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MIDDLE PENNSYLVANIAN THROUGH EARLY PERMIAN TECTONICALLY CONTROLLED BASINS: EVIDENCE FROM THE CENTRAL PEQUOP MOUNTAINS, NORTHEAST NEVADA

Sweet, D., and Snyder, W.S., Department of Geosciences, Boise State University, 1910 University Drive, Boise, ID, 83725

The generally accepted model for Late Paleozoic tectonism along the western margin of the U.S. is the Late Devonian-early Mississippian Antler orogeny, followed by tectonic quiescence, and ending with the Late Permian-early Triassic Sonoma orogeny (e.g., Burchfiel and Davis, 1975; Dickinson, 1977; Burchfiel et al., 1992). However, recent workers have documented numerous tectonic unconformities within the Late Paleozoic stratigraphic succession of eastern Nevada that could not be entirely explained by the Antler or Sonoma orogenies (e.g. Gallegos et al., 1991, Snyder et al, 1991, Trexler et al., 1991, Snyder et al., 1995, VanHofwegen, 1995, Sweet, 2001, Trexler et al., submitted). Thus, a growing appreciation for rethinking the Late Paleozoic tectonic history is occurring among many workers. A comparison of two closely geographically linked (~15 km apart) stratigraphic sections within the Central Pequop Mountains (CPM) and Nine Mile Canyon (NMC) (Figure 1) document tectonically controlled basins providing further data for restructuring the Late Paleozoic tectonic history.

In the CPM, the stratigraphic succession is comprised of mixed siliciclastic-carbonate strata and is approximately 2580 m thick. From oldest to youngest, the lithostratigraphic units are the Diamond Peak (~490 m), Ely Limestone (~431 m), Hogan Formation (~306 m), and Pequop Formation (~1659 m). The Diamond Peak Formation consists of silty to sandy limestone, calcareous and allochemic sandstones, micritic siltstones, quartzose sandstones, and chert and protoquartzite pebble conglomerates.

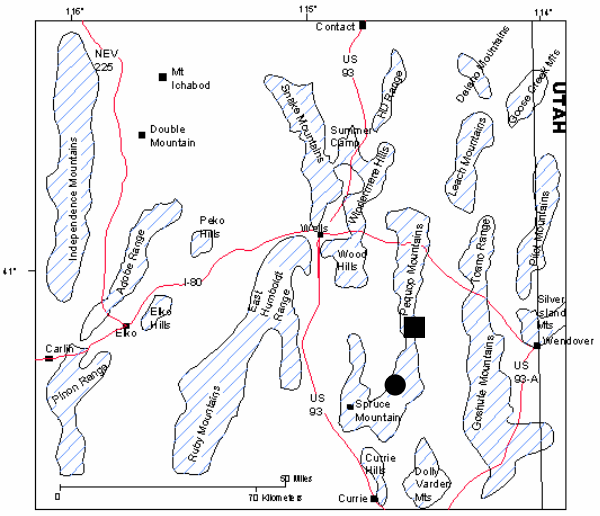

Figure 1: Location map of northeastern Nevada showing the chief locations discussed in this study. Central Pequop Mountains = black square. Nine Mile Canyon = black circle. Crosshatches represent mountain ranges.

The age of the Diamond Peak is considered Chesterian based upon stratigraphic position beneath the Ely Limestone and regional correlation to the type section (Robinson, 1961). Conodonts and foraminifera have been collected to confirm this age, but to date, have not been identified. The contact between the Ely Limestone and the underlying Diamond Peak Formation is gradational. The fossiliferous limestone of the Ely is characteristically cyclic and contains locally abundant chert nodules and stringers. Other

lithologies within the Ely include conglomerates in the basal part, allochemic sandstones, and micritic siltstones. Fusulinaceans recovered from the upper portion of the Ely Limestone have been identified as mid-Atokan. The Hogan Formation unconformably overlies the Ely Limestone. Micritic siltstones and silty micrites with periodic 20-30 cm grainstone beds comprise the majority of the Hogan Formation. The grainstone beds are interpreted to be event beds. Along strike, the underlying Ely is trimmed by a slight angular (5-10°) unconformity. Numerous conodonts have been recovered from the Hogan Formation and preliminary identification provides mid-Pennsylvanian ages. Tighter conodont age control is pending. Fusulinaceans have also been recovered from the Hogan and have been preliminarily identified as mid-Desmoinesian. The Pequop Formation unconformably overlies the Hogan Formation. A variably thick (0-6 m) lenticular conglomerate marks the abrupt contact. The conglomerate contains clasts of chert, quartzite, and limestone. Fusulinids recovered from the limestone clasts have been preliminarily identified as Atokan. Over an interval of 3 m, the conglomerate changes to a fusulinacean-coral bearing limestone that varies greatly in quartz sand content. Fusulinaceans recovered from limestones directly above the conglomerate have been preliminarily identified as Sakmarian in age.

