MIDDLE-LATE PLEISTOCENE GEOMORPHIC EVOLUTION OF THE EASTERN SAN MARCIAL BASIN, SOUTHERN RIO GRANDE RIFT, NEW MEXICO

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Completion of recent STATEMAP geologic mapping and preliminary age control allow constraints on the Quaternary landscape evolution of the eastern San Marcial basin. Particular effort was taken to understand the correlation of deposits under a prominent geomorphic surface that projects to ~25-40 m above the Rio Grande floodplain. Detailed mapping indicates that this geomorphic surface is comprised of 3 closely spaced (by 1-6 vertical m) surfaces underlain by three allostratigraphic units (Qs1, Qs2, and Qs3). Near the modern Rio Grande, each allostratigraphic unit contains a common suite of facies that include axial sands and floodplain deposits overlain by westerly-derived alluvial fans. This suite grades laterally northwestward into gravelly piedmont deposits. The youngest unit, Qs1, is the thickest and includes at least two cycles of an axial-to-distal fan upward facies progression. Qs1 has capping soils exhibiting stage II+ to III+ carbonate morphology, a typical tread height of 21-25 m and a strath height ranging from buried to 9 m above the modern Rio Grande floodplain. It is correlated to the Matanza Formation near Socorro, which has a ca. 70 ka surface (Sion et al., 2020), and we infer that the deposit age is 130-70 ka. The middle unit, Qs2, has a strath and tread height of 20-24 m and 27-35 m, respectively, and the older unit (Qs3) has strath and tread heights of 27-30 m and 40-42 m. Both Qs2 and Qs3 are associated with capping soils having stage III to IV carbonate morphologies. A preliminary surface age (Be-10) and depositional age (OSL, multi-grain K-feldspars using post-IRIR protocol) of Qs2 are 135-240 ka and 322 ± 35 ka, respectively, suggesting a period of prolonged deposition between ~140-320 ka. The age of Qs3 is not constrained but likely in the range of 330-650 ka. Mapping of these allostratigraphic units in tributary canyons to the northwest of the modern floodplain, away from axial terrace deposits, indicates that they merge into a compound deposit where the individual units are difficult to differentiate. The relative differences in tributary-terrace tread heights also decrease upstream so that they become practically indistinguishable above the compound piedmont deposit. Interestingly, a younger, intermediate-level terrace deposit, inferred to correlate to the Jaral Largo terrace in Socorro (27-29 ka surface age, Sion et al., 2020), is ubiquitously inset several meters below the top of Qs1 and Qs2 near the Rio Grande but can be correlated to the northwest to a distinctive piedmont deposit that locally overlies the surface of the compound deposit. This indicates that proximal-middle piedmont deposition has continued into the late Pleistocene >6-7 km northwest of the Rio Grande. Also, the notable upstream convergence of the three units shows that base level is strongly controlled by the Rio Grande, and for small drainages its base level fluctuations are muted >6-7 km away from the river.

References:


Keywords:

San Marcial, basin, Quaternary, landscape evolution, terraces, base level, Rio Grande rift, terrace facies, geomorphic surfaces