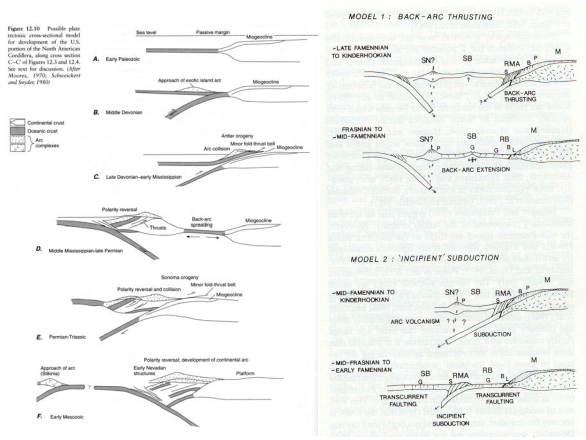
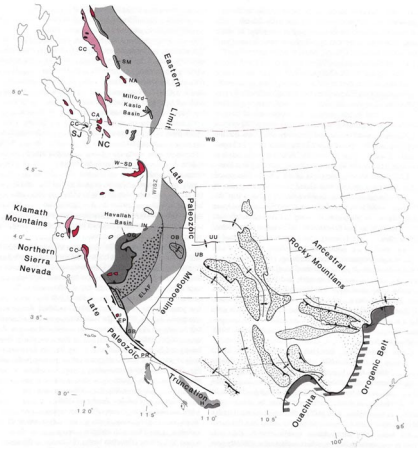
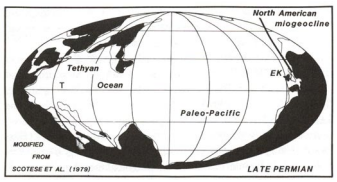
PENNSYLVANIAN-PERMIAN

- Quiescence
- Volcanism Ceases
- Havallah Basin of Extension?
- Passive Margin (?) Shelf Sedimentation







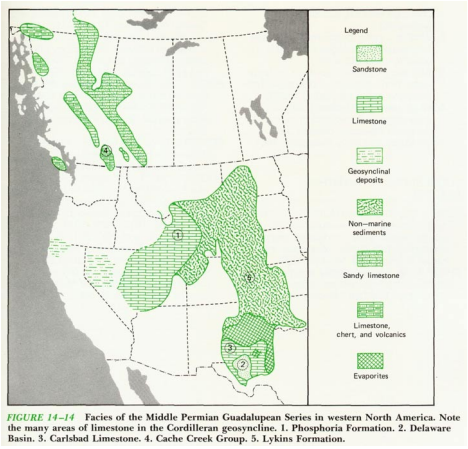
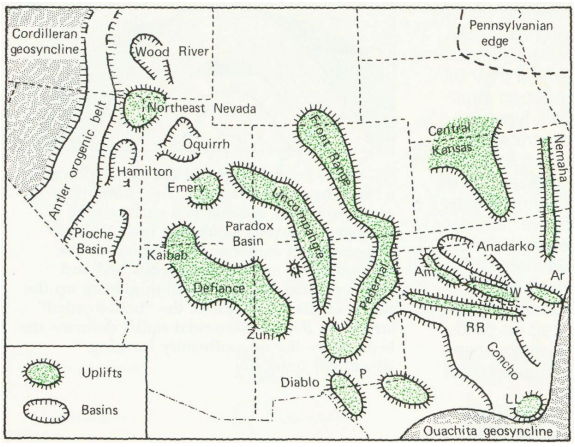
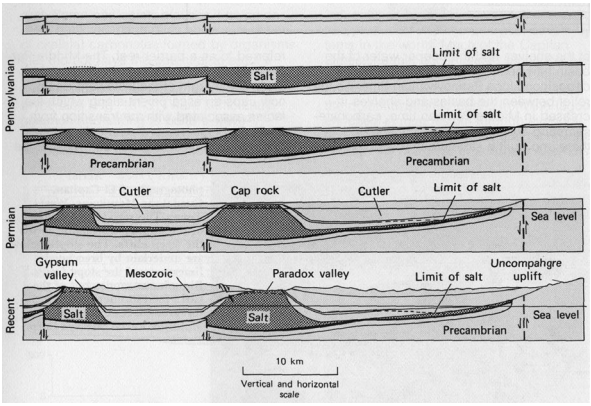


FIGURE 14–14 Facies of the Middle Permian Guadalupean Series in western North America. Note the many areas of limestone in the Cordilleran geosyncline. 1. Phosphoria Formation. 2. Delaware Basin. 3. Carlsbad Limestone. 4. Cache Creek Group. 5. Lykins Formation.

