

Spatial and Temporal Distribution of Late Paleozoic Structures in Nevada:

**Progressive Tectonic Evolution of the
Western Laurentian Margin**

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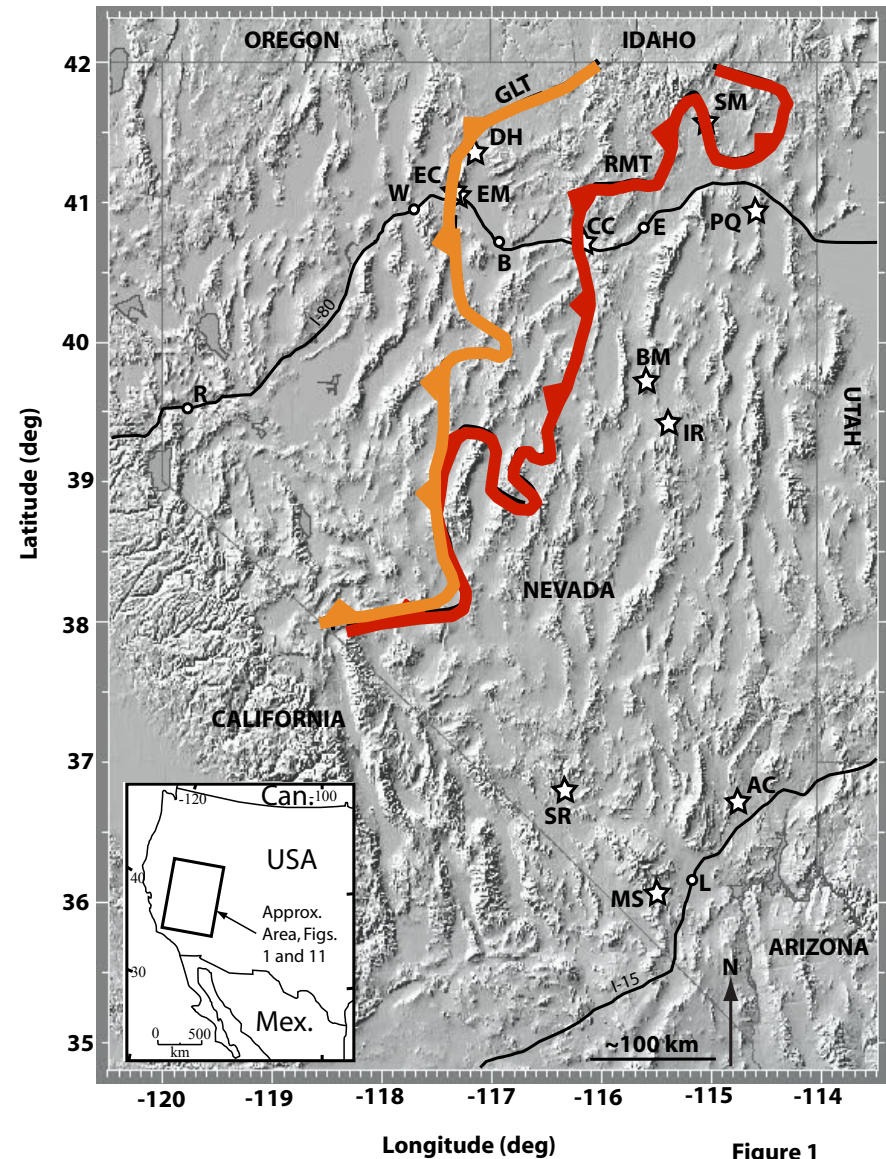
Paleozoic orogenies

- **Antler orogeny**

Late Devonian – Early Mississippian

- **Sonoma orogeny**

Late Permian – Early Triassic



The Problem: structures of many ages!

Take-away messages from this talk

- Overprinted structures – **repeated Late Paleozoic deformation events**
