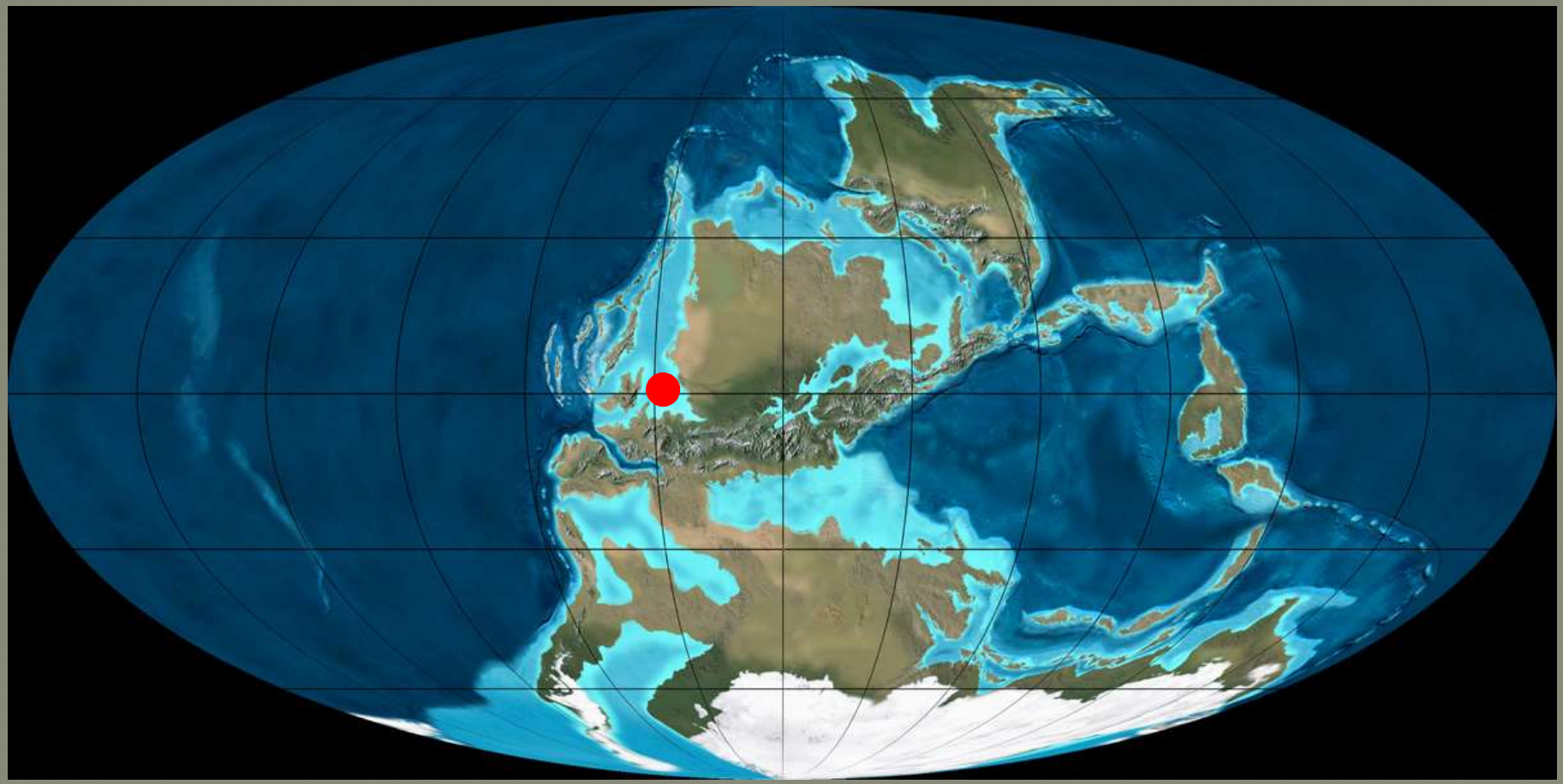
The Amado event—a glacio-eustatic signal across the Middle-Late Pennsylvanian boundary in central and southern New Mexico

Spencer G. Lucas, Karl Krainer, James Barrick, Bruce D. Allen, William A. DiMichele and Daniel Vachard

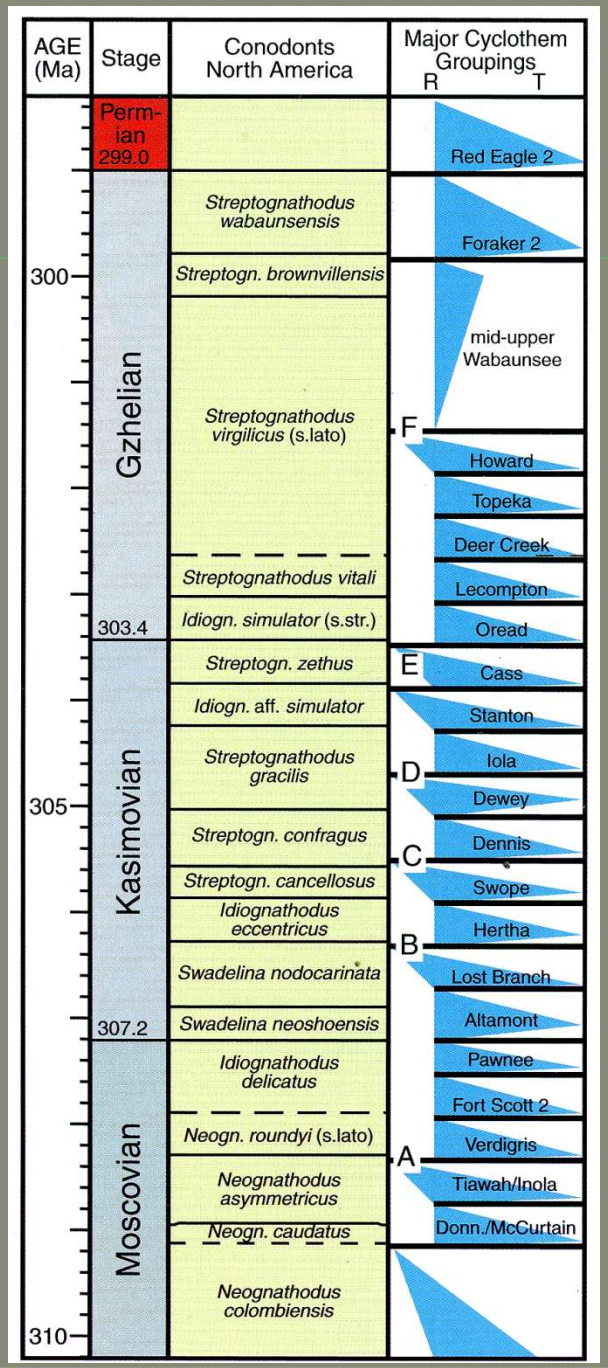
NM Museum of Natural History; Innsbruck University; Texas Tech University; NM Bureau of Geology; Smithsonian Institution, Universite Lille