Ancestral Rockies Uplift

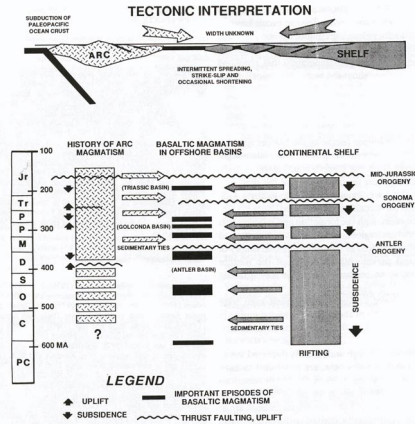
- Paradox Basin & Uncompaghre Uplift
- Transgressive Association
- Allegheny Events in Marathon/Ouachita Belt

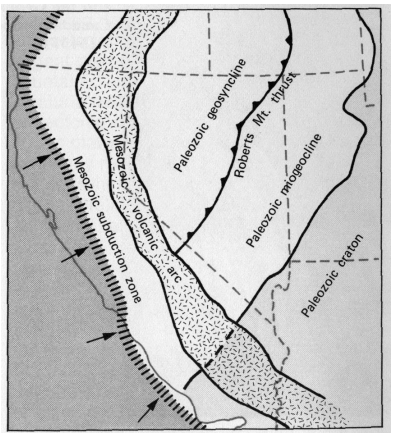




Sonoma Orogeny

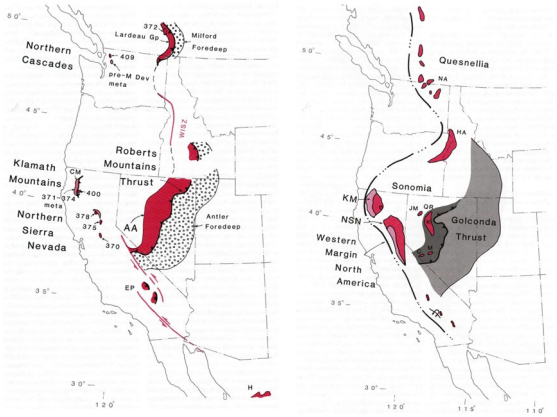
- Late Permian and early Triassic age
- Change from passive to active margin conditions
- Emplacement of Golconda Allochthon
- Truncation of NE-SW trending continental margin in Mojave area
- Formation of a new active margin

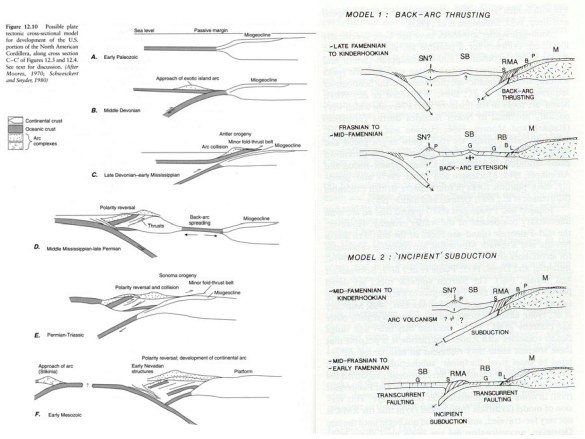




Golconda Allochthon

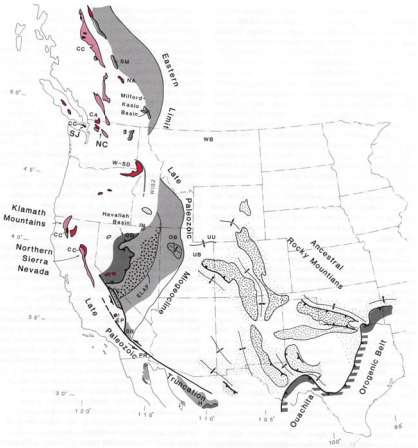
- Upper plate
  - Argillite, sandstone, volcanic rocks
- Lower plate
  - Carbonates and clastics