- Dated unconformities bound “**time slices**”, **documenting specific tectonic events**
- Initiation of **shortening** in western Laurentia **propagated southward** with time
- **Conclusion: SW margin of Laurentia (SLAB) was sinistral/transpressive throughout Late Paleozoic time** ... consistent with the northward motion of Laurentia and Pangaea

Late Paleozoic Unconformities

Davydov, Snyder, Trexler

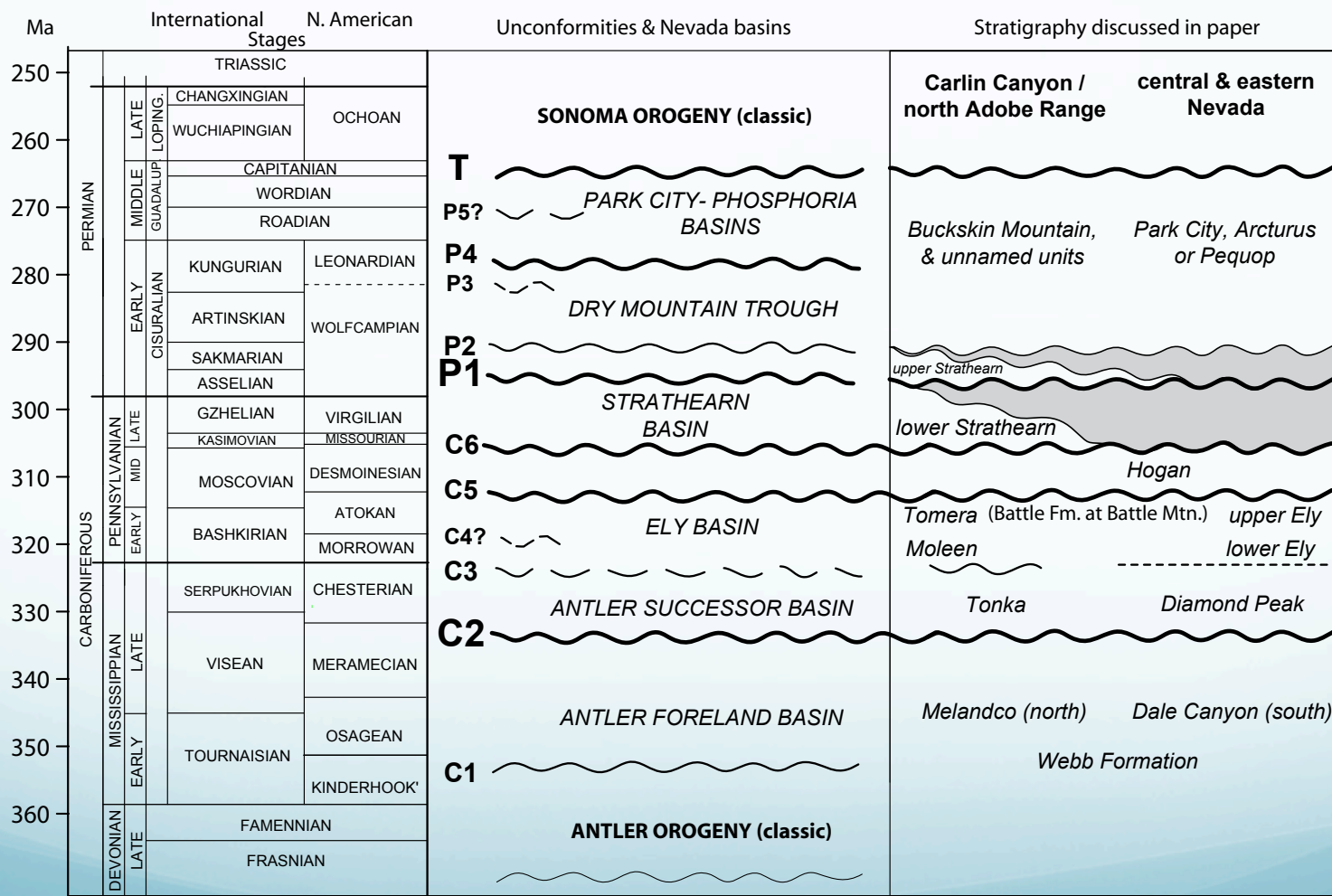
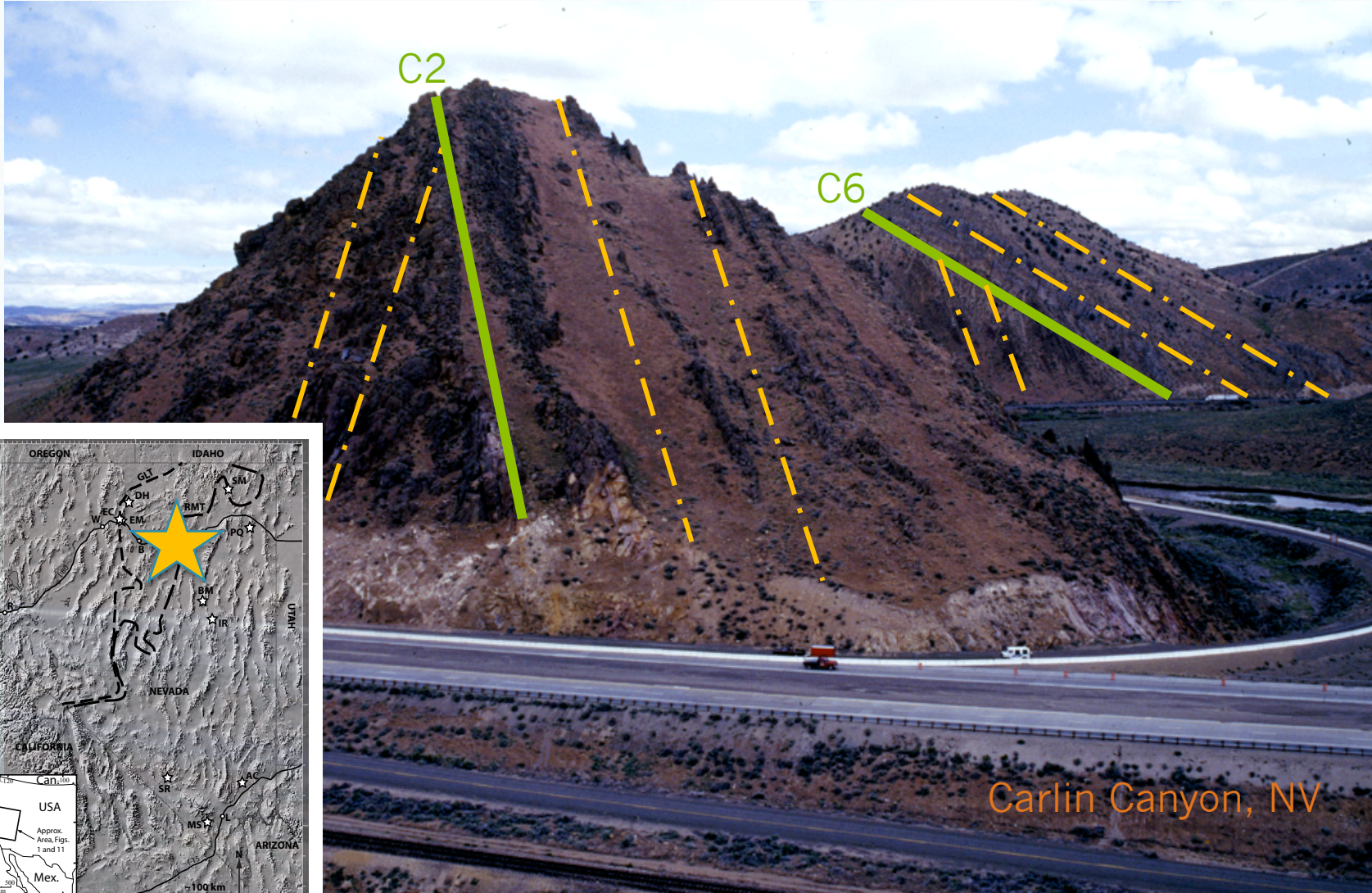


