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The collision of the Ouachita-Marathon-Sonora margin of Paleozoic North America with the western portion of Gondwana: Stratigraphic and structural implications for timing of deformational events and resultant plate-tectonic model

Forrest G. Poole¹, William J. Perry, Jr.¹, and Raul J. Madrid²

(1) U.S. Geological Survey, Box 25046, Federal Center, Denver, Colorado 80225, U.S.A

(2) Independent Scientist, 155 Kaanapali Drive, Napa, California, 94558, U.S.A

Paleozoic oceanic sedimentary rocks of the continuous Ouachita-Marathon-Sonora continental margin were deposited along the southern edge of the North American craton. These three depositional sites formed in late Paleozoic time during oblique collision of the craton and the South American portion of Gondwana. The resulting continuous collisional Ouachita-Marathon-Sonora orogenic system (OMS) extends nearly 3,000 km from Mississippi (Ouachita) westward through Texas (Marathon) and southward to the Mexico (Sonora) portion of the margin. Caught up between the two colliding cratons were preorogenic sediments deposited in offshelf settings between North and South America. Initial synorogenic sediments were deposited in the margin-parallel deep-water ocean basin between the two cratons. These sediments later were transported as allochthons formed during cratonal collision, in advance of which were developed foreland basins and uplifts. Sedimentary facies and structural style are similar and correlative along the southern margin of North America. These allochthons are part of a large accretionary wedge complex thrust northwestward 50-200 km onto North American continental-shelf rocks. This accretionary wedge formed above a south-dipping subduction zone and subsequently was obducted onto the southern edge of the North American craton.

The preorogenic promontories and embayments that formed along the late Proterozoic-early Paleozoic Ouachita-Marathon-Sonora continental margin are probably related to a northeast-striking rift system (oceanward of the continental edge) offset by northwest striking transform faults, one of which is the so-called Mojave-Sonora megashear. Synorogenic late Paleozoic foreland basins and uplifts developed cratonward across the Transcontinental Arch and northwestward to the southern Ancestral Rocky Mountains of Colorado. The timing and sense of movement of these intracratonic structures have complex relationships to the collisional margin.

Deformation in all three portions began in mid-Mississippian time and ended in the Late Pennsylvanian in the Ouachita Mountains, Early Permian in the Marathon region, and Late Permian in Sonora. These portions of the orogenic system were subjected to clockwise rotation of Gondwana (Africa and South America) during oblique collision with North America. This rotation is compatible with the interpretation of diachronous westward younging of terminal OMS orogenic activity along the margins of North America and Gondwana. The Sonora portion of the OMS orogenic system indicates that northwestern Gondwana once lay south of western North America (south of central Sonora), and was not restricted to areas to the east of Sonora as often shown in Pangean reconstructions. The major plates-North American and Gondwana cratons-converged during the Pennsylvanian and were joined during the Permian to form the super-continent of Pangea. Probable northwest marginal remnants of Gondwana in Mexico include the El Fuerte area of Sinaloa and Sonora, as well as another large block in the Coahuila and southeast Chihuahua area.