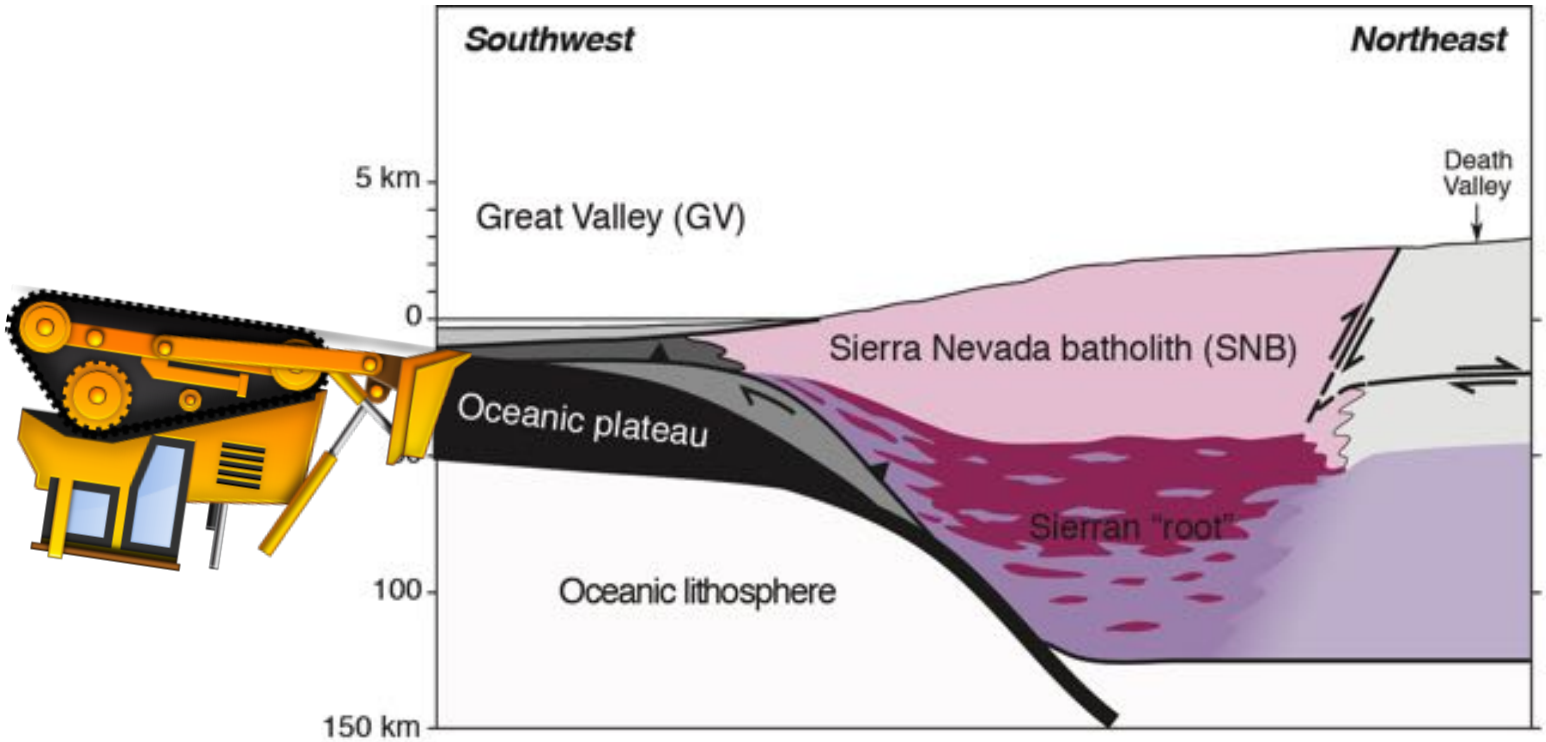




Sun et al., 2017, GRL

Liu et al., 2010, Nat. Geosci.