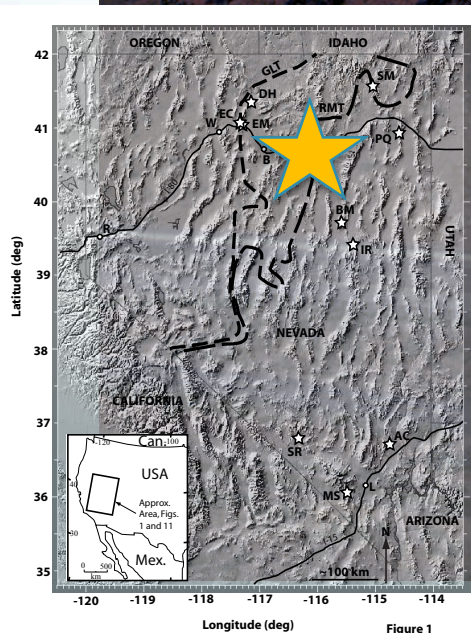
Figure 1



1: Repeated Late Paleozoic deformation, erosion, deposition



Carlin Canyon, NV

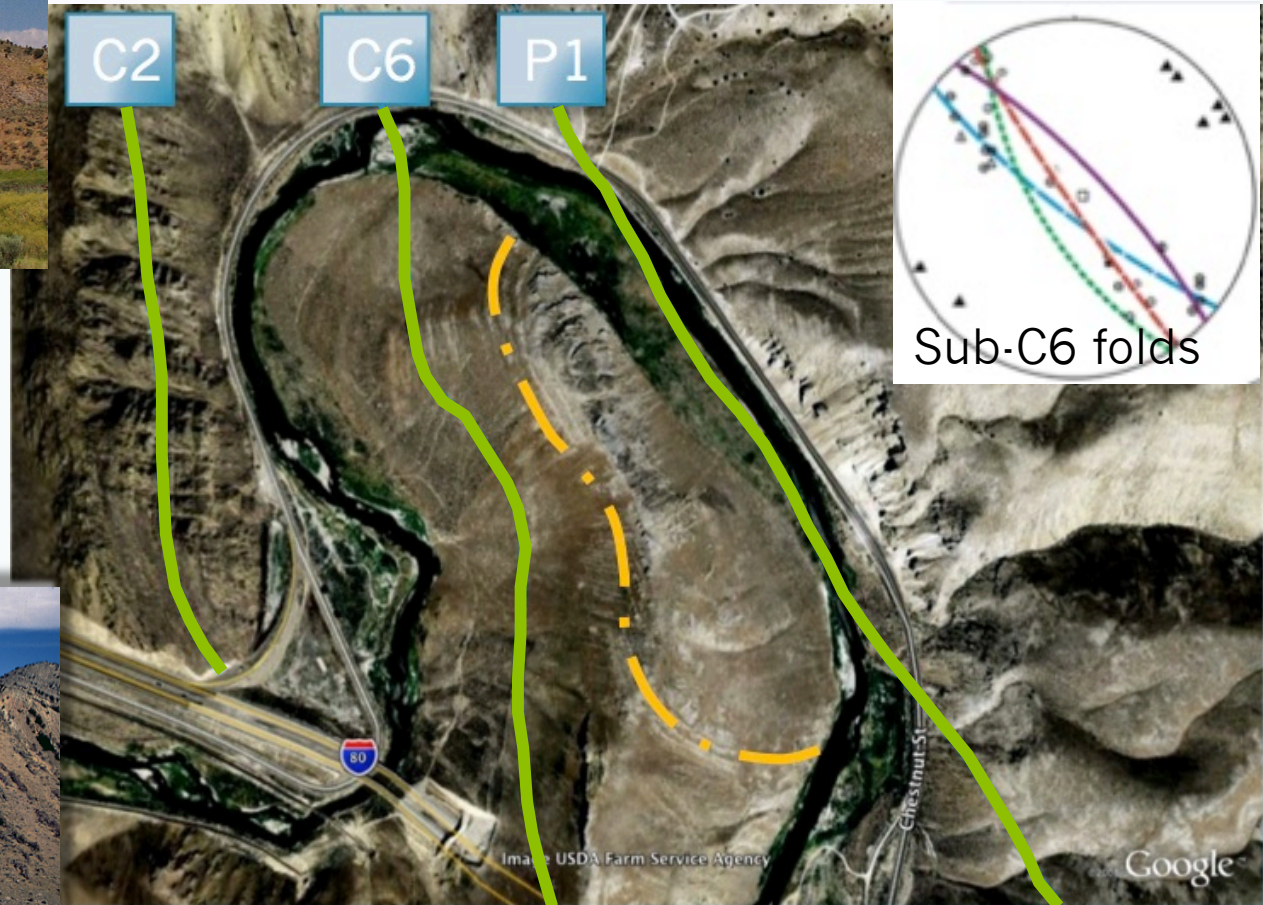


Superposed structures at Carlin Canyon

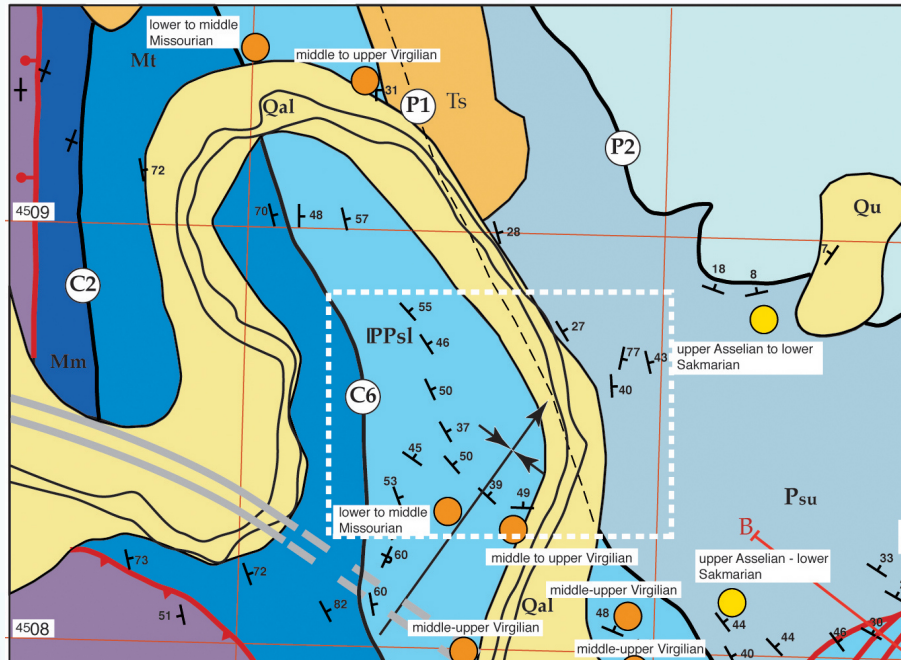
C6 unconformity



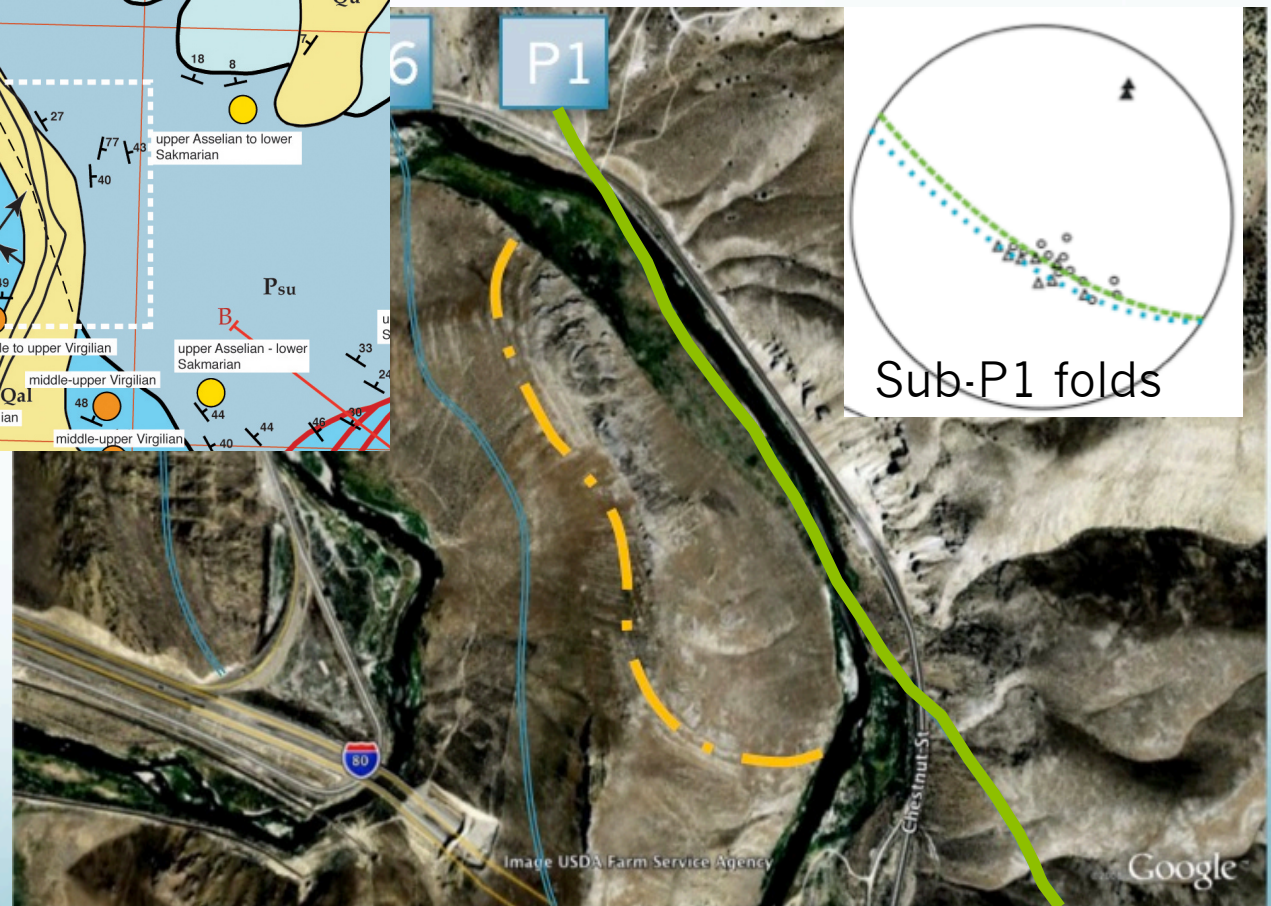
C2 unconformity