Pennsylvanian world

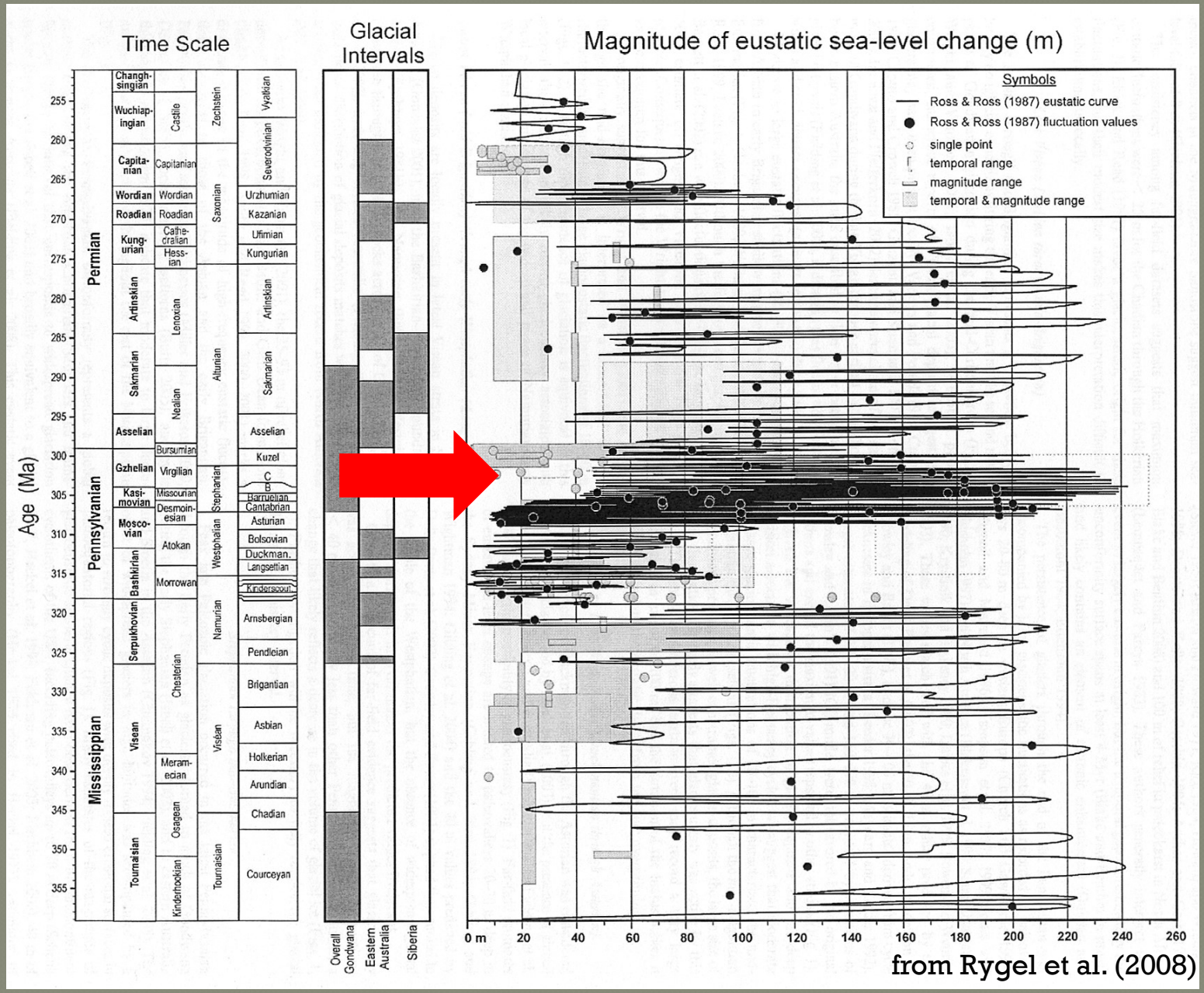


Drivers of sedimentation in the Pangean tropics

- Glacio-eustasy due to orbital forcing by eccentricity cycles (100 and 400 kyr)—well seen in midcontinent cyclothems
- Ancestral Rocky Mountain tectonics
- Autocyclic drivers—local climate, delta switching, etc.

