Applying U-Pb Detrital Zircon Geochronology to Constrain Oligocene-Miocene closed-basin Rio Grande Rift sedimentation in the Palomas and Jornada del Muerto Basins, Southern New Mexico

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Latest Oligocene–Miocene synorogenic strata of the Hayner Ranch and Rincon Valley formations preserve the early rift history of closed-basin sedimentation in southern New Mexico and crop out along the modern Rio Grande rift (RGR) margin in the Palomas and Jornada del Muerto basins. The RGR preserves a near-continuous record of volcanism and sedimentation from late Eocene–Present, and although a considerable amount of previous work has focused on documenting the onset, extent, and geochemistry of Eocene–Oligocene volcanism during the early stages of the RGR, very little is known about provenance, drainage development, and sediment dispersal during the latest Oligocene–Miocene. Given the unique distribution of bedrock source areas that have been exposed as a result of rift deformation (e.g., Cenozoic volcanic fields, recycled Paleozoic–Mesozoic stratigraphy of the Colorado plateau, and Precambrian basement sources), southern New Mexico is an excellent natural laboratory to carry out this project. Presented here are N=7 new detrital zircon samples representing 972 new U-Pb ages from the Hayner Ranch Formation and 604 new U-Pb ages from the Rincon Valley Formations (1576 new U-Pb ages total from both units).

The basal Hayner Ranch Formation contains one primary peak age at 28 Ma and secondary peak ages at 47 and 36 Ma with isolated ages occurring between 225-150, and 95-55 Ma. In addition to these Phanerozoic ages, the Hayner Ranch also has rare, isolated Precambrian grains that fall between 1500-1400 Ma. The overlying Rincon Valley Formation has one primary peak age at 36 Ma and secondary peak ages at 167, 97, and 49 Ma with isolated age occurrences at 550, 400, and 225 Ma. Precambrian age occurrences are more abundant in the Rincon Valley and fall between 1700-1600, 1500-1400, and 1000-1300 Ma.

Detrital zircon ages that fall between 1700-1400 Ma overlap in age with the Mazatzal and Granite-Rhyolite Precambrian provinces and may represent detritus derived from local basement uplifts (e.g., basement exposed along the western Caballo Mountains front). Ages that fall between 1300-1000 Ma overlap with the Grenville province and are likely recycled from parts of the Dakota Sandstone. Mesozoic ages (225-95 Ma) overlap with the Cordilleran arc and likely are recycled. Zircon ages that occur near 47 and 36 Ma are likely derived from the Palm Park Formation (and equivalent Rubio Peak and Spears Formation) and caldera complexes, respectively. Abundant zircons that fall near 28 Ma overlap in age with the Uvas basaltic andesite and equivalent tuffaceous sandstone of the Thurman Formation. Given the large occurrence of these ages in the Hayner Ranch, these may represent detritus delivered to closed basins via ash-fall tuffs.