Superposed structures at Carlin Canyon



P1 unconformity



2: Mid-Pennsylvanian structures

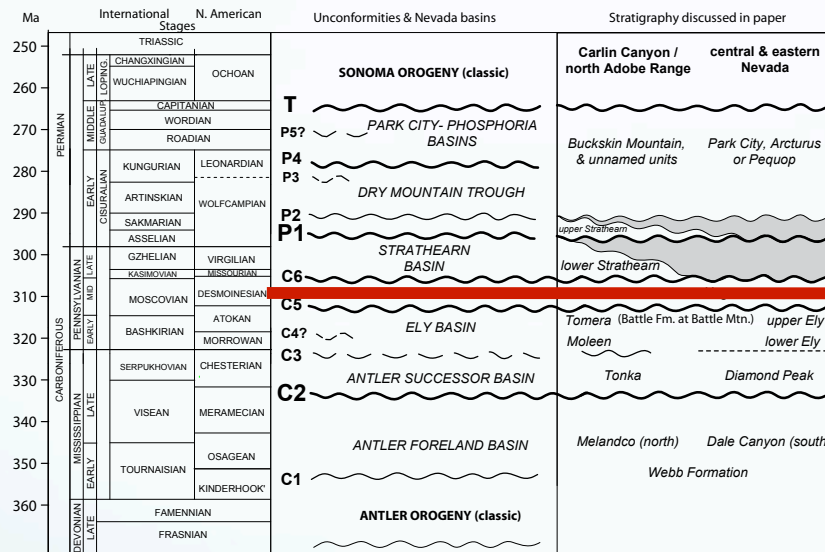


Figure 1

Distribution of mid-Pennsylvanian structures

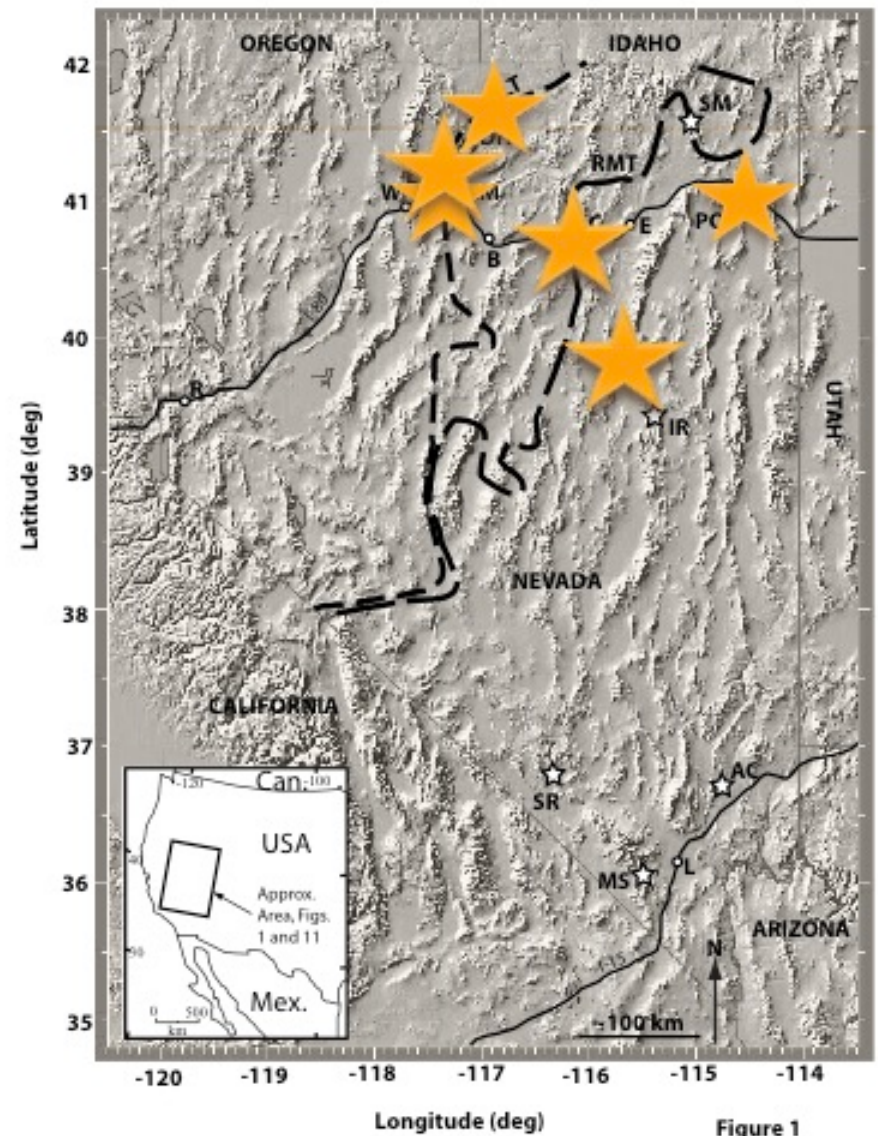


Figure 1

Kinematics of mid-Pennsylvanian structures

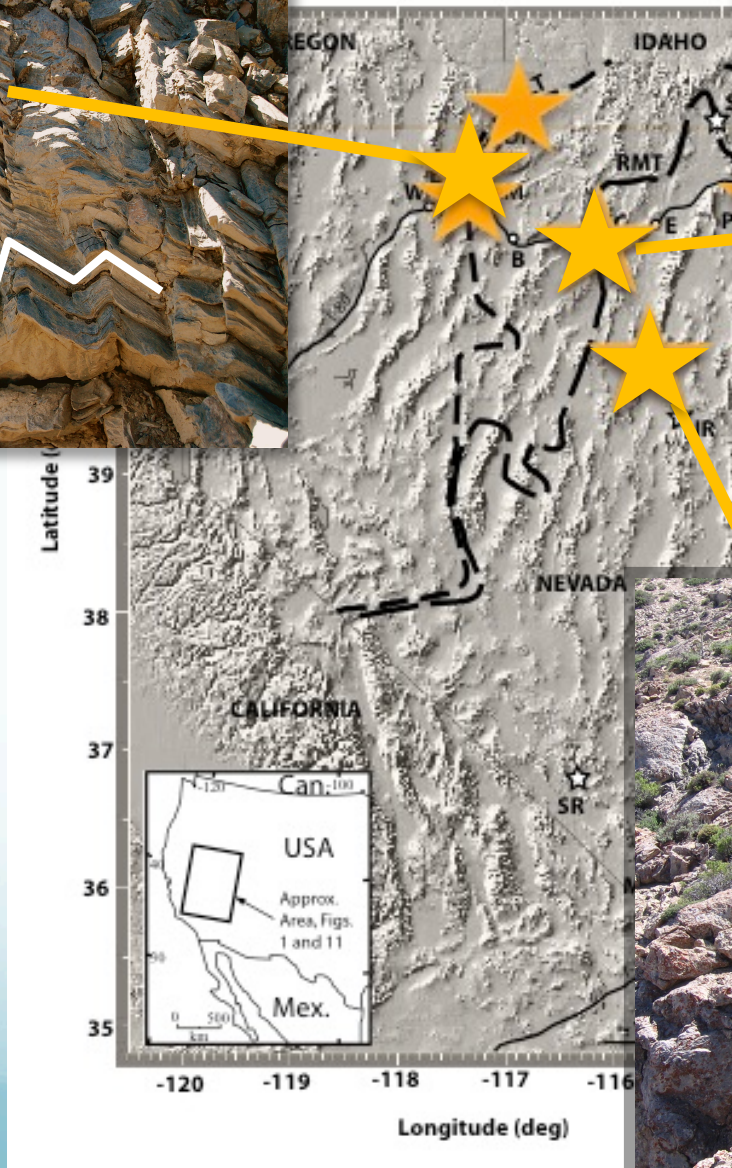
Emigrant Canyon



Carlin Canyon



Buck Mountain



