The Amado Event—a Glacio-Eustatic Signal Across the Middle-Late Pennsylvanian Boundary in Central and Southern New Mexico

Spencer G. Lucas¹, Karl Krainer², James E. Barrick³, Bruce D. Allen⁴, William A. DiMichele⁵ and Daniel Vachard⁶

¹New Mexico Museum of Natural History, 1801 Mountain Road N.W., Albuquerque, NM, 87104, spencer.lucas@state.nm.us
²Institute of Geology, University of Innsbruck, Innsbruck, A-6020, Austria
³Department of Geosciences, Texas Tech University, Lubbock, TX, 79409
⁴New Mexico Bureau of Geology and Mineral Resources, Socorro, NM, 87801
⁵NMNH Smithsonian Institution, Washington, DC, 20560
⁶Universite Lille, Villeneuve d'Ascq cedex, France

The Late Paleozoic ice ages of the Pennsylvanian-early Permian have long been seen as primary drivers of global sea level and of cyclical marine deposition in the Pangean tropics. However, in the American Southwest, particularly in New Mexico, the tectonism of the ancestral Rocky Mountain (ARM) orogeny, principally caused by the collision of Gondwana and Laurussia that assembled Pangea, is also an important driver of sedimentation. Further complications are introduced by classic autocyclic drivers of sedimentation, including local and regional climates, productivity fluctuations in the carbonate factory and chaotic aspects of sediment discharge. In the New Mexico Pennsylvanian-early Permian section, most claims of glacio-eustatically driven sedimentary cycles do not stand up to critical scrutiny. Nevertheless, detailed correlations and facies analysis along an ~ 250 km transect from the Sacramento Mountains in Otero County through the northern Sandia Mountains in southern Sandoval County identify the sedimentary signal of a substantial eustatic event across the Middle-Late Pennsylvanian (Desmoinesian-Missourian) boundary. Correlations are based primarily on conodont biostratigraphy supplemented by biostratigraphy based on fusulinids and other forams. This event is seen in the Sacramento Mountains in the Alamo clastic trough, a structure created by ARM tectonism, as deposition shifted from clastic-dominated to platform carbonates that cross the Desmoinesian-Missourian boundary. To the north, this event is correlated to the carbonate-dominated Desmoinesian/Missourian Amado Member within the clastic-dominated lower part of the Atrasado Formation at numerous localities in Socorro, Valencia, Bernalillo and southern Sandoval counties. We thus term this the “Amado event,” a substantial glacio-eustatic event essentially equivalent to the Swope cyclothem of the Midcontinent. Strata above and below the Amado event interval are mixed siliciclastic and carbonate sediments that generally lack organized facies stacking and show great lateral variations in thickness and facies. Their stratigraphic architecture suggests that an allocyclic driver such as eustasy was not the primary driver of deposition. The laterally extensive limestones of the Amado Member are composed of muddy microfacies (mostly wackestone to floatstone) and have a diverse fauna of brachiopods, crinoids, bryozoans and other invertebrates. These limestones were deposited in a normal-marine, low-energy shelf environment. There are almost no high-energy sediments (grainstone, rudstone), which means that the Amado interval was deposited during a period of relative tectonic inactivity on a broad marine shelf. The Amado event marks the onset of a major global environmental event during the Kasimovian/Missourian interval, possibly a large scale deglaciation in Gondwana, a huge event that would have affected global sea level and climate in the Pangean tropics.