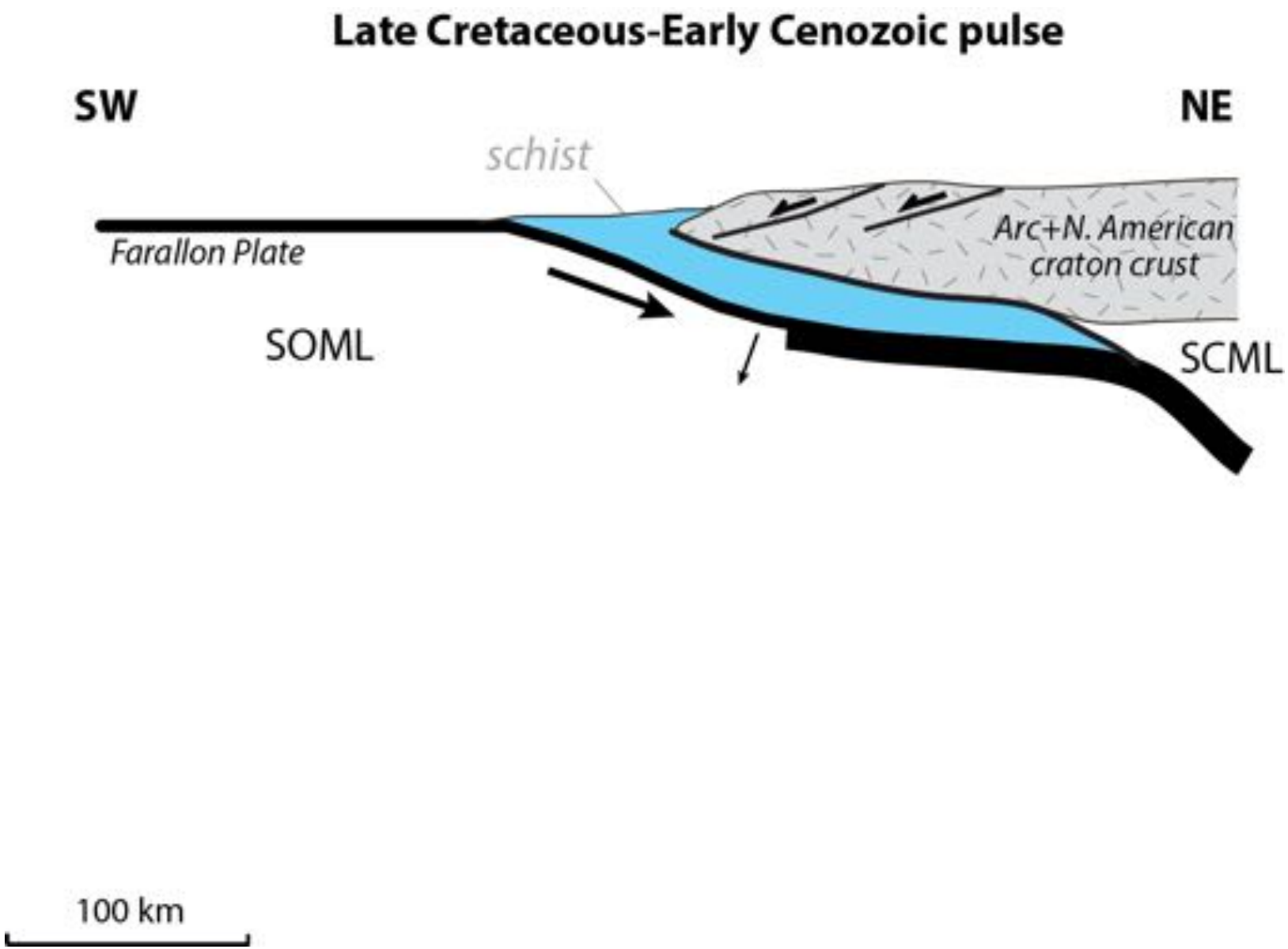
Immediate effect of such collision?