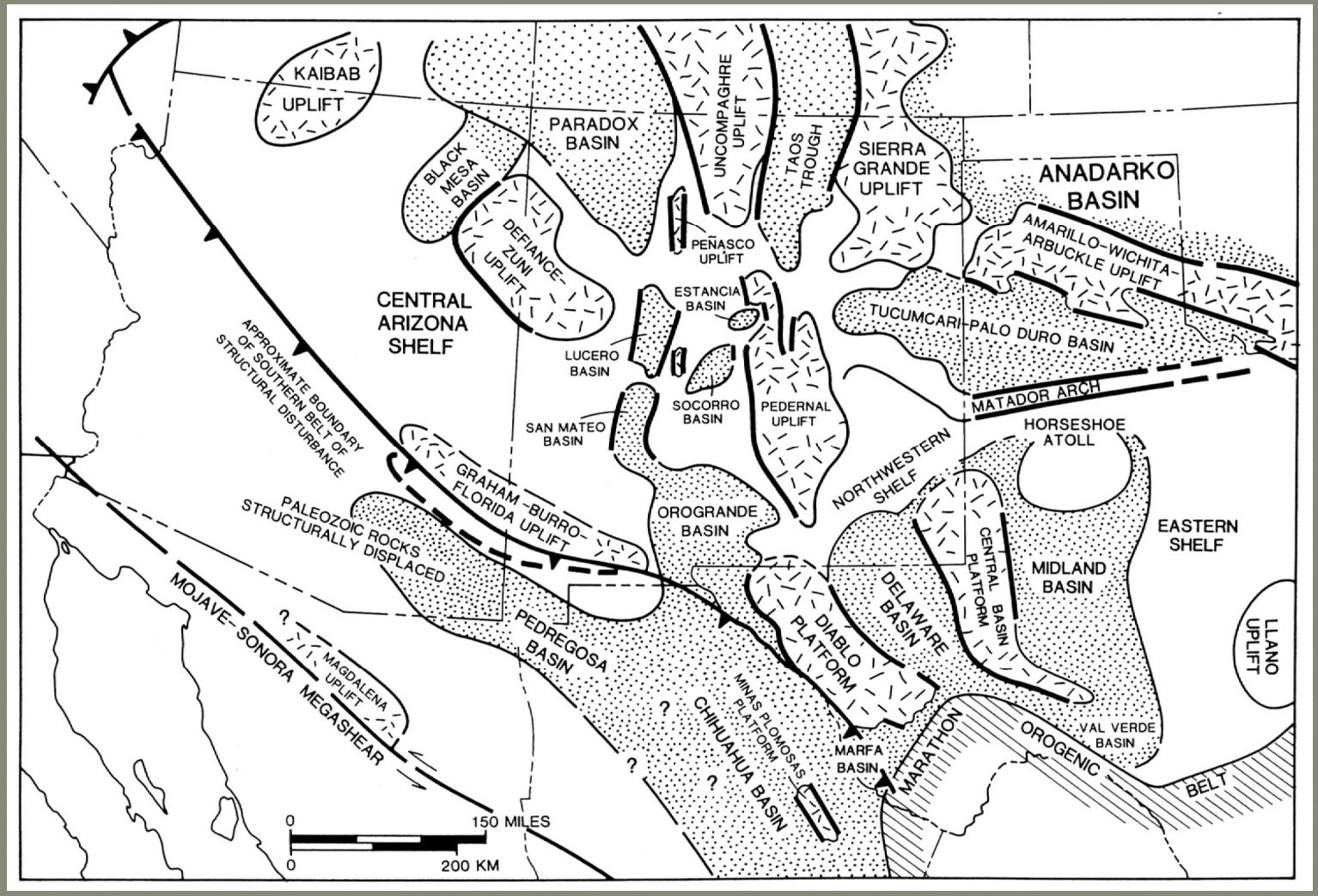


Missourian deglaciation



from Rygel et al. (2008)

Ancestral Rocky Mountain (ARM) orogeny



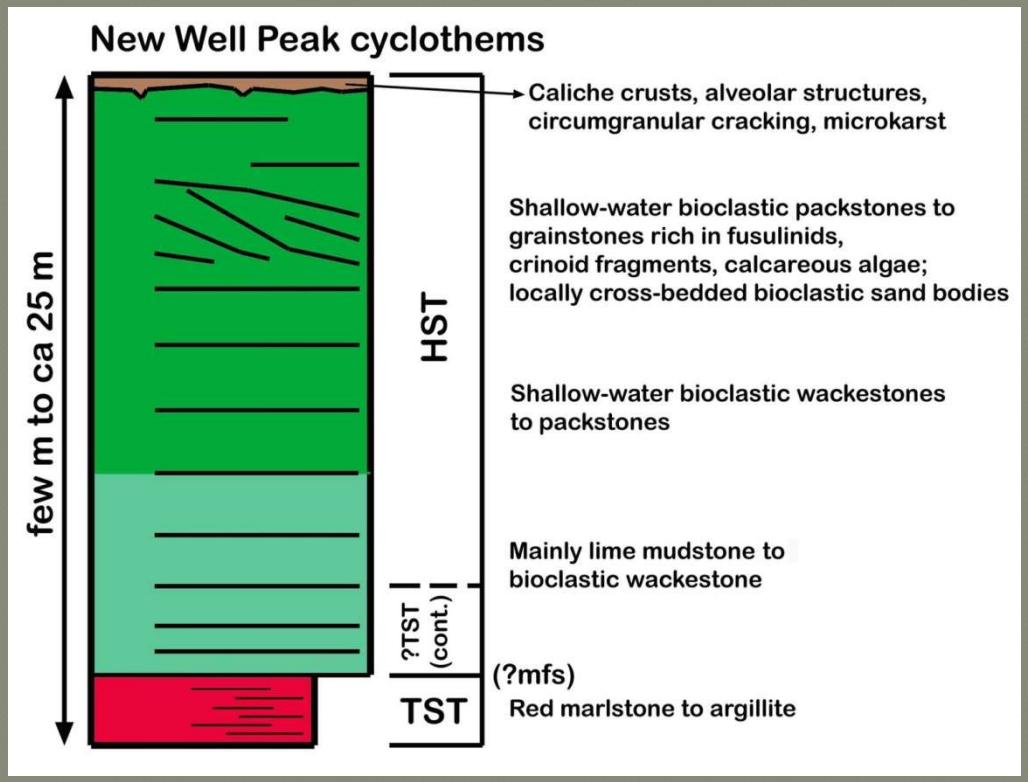
Ross & Ross (1987)