Havallah Basin

- Source for Golconda rocks
- Either a passive margin or a marginal basin
- Source of materials
  - Sediments from Antler thrust to the east
  - Andesitic source to the west



Stratigraphy of Havallah Basin

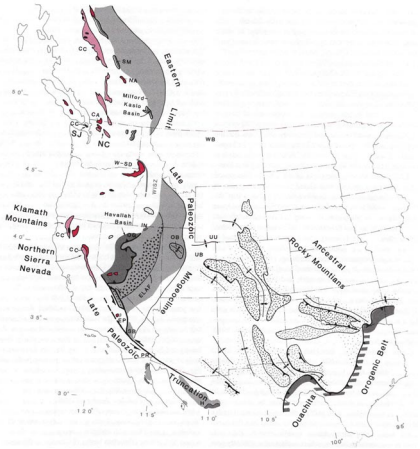
- Early Mississippian Sediments from Antler Thrust Belt
- Upper Mississippian Pillow Lava and Radiolarian Chert
- Penn/perm Carbonate Turbidities from the East
- Early Permian Basaltic Volcanism
- Late Permian Arc Derived Detritus

Related Depositional Environments

- Continental shelf to the east
  - Penn/Perm transgressive marine sequences
- Island arc to the west
  - Andesite through rhyolites preserved in Klamath Mts. and Sierra Nevada

Consequences

- Havallah Basin Closed
- Volcanic Basinal Rocks Thrust Eastward
- West Facing or East Facing Arc?



Nevadan Orogeny (162-144 Ma)

- General
  - Turbidite Deposition Across Ophiolites and Synchronous Deformation Define Orogeny
- Plate Edge
  - Fore Arc Basins Source of Ophiolites
- Isolated Magmatism as Small Plutons

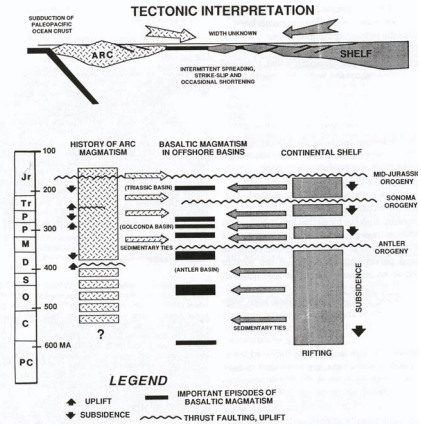


Plate Interior

- Foreland fold and thrust belt
- Major sediment source to the west
- Trough near the highland
- Syntectonic intrusions
  - Orogenic highlands Nevada, Utah, Idaho

Plate Kinematic Patterns

- NW acceleration to 200 Km/Ma
- Sinestral tangential motion
  - Relative to plate edge

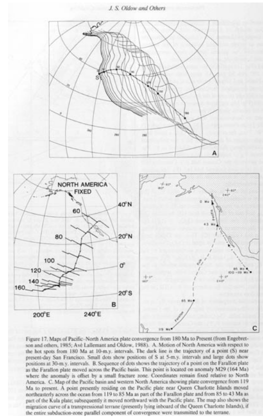


Figure 17. Maps of Pacific–North America plate convergence from 180 Ma to Present (from Engebretson and others, 1985; Avé Lallemant and Oldow, 1988). A. Motion of North America with respect to the hot spots from 180 Ma at 10-m.y. intervals. The dark line is the trajectory of a point (S) near present-day San Francisco. Small dots show positions of S at 5-m.y. intervals and large dots show positions at 30-m.y. intervals. B. Sequence of dots shows the trajectory of a point on the Farallon plate as the Farallon plate moved across the Pacific basin. This point is located on anomaly M29 (164 Ma) where the anomaly is offset by a small fracture zone. Coordinates remain fixed relative to North America. C. Map of the Pacific basin and western North America showing plate convergence from 119 Ma to present. A point presently residing on the Pacific plate near Queen Charlotte Islands moved northeasterly across the ocean from 119 to 85 Ma as part of the Farallon plate and from 85 to 43 Ma as part of the Kula plate; subsequently it moved northward with the Pacific plate. The map also shows the migration curve of a transpressional terrane (presently lying inboard of the Queen Charlotte Islands), if the entire subduction-zone parallel component of convergence were transmitted to the terrane.