Provenance Trends From Upper Cretaceous Nonmarine Strata in Southern New Mexico: Implications for Drainage Evolution and Sediment Dispersal Along the Southwestern Margin of the Western Interior Seaway

Brian A. Hampton, Greg H. Mack and Cody J. Stopka

Upper Cretaceous nonmarine strata in southern New Mexico mark the final phase of Late Cretaceous (Cenomanian–Campanian) sedimentation associated with the Sevier orogeny. Presented here are U-Pb detrital zircon ages, sandstone modal composition, and paleocurrent measurements from the Dakota Sandstone, Tres Hermanos Formation, and Crevasse Canyon Formation (Lower Member and Ash Canyon Member). The Dakota Sandstone is dominated by monocrystalline quartz (84%) with minor volcanic and metamorphic lithic grains (15%) with rare occurrences of feldspar (1%). Paleoflow measurements show east-directed (108°) to northeast-directed flow (50°). Detrital zircon age peaks occur at 1732, 1651, 1416, 1050, 626, 412, 230, and 103 Ma. The calculated range of maximum depositional ages (MDAs) for the Dakota Sandstone is 103–104 Ma. The Tres Hermanos Formation is composed primarily of monocrystalline quartz (63%) with volcanic and metamorphic lithic grains (27%) and minor feldspar (10%). Paleoflow measurements reflect east-directed (93–109°) and southeast-directed (166°) flow. Peak detrital zircon ages occur at 1709, 1420, 1085, 169, and 94 Ma. MDAs for the Tres Hermanos Formation range from 93–96 Ma. The Lower Member of the Crevasse Canyon Formation is composed of monocrystalline quartz (50%) along with volcanic and metamorphic lithic grains (41%) and minor abundance of feldspar (9%). Paleoflow measurements show primarily east-directed flow (100°). Detrital zircon age peaks occur at 1702, 1420, 1067, 167, and 91 Ma. The Lower Member of the Crevasse Canyon Formation is composed of monocrystalline quartz (48%) with volcanic and metamorphic lithic grains (46%) and minor occurrences of feldspar (6%). Paleoflow trends show an east- to southeast-directed flow (108–118°). Peak detrital zircon ages were determined to be 1682, 1415, 1108, 169 and 90 Ma. MDAs for the Ash Canyon Member range from 80–91 Ma. Precambrian to Paleozoic zircons overlap in age with the Yavapai, Mazatzal, Granite-Rhyolite, and Grenville provinces (and age-equivalent ~1.0 Ga rocks). Neoproterozoic, Early Paleozoic, and some Mesoproterozoic-age detritus was originally derived from Appalachian-Ouachita sources and transported to parts of the southwestern U.S. (e.g., Mesozoic eolianites of the Colorado plateau). Second-order recycling of Mesozoic eolianites has been reported from Lower Cretaceous strata of the Bisbee Rift which exhibit U-Pb detrital zircon spectra that very similar to Mesozoic strata of the Four Corners region. Permo–Triassic age detritus overlap in age with granitoid rocks of the Cordilleran magmatic arc that outcrop in California and Arizona. Jurassic to Cretaceous age zircons overlap with the mid-Mesozoic Cordilleran magmatic arc and the Sierra Nevada batholith. Based on the provenance trends summarized above, a sediment dispersal model is favored where the Dakota Sandstone was derived largely from recycled Lower Cretaceous strata of the Bisbee Rift of southeastern Arizona and southwestern New Mexico (present-day Mogollon highlands). Overlying strata of the Tres Hermanos and Crevasse Canyon Formations were sourced primarily from Jurassic–Cretaceous parts of the Cordilleran arc with secondary contributions from recycled strata of the Bisbee Rift and possible the McCoy basin of southern Arizona and southwestern New Mexico.

Keywords:
Sevier, Cretaceous, Provenance, Dakota

2017 New Mexico Geological Society Annual Spring Meeting
April 7, 2017, Macey Center, New Mexico Tech campus, Socorro, NM
Online ISSN: 2834-5800