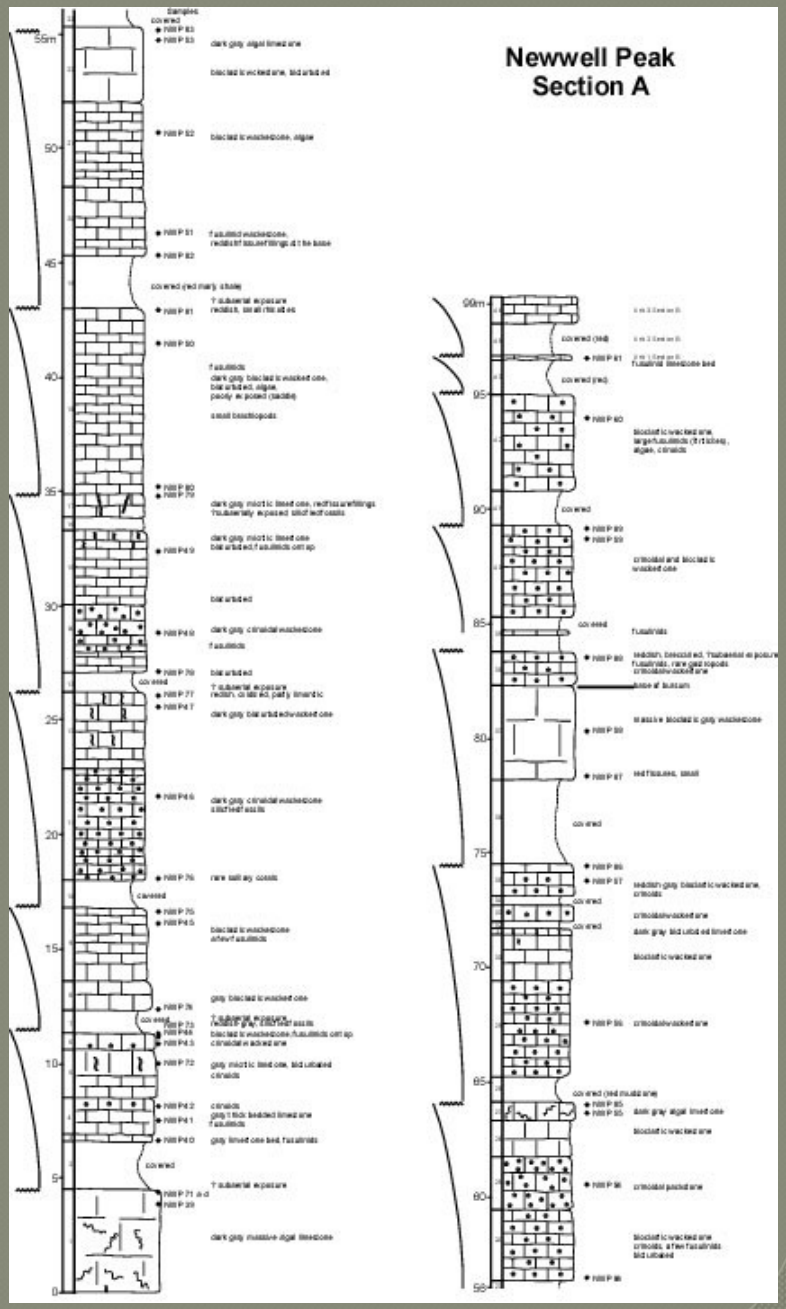
Tectonics

- Non-repetitive (disorganized) facies stacking
- Particular facies not plausibly produced by glacio-eustatically-driven sedimentation (e.g., fanglomerates, etc.)
- Unconformities
- Lateral facies variation

In NM, there appear to be some eustatically-driven, shallowing-upward cycles

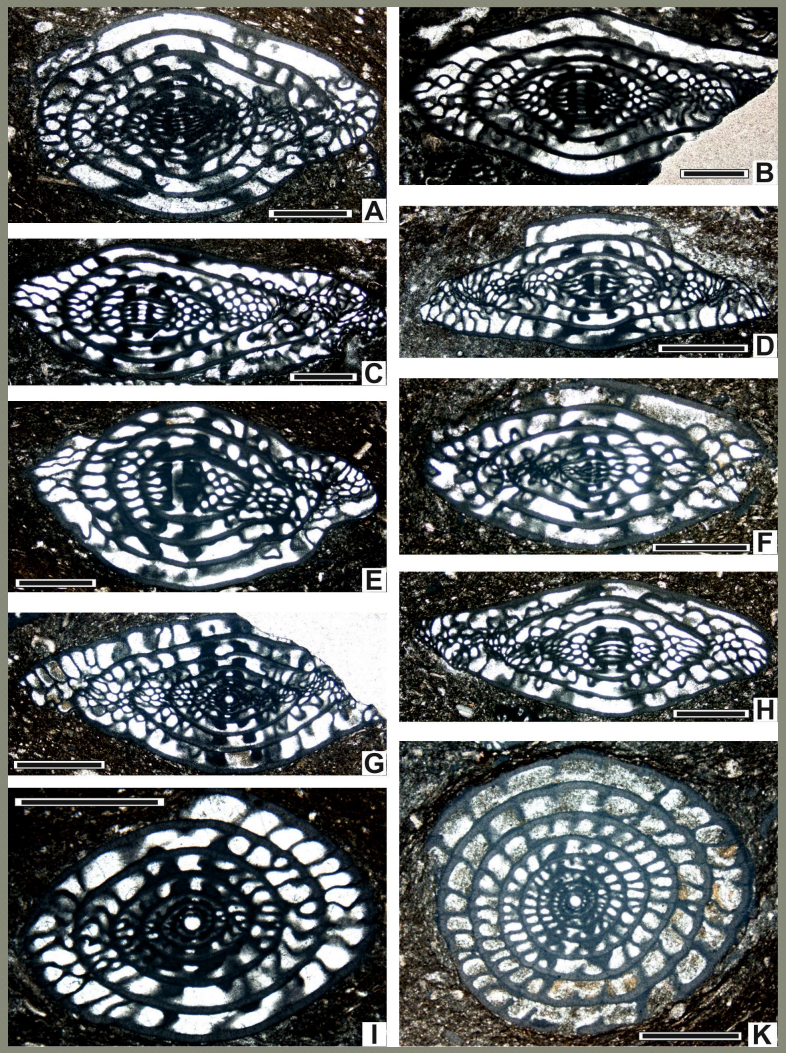
Best example: Penn-Perm transition in Big Hatchet Mountains, SW NM