Thickening; Replacement of Sierran "root" with "the schist"

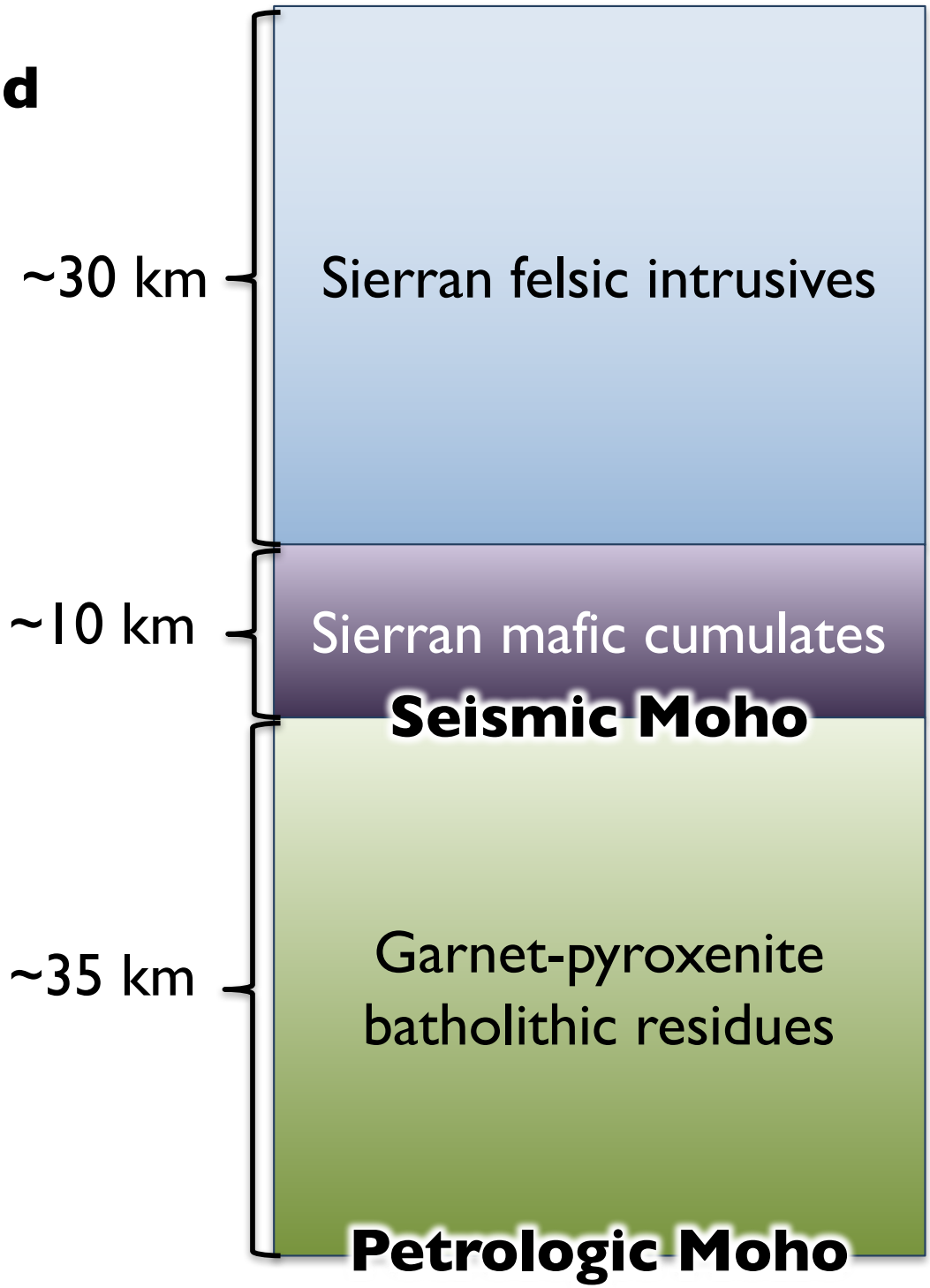
Saleeby et al., 2013

Lasting effects of such collision?