Distribution: mid-Pennsylvanian structures



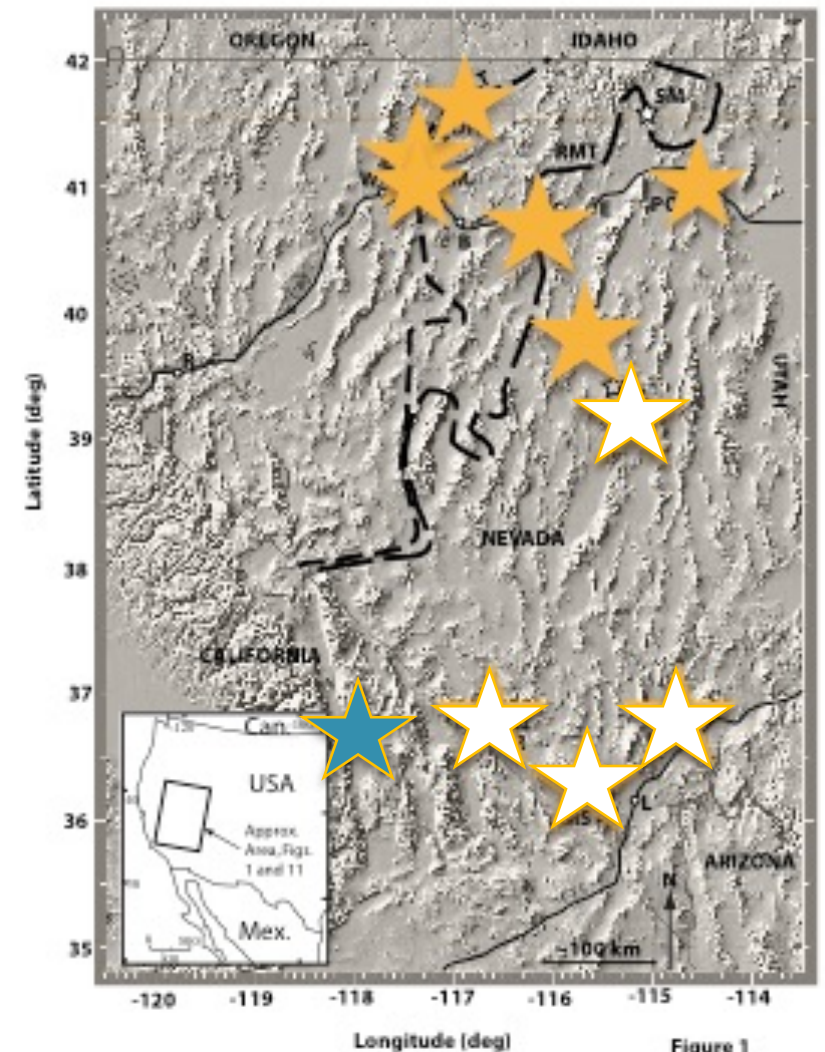
Structures below angular unconformity



Continuous deposition



Continuous deposition



Late Paleozoic Unconformities

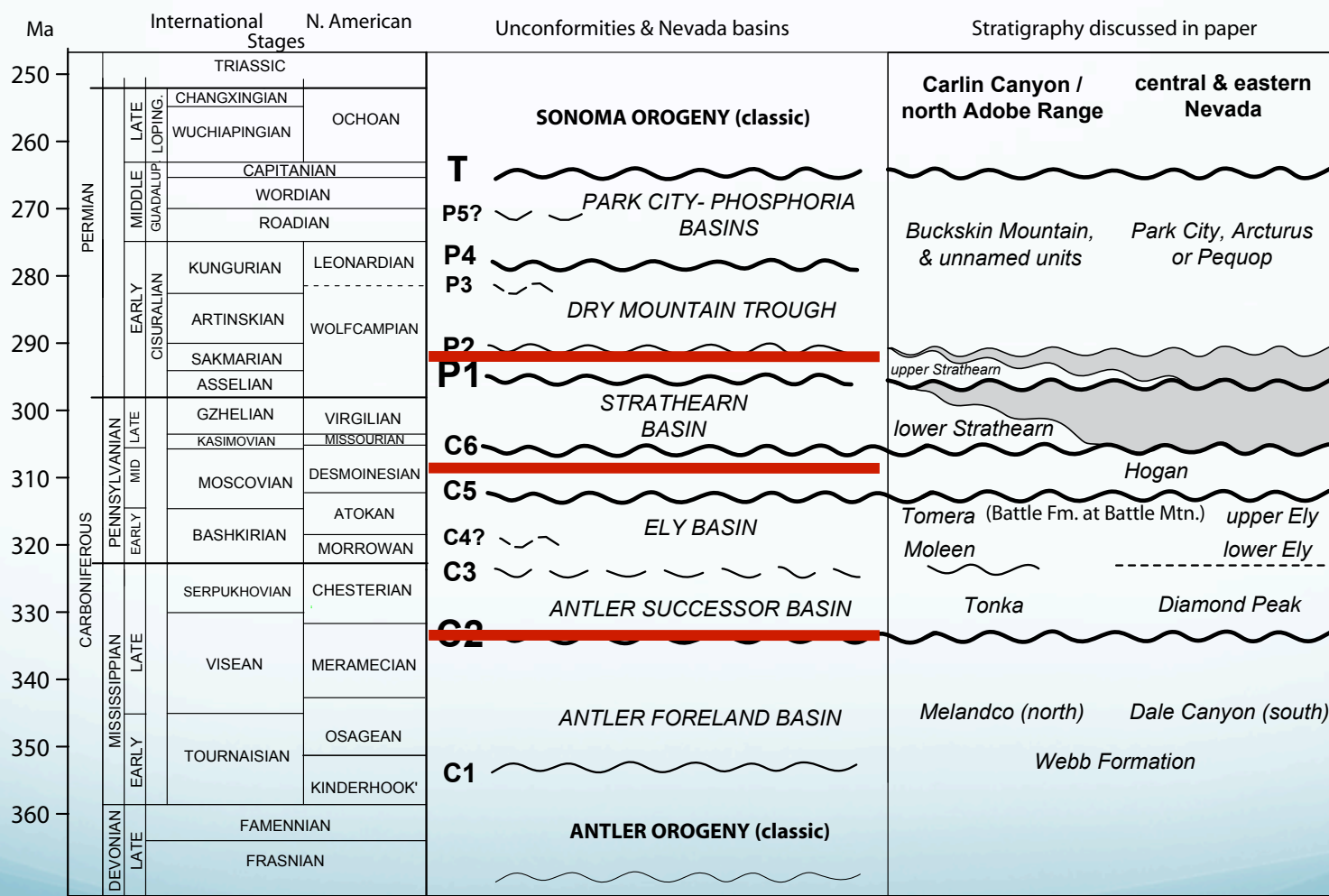


Figure 1

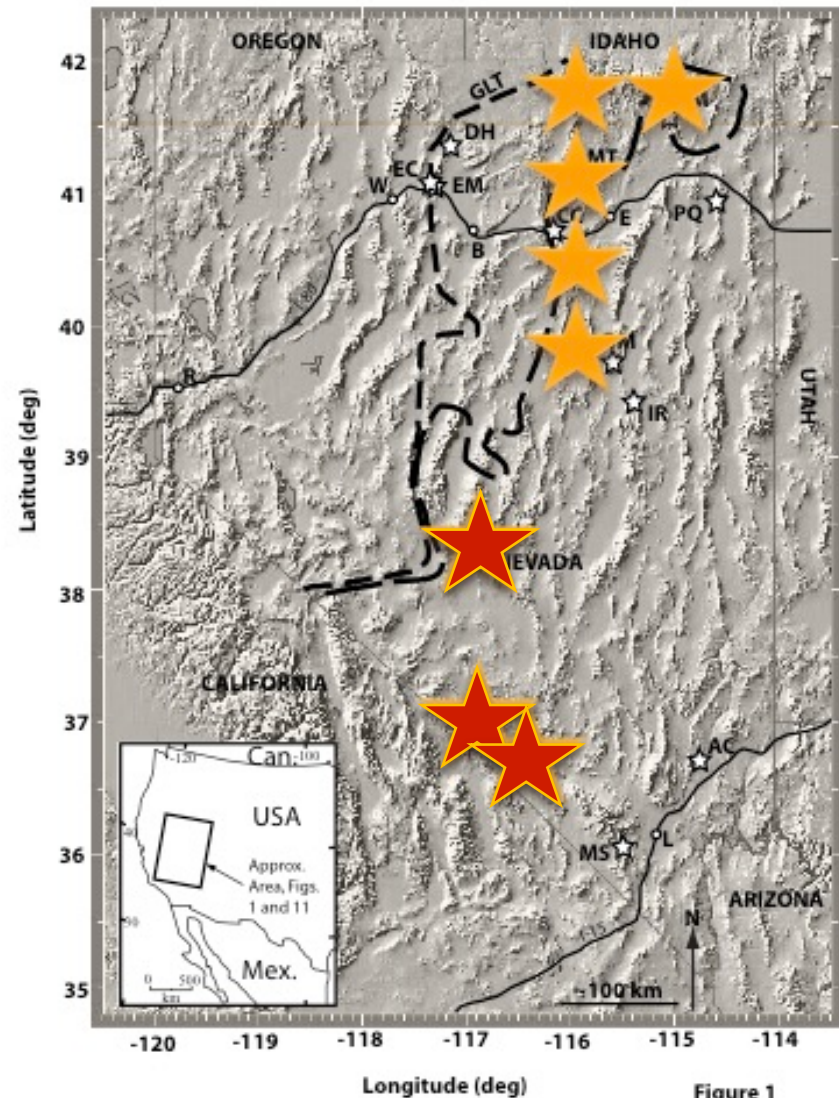
Distribution: mid-Mississippian structures