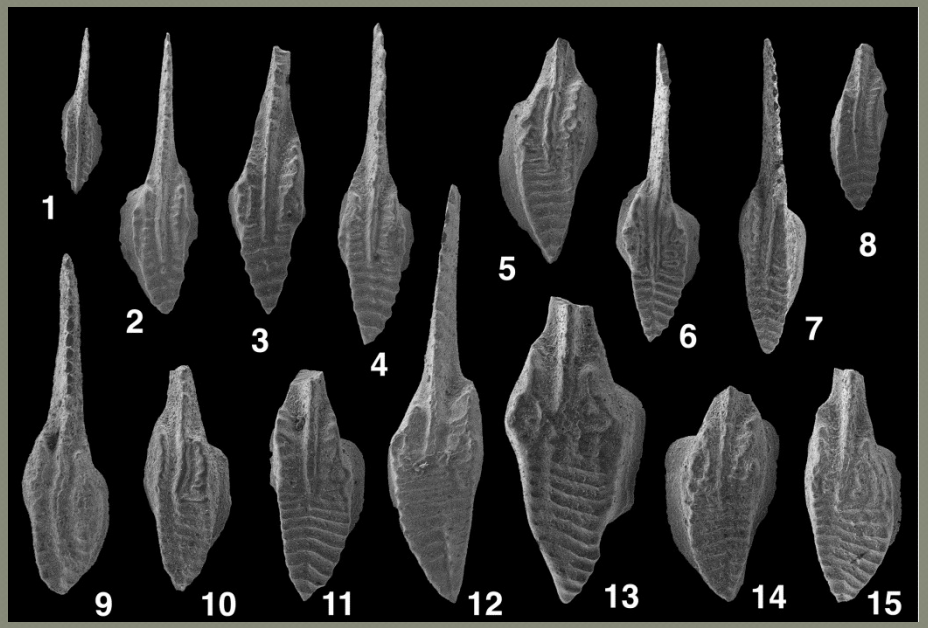




Lucas et al. (2017) *Stratigraphy*

Biostratigraphy



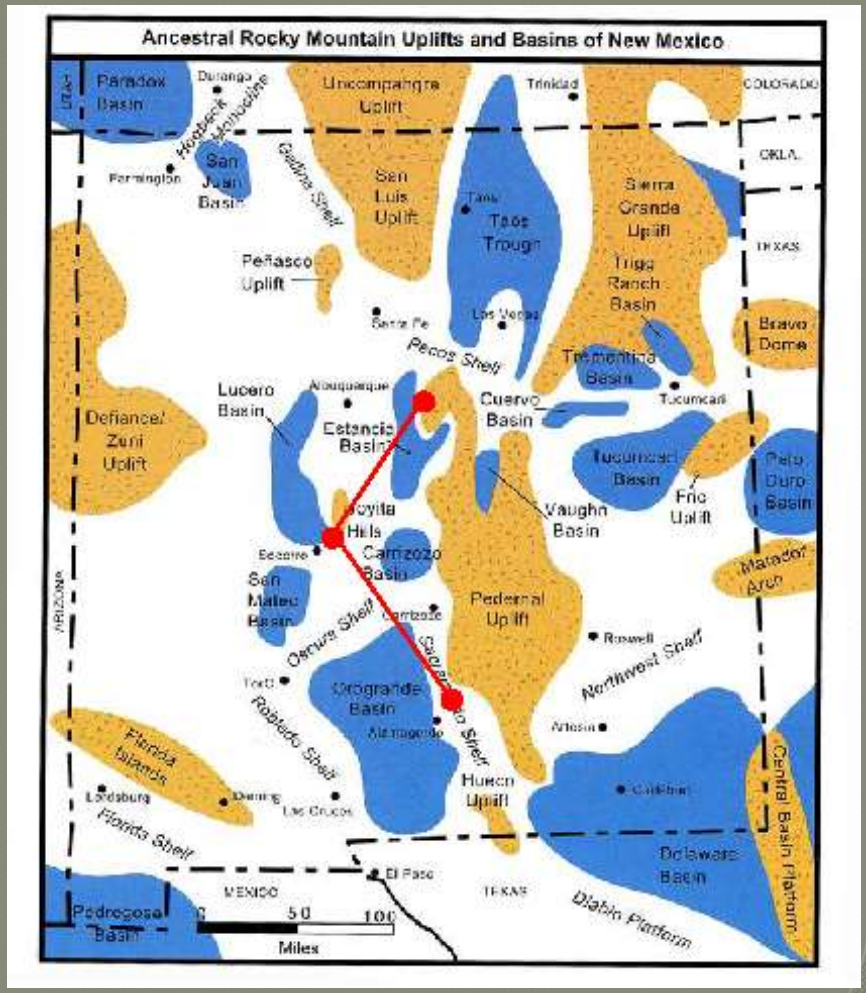


Micropaleontological age control of Middle-Late Pennsylvanian

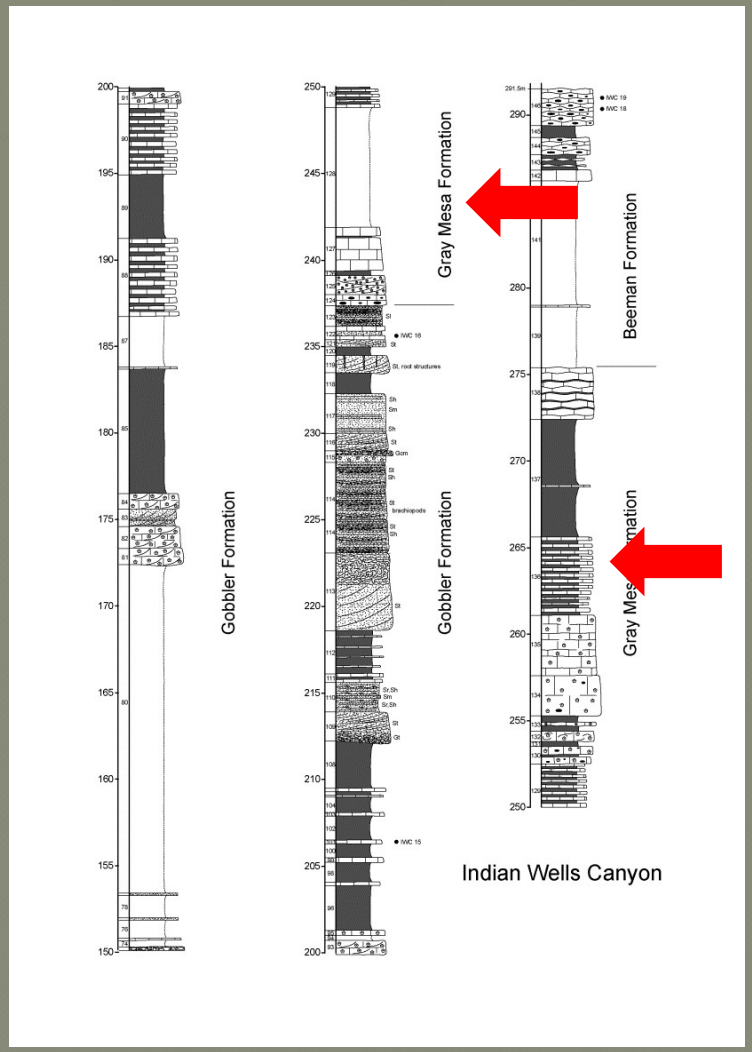
Precise position of Desmoinesian-Missourian boundary

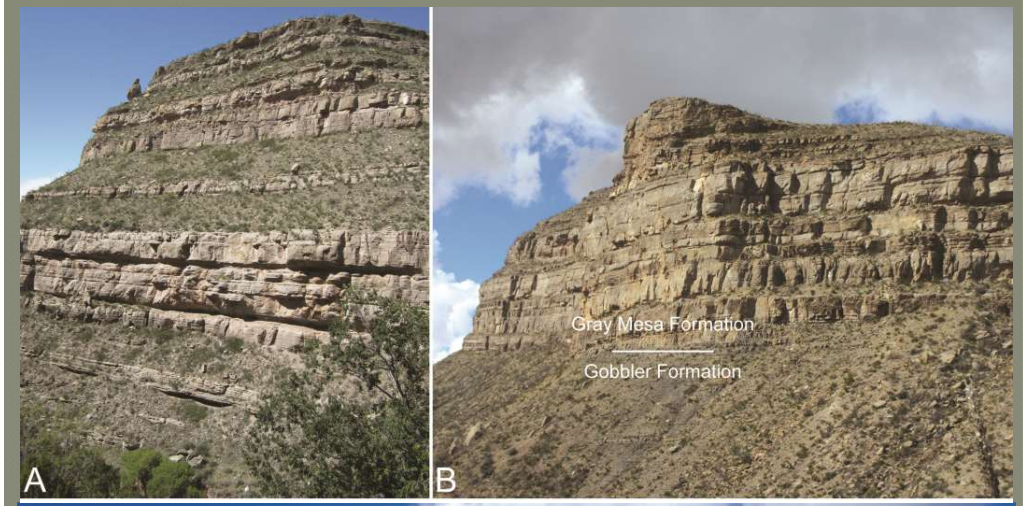
The "Amado event"

- A glacio-eustatic signal in southern and central NM
- Named for Amado Member of Atrasado Formation—a thin (10-20 m thick) and persistent limestone unit that straddles the Middle-Late Pennsylvanian boundary
- Amado facies are muddy wackestones and floatstones bracketed by clastic strata—Amado deposition took place during a time of relative tectonic quiescence
- Can be correlated/recognized across an ~ 250 km long transect from the Sacramento Mountains to Sandia Mountains in southern and central NM



Sacramento Mountains





In Alamo clastic trough, thin tongue of upper Gray Mesa Formation straddles Middle-Late Pennsylvanian boundary