Two tectonic unconformities punctuate the succession at the CPM (Figure 2). The unconformities are the C5 and P2 of Snyder, et al., (2000, and this volume). The first unconformity, C5 separates late Atokan from mid-Desmoinesian strata and is associated with pre-unconformity deformation. In the CPM, the deformation occurs within the upper 145 m of the Ely Formation and is characterized by minor thrusting (10's m of displacement), fault propagated folds, and localized brittle-ductile marble shear zones. The deformation grades from exclusively brittle structures at the top of the Ely to brittle-ductile shear zones towards the base of deformation (still within the Ely). Stereonet plots of bedding from outcrop scale folds and measured hinge lines gives a mean hinge line orientation of 075/27°. The hinge line geometry and the associated fold geometries suggests a N/NW shortening direction. Thrust fault vergence is directed to both the southeast and northwest, but is dominantly to the northwest. The overlying Hogan stratum does not display these structures. To the southeast at Buck Mountain, dominantly northwest verging deformation also occurs within the upper Ely Limestone and is constrained by the overlying Hogan Formation (Snyder, personal communication). Furthermore, to the west, at Carlin Canyon, Trexler et al. (submitted) have documented a sub-C6 (mid-Missourian) deformational event that is dominantly northwest verging. Although, the deformational event at Carlin Canyon is only constrained to be older than Virgilian and younger than mid-Atokan, it is conceivable it correlates with the deformation in the CPM based upon similar oriented structures.

In the CPM, the P2 boundary separates late Desmoinesian from late to medial Sakmarian strata. The Sakmarian strata regionally represent the oldest strata observed above the boundary. The unconformity is interpreted to be tectonic based upon Atokan fusulinaceans recovered from the basal conglomerate (described above) which necessitates local uplift to recycle older limestones.

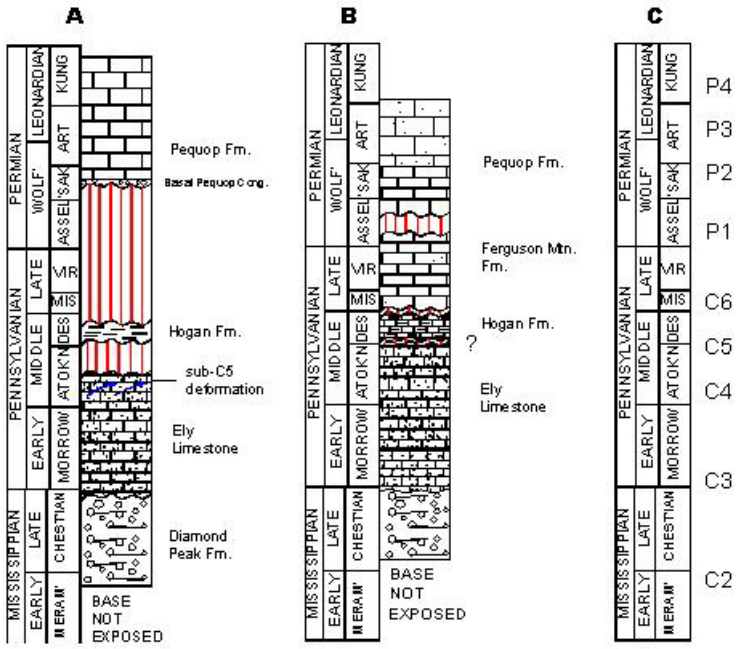

Figure 2: A) Stratigraphic column summary of the Central Pequop Mountains (CPM) section. B) Stratigraphic column summary of the Nine Mile Canyon (NMC) section. C) Tectonostratigraphic boundaries found in eastern Nevada. Nomenclature of tectonostratigraphic boundaries is from Snyder

At Nine Mile Canyon (NMC), the stratigraphic succession is lithologically similar to the CPM; however, it is thicker and preserves a more continuous record of sedimentation. Only the middle Pennsylvanian-Early Permian part of the NMC section has been measured. From oldest to youngest, the section includes the Ely Limestone, Hogan Formation, Ferguson Mountain Formation, and Pequop Formation. Lithostratigraphic units that are present in the CPM are similar in lithology and described above. The Ferguson Mountain Formation is comprised of cyclic limestones that are commonly capped by bioherms and occasionally limestone-chert pebble conglomerates. The bioherms are composed chiefly of corals and *Paleoaplysina*. Fusulinaceans recovered from the Ferguson Mountain have been preliminarily identified as Missourian through early Asselian.

The tectonostratigraphy of NMC is markedly different than the CPM (Figure 2). The P1 unconformity (mid-Asselian) has been documented within NMC where several fusulinacean zones are missing. A tectonic origin for this unconformity has not been established. Preliminary data from fusulinaceans suggests that a small hiatus (less than a zone) may be present at the C6 boundary. To date, the P2 unconformity appears to not be present at NMC. The base of the measured section is not stratigraphically low enough to determine whether or not the C5 unconformity is present.

The more continuous deposition throughout the upper Pennsylvanian at NMC is problematic. This marked contrast suggests differential uplift and subsidence over a relatively short distance (~15 km). Marcantel (1973) suggested a zone of flexure or faulting was located between the two sections during the Late Pennsylvanian. The data presented within this study confirm that the difference in sedimentation between the two locations was structurally controlled.

Conclusions

- The Central Pequop Mountains stratigraphic succession records two tectonic unconformities: C5 (mid-Desmoinesian) and P2 (mid-Sakmarian)
- The C5 unconformity at the Central Pequop Mountains is associated with pre-unconformity deformation that shows a dominant northwest vergence to the folds and thrust faults. Buck

Mountain and Carlin Canyon stratigraphic successions may record the same phase of deformation.

- Comparisons between Central Pequop Mountains and Nine Mile Canyon document markedly different stratigraphic successions over a relatively short distance (~15 km). This suggests a structural control for these stratigraphic differences during the Late Pennsylvanian.

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