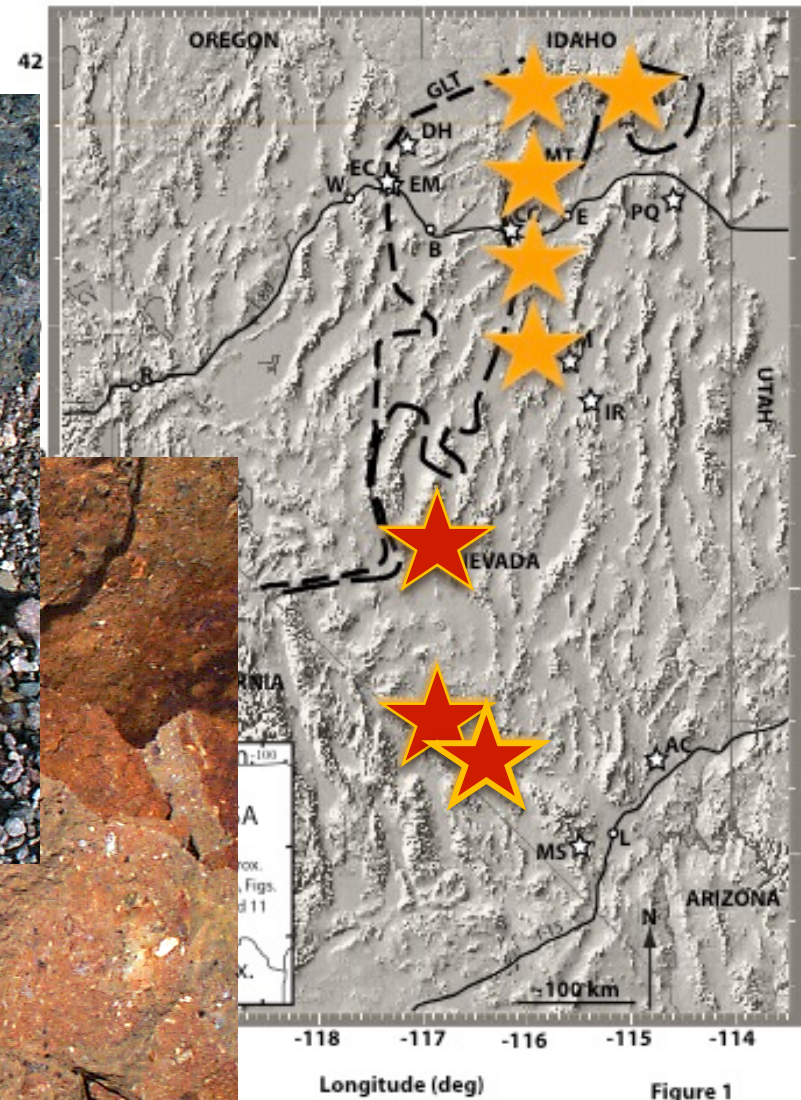
Structures below angular unconformity



Continuous deposition, abrupt provenance change

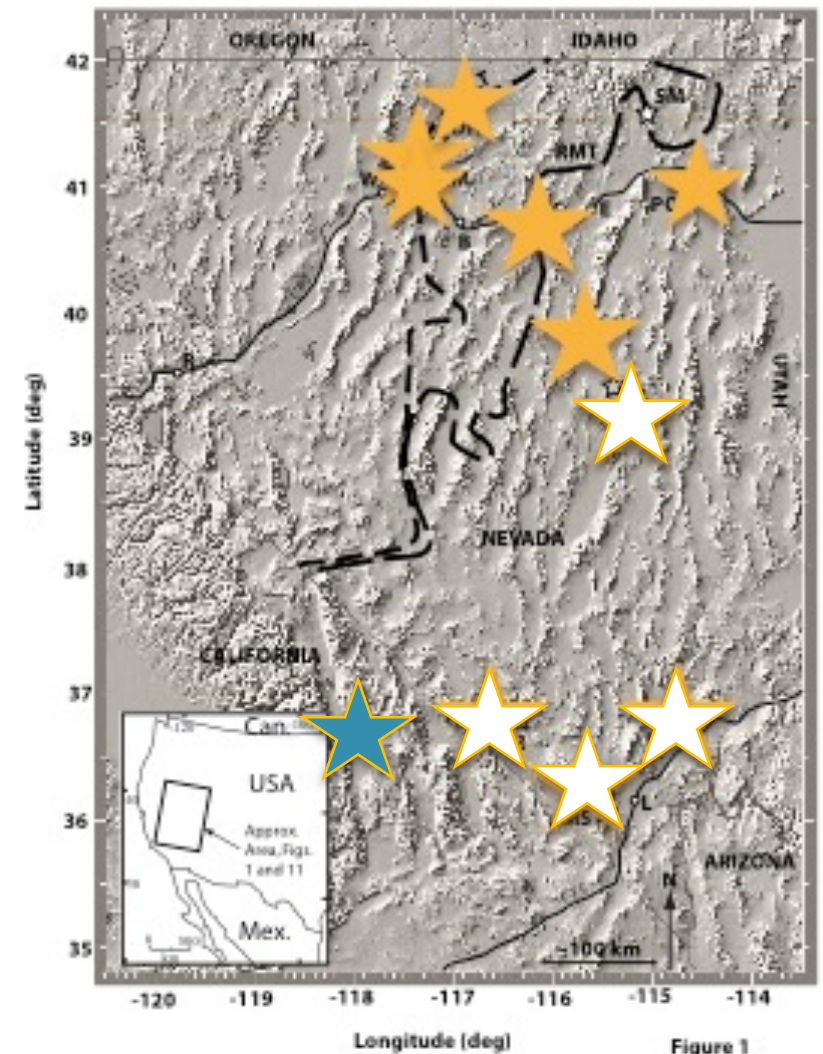


mid-Mississippian *provenance change*

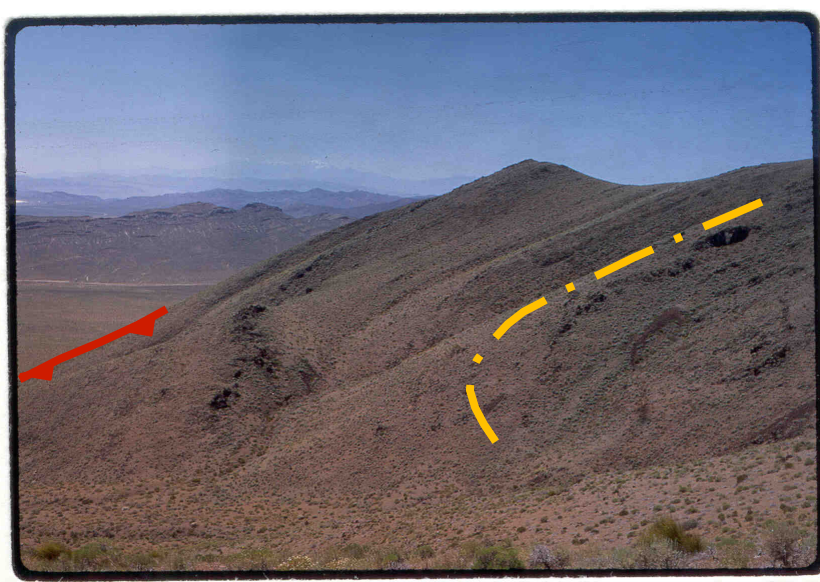


Distribution: mid-Pennsylvanian structures

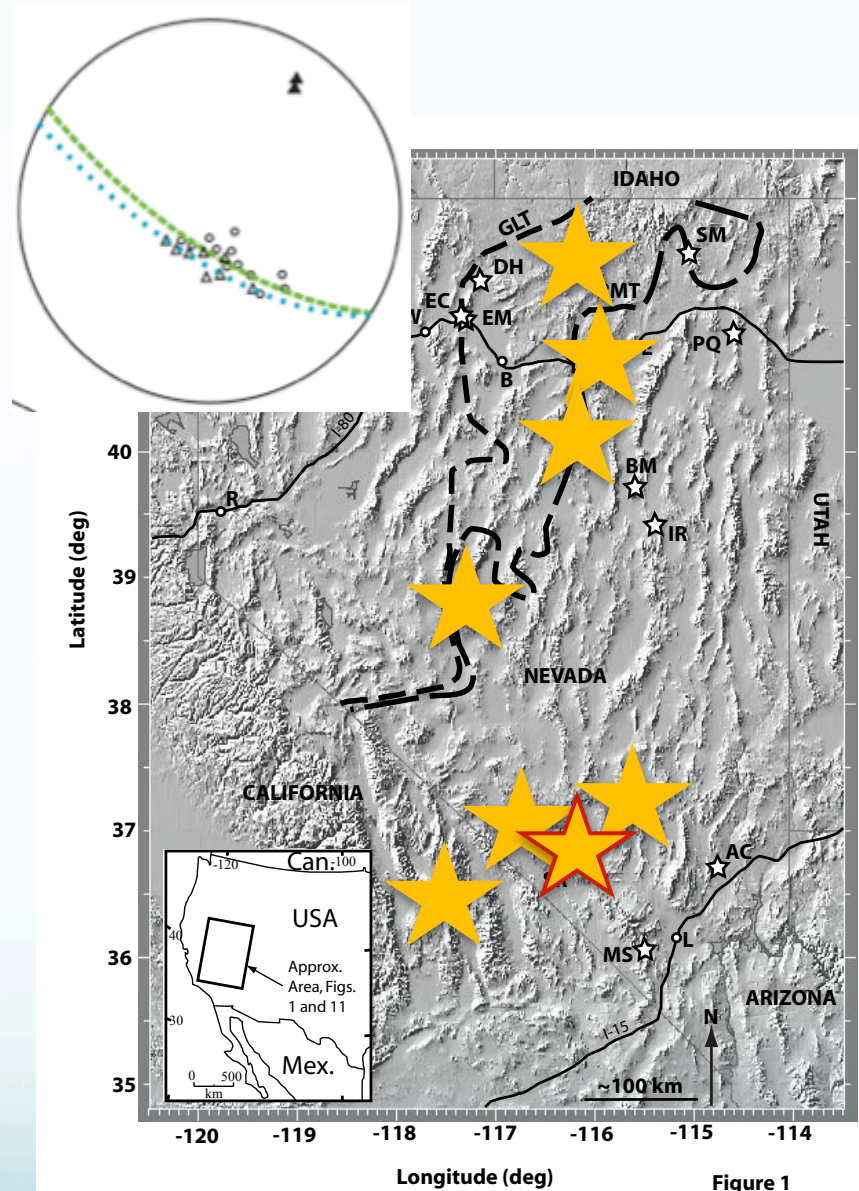
- ★ Structures below angular unconformity
- ★ Continuous deposition, abrupt change to **shallower** depositional environment (e.g., *Sciappa et al., 1999; Bishop et al., 2010; Martin et al., 2012*)
- ★ Continuous deposition, abrupt change to **deeper** depositional environment (*Stevens, Stone & Ritter, 2001*)