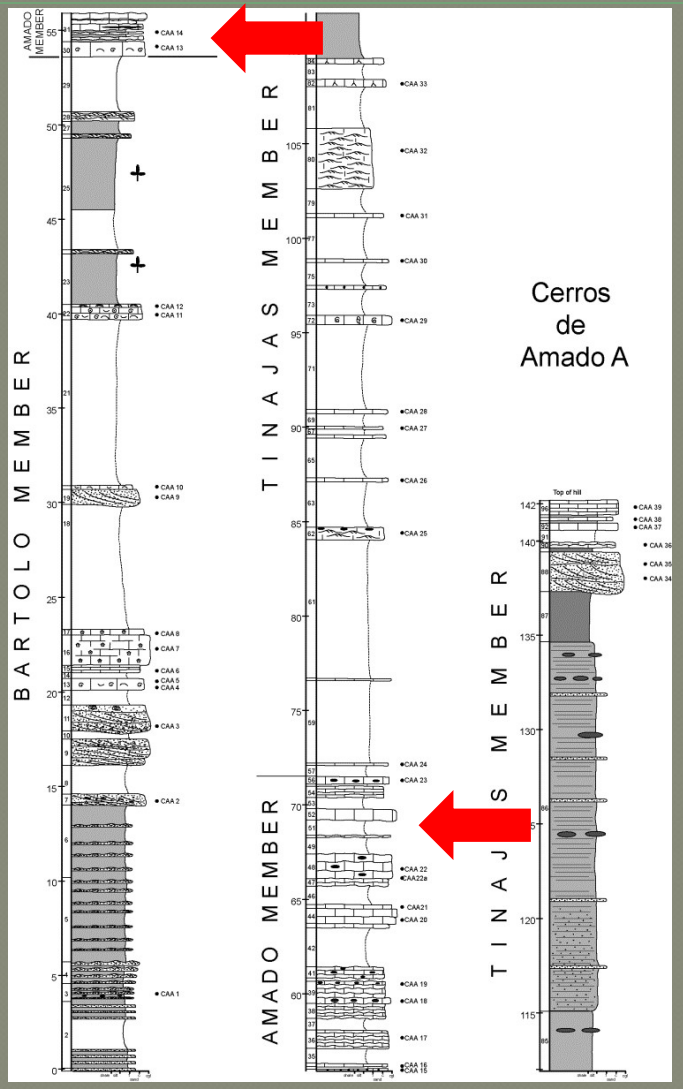
from Lucas et al. (2021)

Cerros de Amado, Socorro County

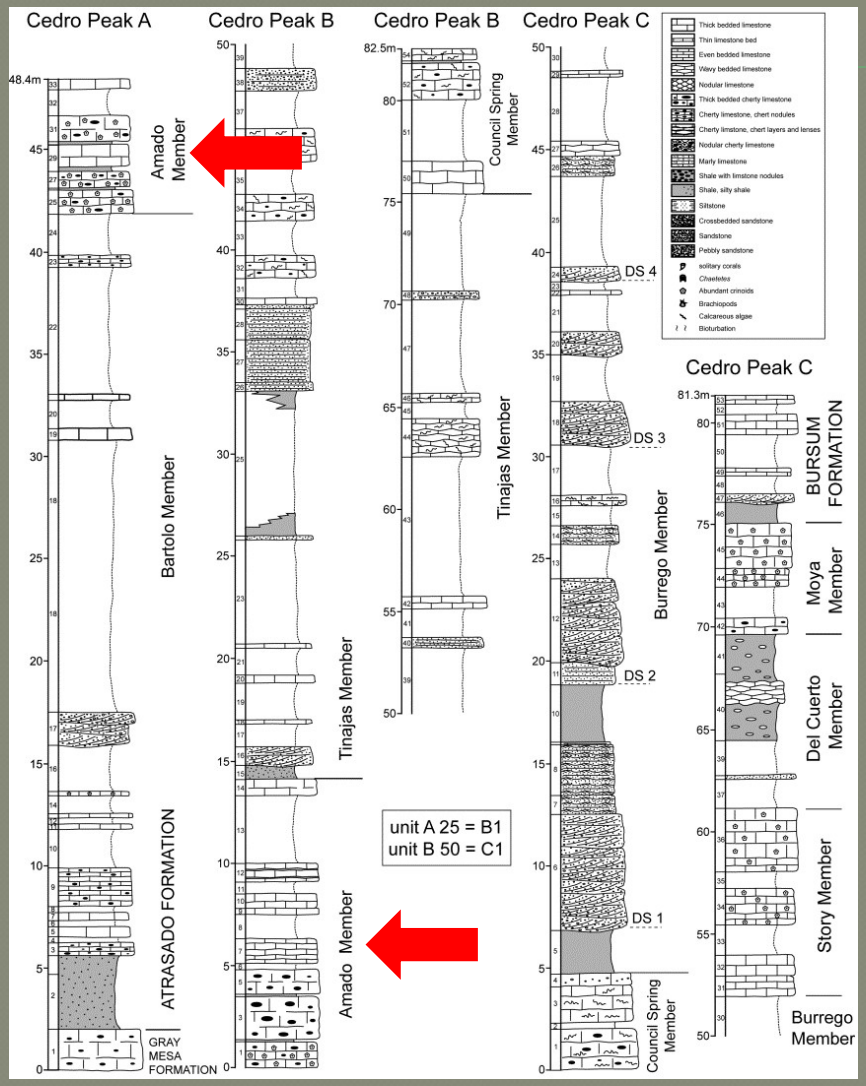
Type Amado = relatively thin, persistent, limestone-dominated unit