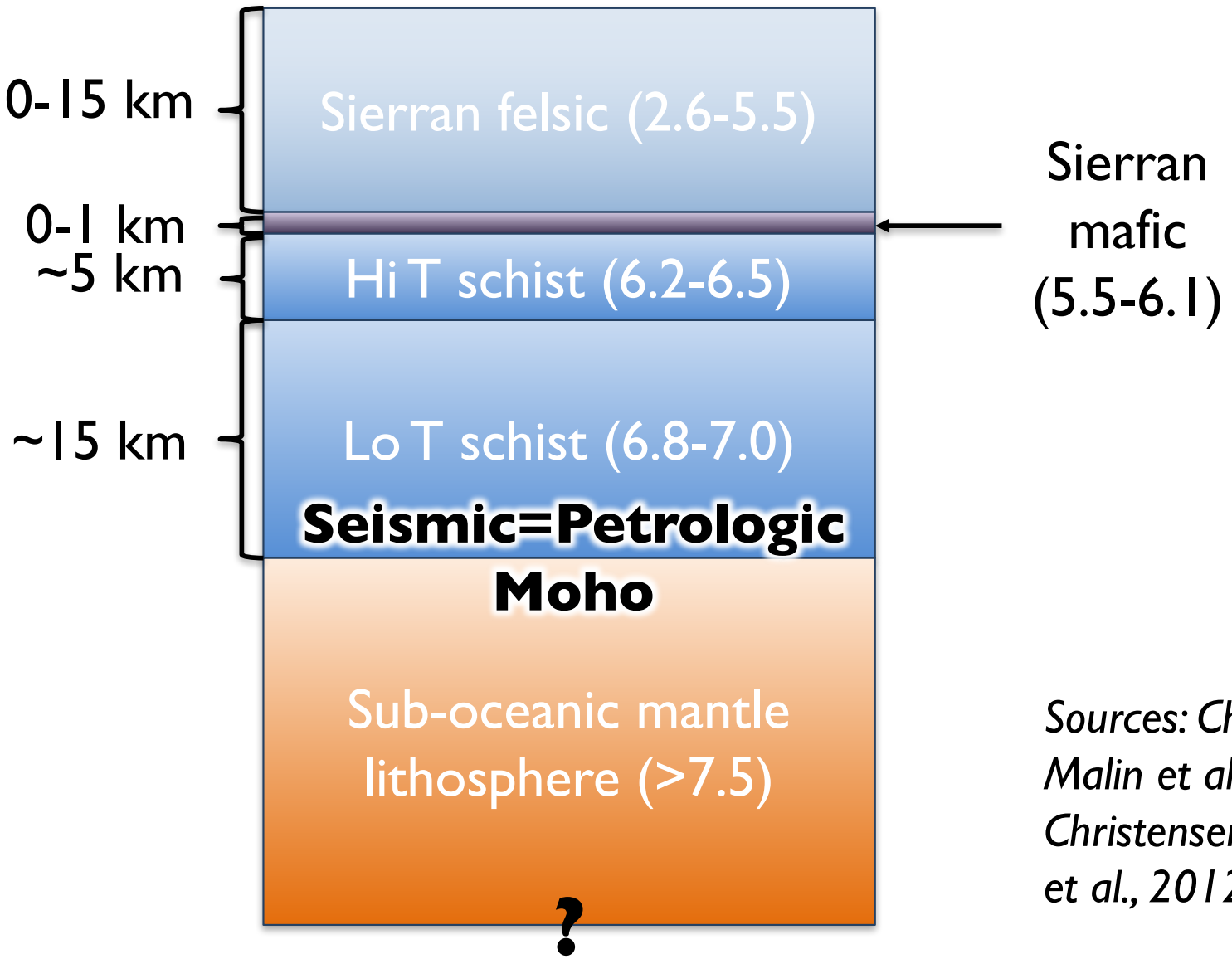
Chapman, 2017, IGR

Pre-Laramide simplified W. Mojave column

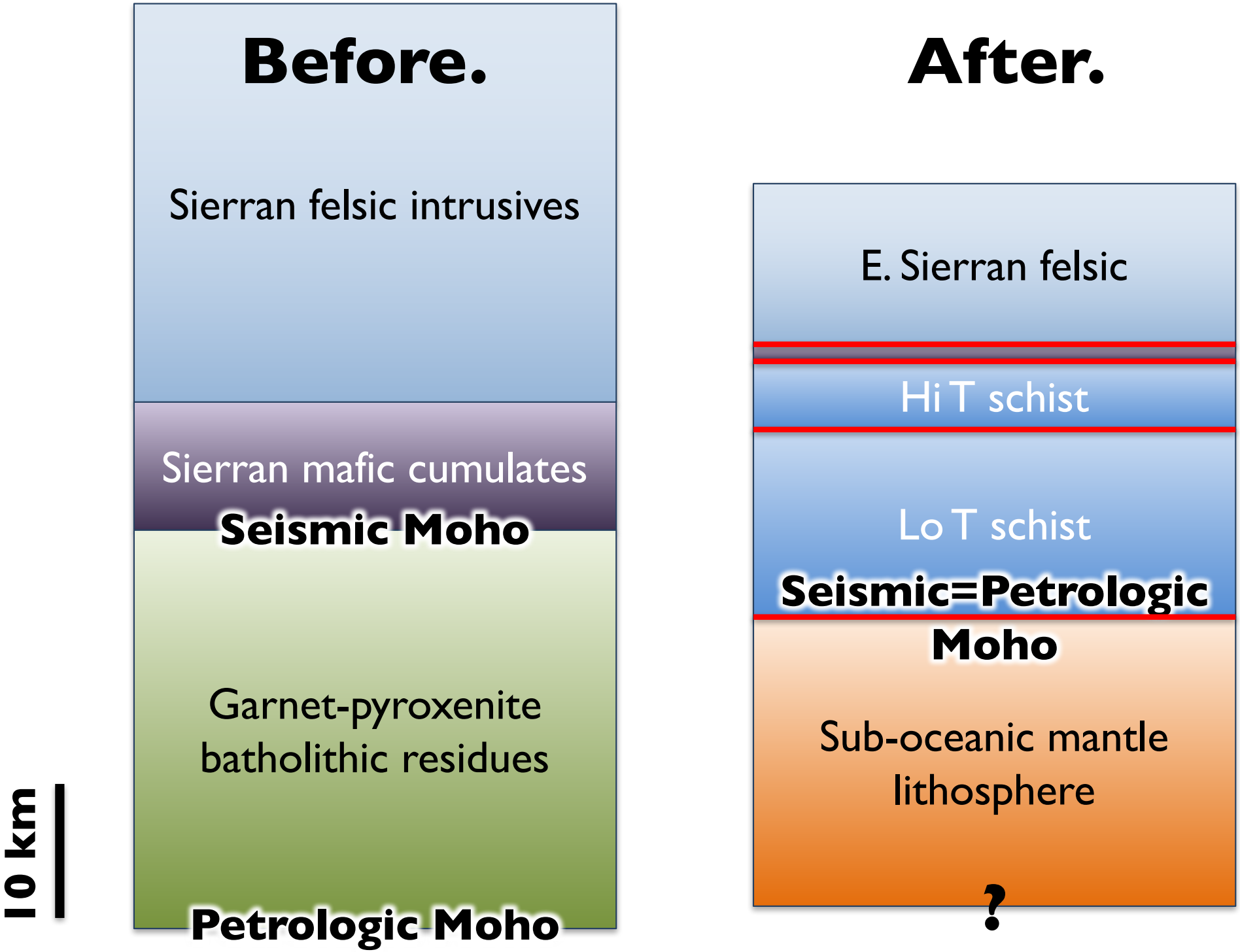


Sources: Jones and Phinney, 1998; Ruppert et al., 1998; Ducea and Saleeby, 1998; Fliedner et al., 2000; Cheadle et al., 1986; Malin et al., 1995; Saleeby et al., 2003; Chapman et al., 2012)

Present simplified W. Mojave column



Sources: Cheadle et al., 1986; Malin et al., 1995; Pellerin and Christensen, 1998; Chapman et al., 2012)


Before.
Sierran felsic intrusives
Sierran mafic cumulates
Seismic Moho
Garnet-pyroxenite batholithic residues
Petrologic Moho
10 km
After.
E. Sierran felsic
Hi T schist
Lo T schist
Seismic=Petrologic Moho
Sub-oceanic mantle lithosphere
?

Summary

- Late Cretaceous plateau subduction
- Removal of forearc, arc, SCML; replaced with schist sheet
- Tectonic preconditioning: Gravitational collapse, slab window-related extension/magmatism, routing of SAf?