Distribution: Early Permian structures

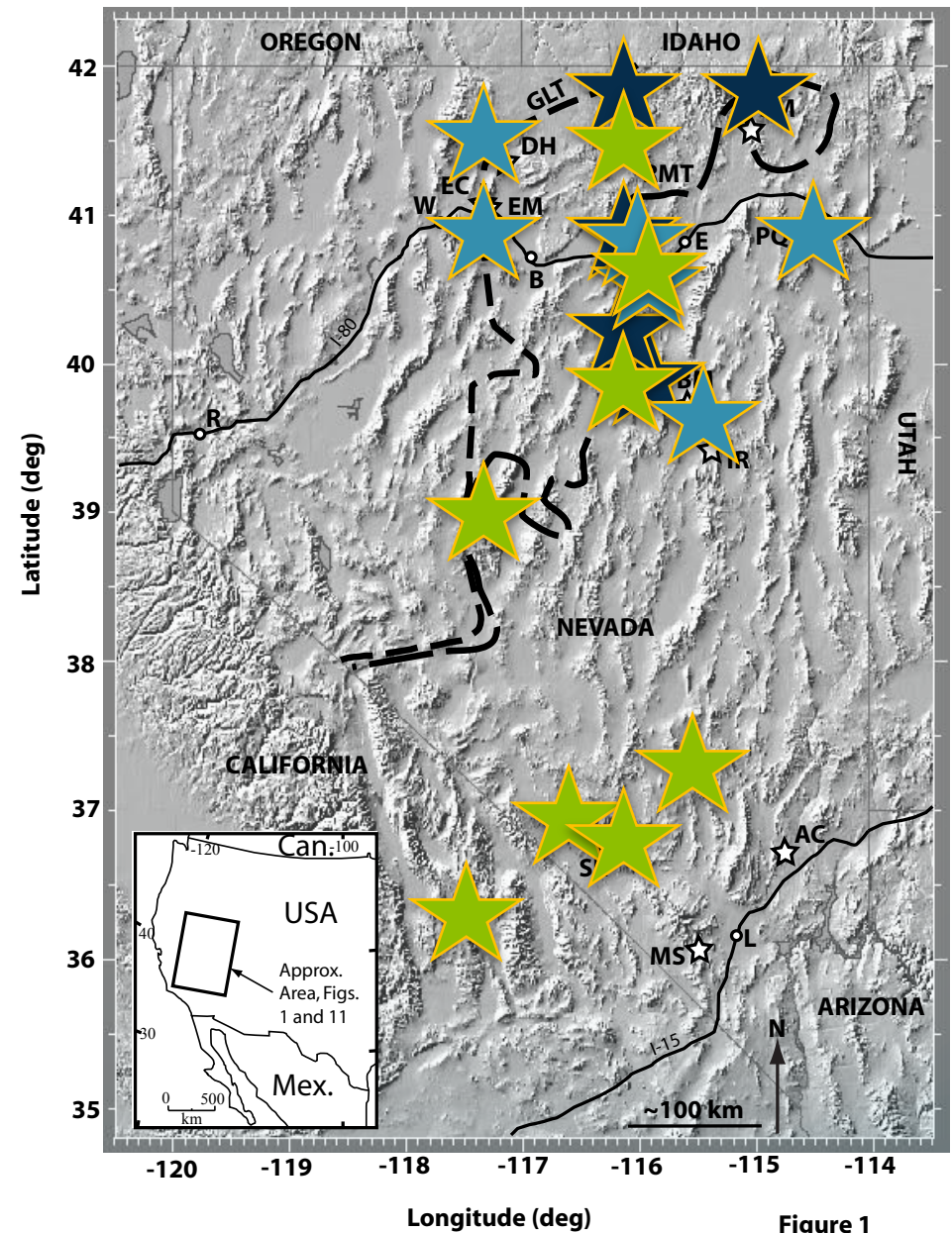


Eleana Range



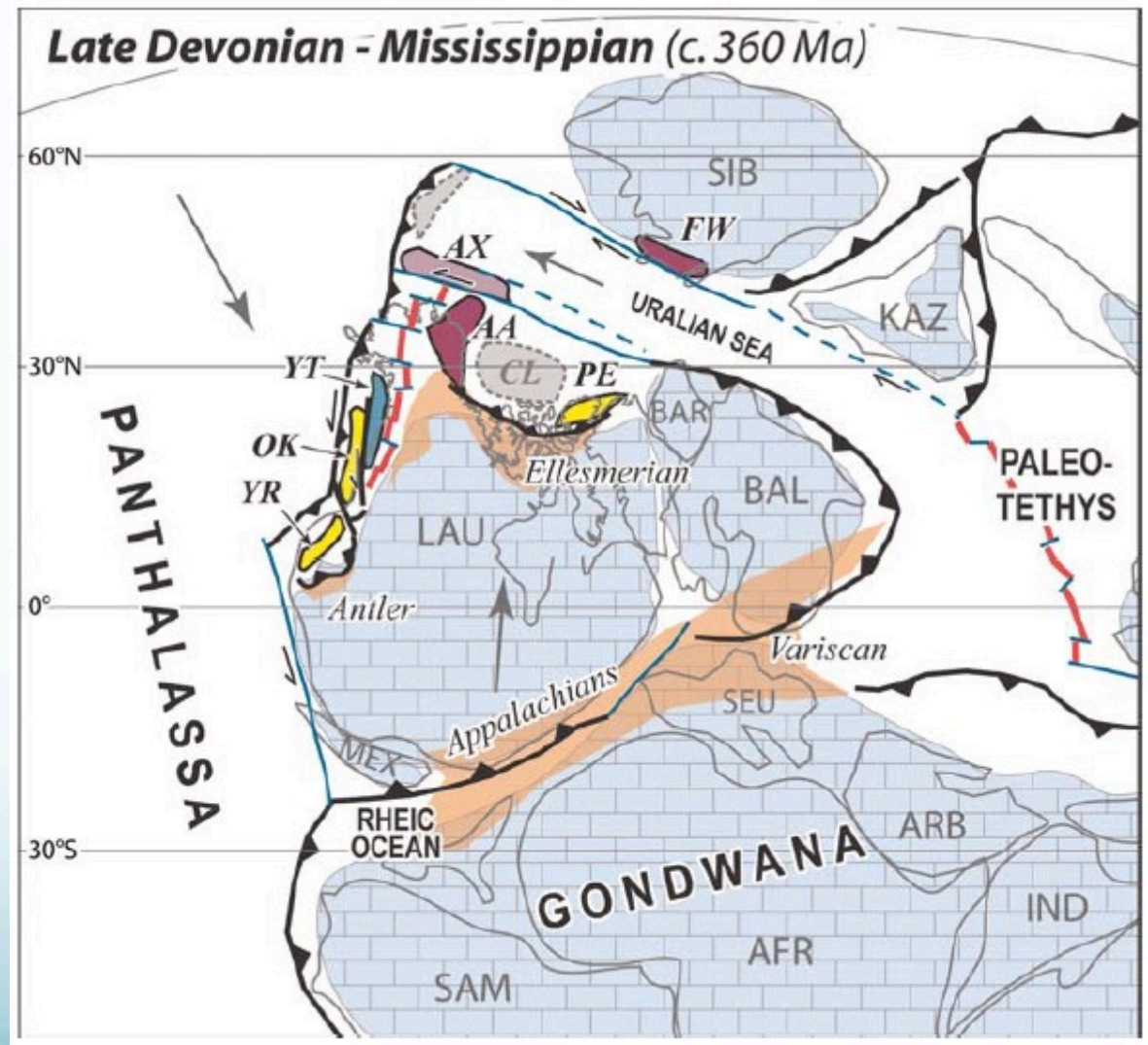
Southward progression with time

- ★ Early Permian structures
- ★ Mid-Pennsylvanian structures
- ★ Mid-Mississippian structures