Between two clastic-dominated intervals

Conodonts correlate to 4 cyclothems

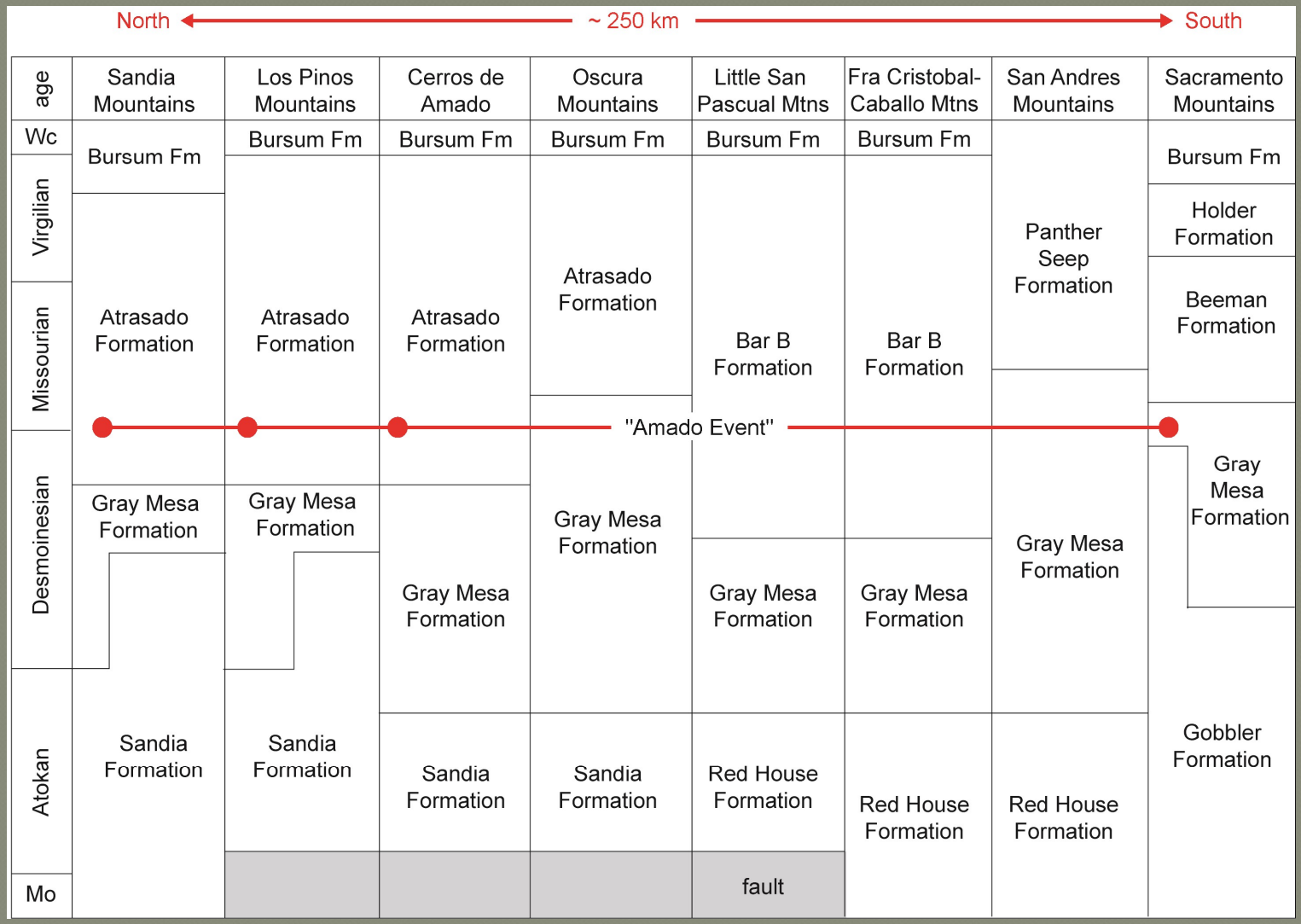


Cedro Peak, Manzanitas Mountains



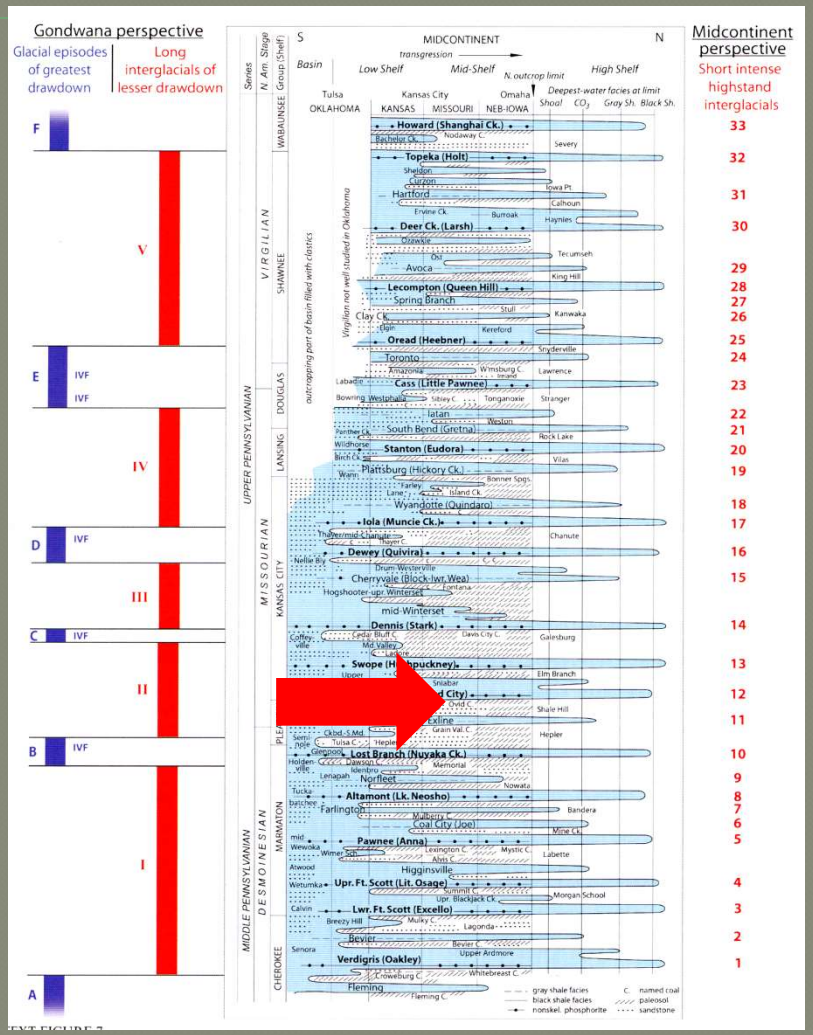
Similar stratigraphy in Sandia Mountains to north

The Amado event



What caused the Amado event?

- Correlates to major deglaciation event in Gondwana
- Recorded by limestone interval that likely formed during time of relative tectonic quiescence in the ARM orogenic belt of NM
- So, supports conclusion that this is a eustatic signal
- But, a complex signal of multiple glacio-eustatic events



Amado event = Middle-Late Pennsylvanian boundary glacio-eustatic signal