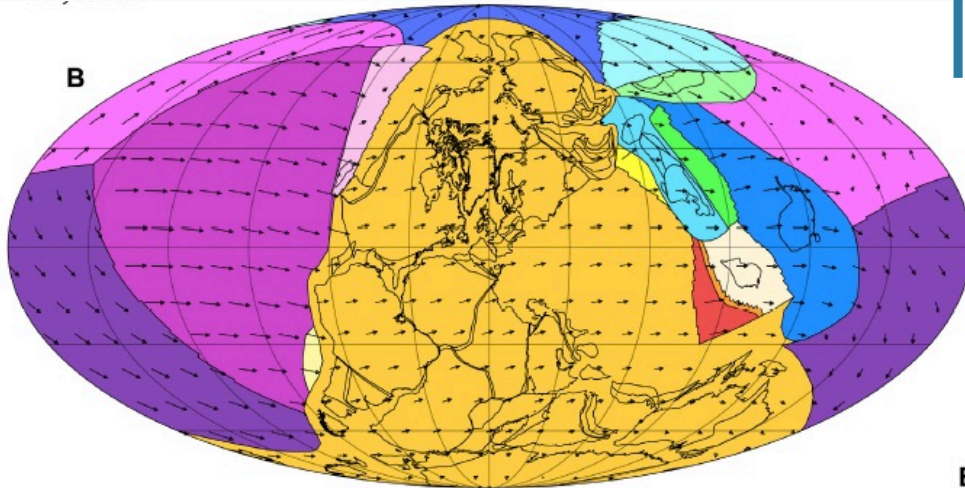
Tectonic model

Colpron and Nelson, 2009

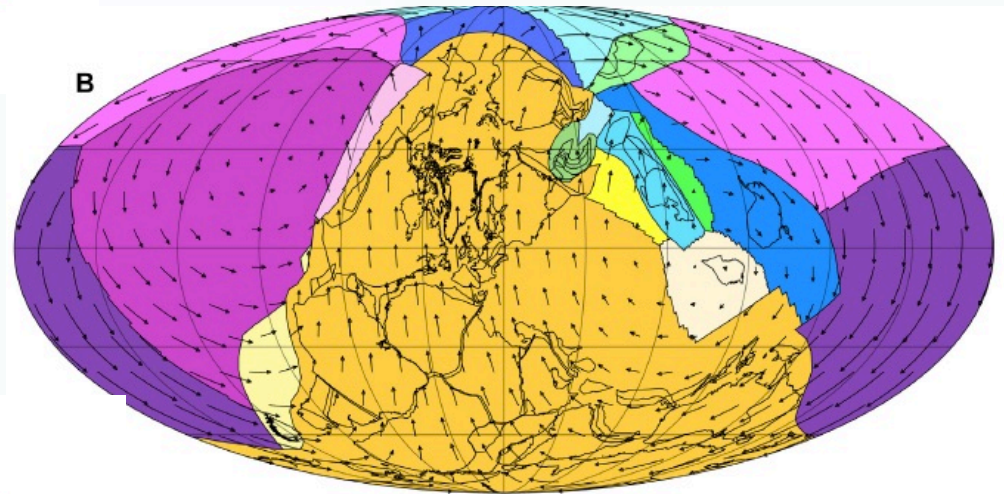


Tectonic model

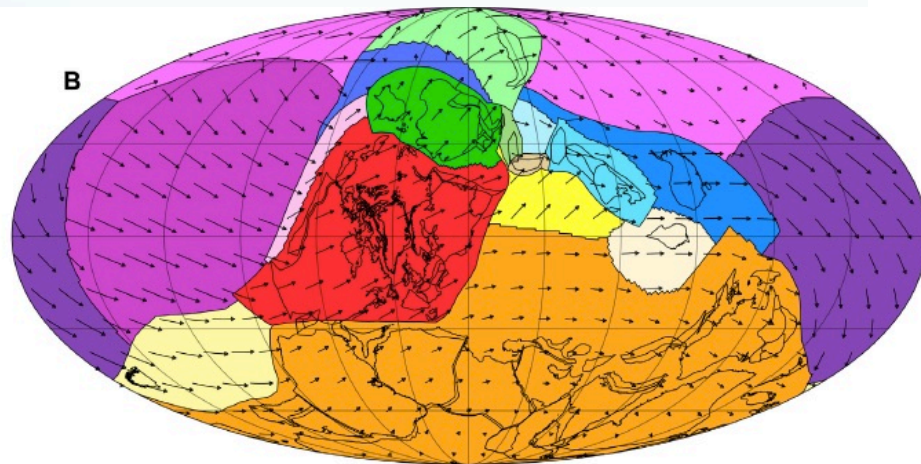
Domeier and Torsvik, 2014



290 Ma, Early Permian



310 Ma, Late Carboniferous



330 Ma, mid-Carboniferous

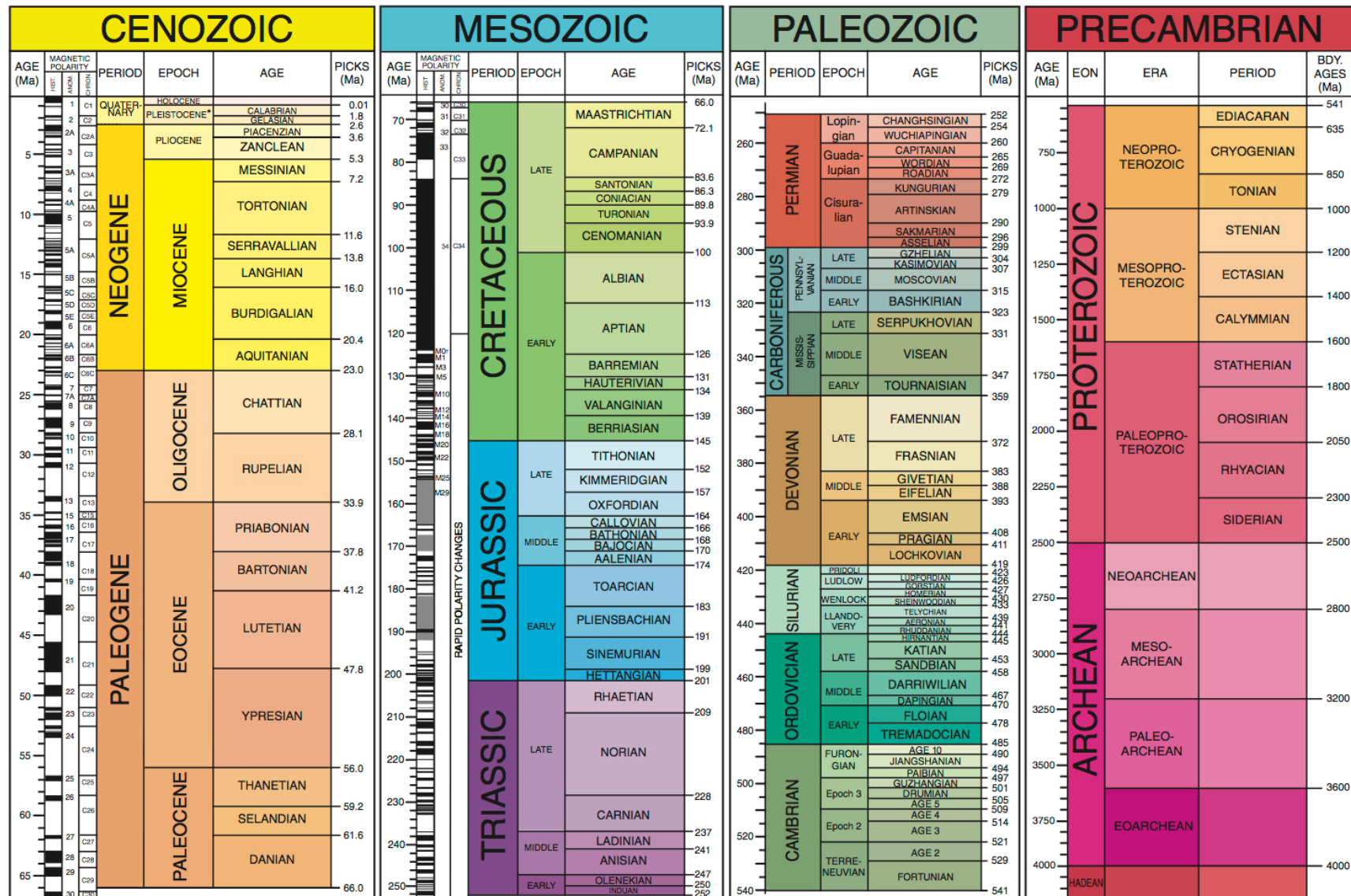
Conclusions

- Southwestern Laurentian margin (SLAB) was active *throughout* late Paleozoic time
- Tectonic activity migrated southward along the margin; increase in Middle - Late Pennsylvanian
- Dominant shortening direction was NW-SE, consistent with other evidence for sinistral transpression along the margin
- Mechanism for sinistral motion = northward motion of Laurentia and Pangaea





GSA GEOLOGIC TIME SCALE v. 4.0



*The Pleistocene is divided into four ages, but only two are shown here. What is shown as Calabrian is actually three ages—Calabrian from 1.8 to 0.78 Ma, Middle from 0.78 to 0.13 Ma, and Late from 0.13 to 0.01 Ma. Walker, J.D., Geissman, J.W., Bowring, S.A., and Babcock, L.E., compilers, 2012, Geologic Time Scale v. 4.0: Geological Society of America, doi: 10.1130/2012.CTS004R3C. ©2012 The Geological Society of America. The Cenozoic, Mesozoic, and Paleozoic are the Eras of the Phanerozoic Eon. Names of units and age boundaries follow the Gradstein et al. (2012) and Cohen et al. (2012) compilations. Age estimates and picks of boundaries are rounded to the nearest whole number (1 Ma) for the pre-Cenomanian, and rounded to one decimal place (100 ka) for the Cenomanian to Pleistocene interval. The numbered epochs and ages of the Cambrian are provisional. REFERENCES CITED Cohen, K.M., Finney, S., and Gibbard, P.L., 2012, International Chronostratigraphic Chart: International Commission on Stratigraphy, www.stratigraphy.org (last accessed May 2012). (Chart reproduced for the 34th International Geological Congress, Brisbane, Australia, 5–10 August 2012.) Gradstein, F.M., Ogg, J.G., Schmitz, M.D., et al., 2012, The Geologic Time Scale 2012: Boston, USA, Elsevier, DOI: 10.1016/B978-0-444-59425-9.00004-4.

