Middle-Late Pleistocene geomorphic features & evolution of the eastern San Marcial basin, southern Rio Grande rift, N.M.

Daniel Koning, Dave Love, Brad Sion, Kevin Hobbs, Andrew Jochems, Kristin Pearthree
An extensive geomorphic surface covers most of the basin

Surface projects to ~25-40 m above the modern Rio Grande floodplain

Post-Santa Fe Group, relatively coarse sediment below the surface informally called the “San Marcial formation.”

View to north from southern part of San Marcial basin

Chupadera Mtns

Mesa del Contadero

San Marcial fm

Palomas Fm (1-1.5 Ma)

Crawford Draw
Longitudinal profile of geomorphic surface

Mesa de Contadero (818±10.6 ka, Sion et al., 2020)
Questions

- Really a single geomorphic surface on San Marcial fm, and if so what age?
- Formed by aggradation or erosion (i.e., a pediment?)
- What conditions promoted the development of this feature? – still under investigation
- How does surface relate to Rio Grande base level changes?
Results from field mapping

- To north, the geomorphic surface is comprised of three closely spaced surfaces (1-6 m apart).
- Each surface is associated with an allostratigraphic unit; sometimes there is more than one erosional surface on a given deposit.
- Because of areas of uncertainty in correlations, these allostratigraphic units are lumped into the lithostratigraphic San Marcial fm
  
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  Qs3 → oldest
  Qs2 → middle
  Qs1 → youngest
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Qsg# → Gravelly piedmont or terrace facies
Qsa# → Axial facies near the Rio Grande
Allostratigraphy in smaller tributary drainages NW of Rio Grande

Terrace stratigraphy away from Milligan’s Gulch, Fort Craig quadrangle

Lorem ipsum

Source: Fort Craig geologic map (OF-GM-288)
Stratigraphy and age control near the Rio Grande

Be-10 surface age: 135-240 ka

OSL age (multi-grain feldspars using post IRIR protocol: 322 ± 35 ka

Probably correlates Matanza fm in Socorro basin, which has surface age of ca. 70 ka (Sion et al., 2020)

Figure from: Fort Craig geologic map (OF-GM-288)
Two youngest allostratigraphic units
Allostratigraphic units Qsg2 and Qsg3

Basalt capping Mesa del Contadero: 818.3 ± 10.6 ka

Santa Fe Group culmination surface: 82 m above floodplain

Qsg3 (37-38 m above floodplain)

Qsg2
Differentiating allostratigraphic units Qsg1 and Qsg2

Can follow tread of given terrace if adequately preserved

Soil properties are helpful but surface erosion creates internal variability

Qsg2: Stage III+ to IV carbonate morphology

* Qsg3 shares a similar soil as Qsg2 but seems a little thicker.

Qsg1: Stage II+ to III carbonate morphology
Intermediate-level unit (younger than San Marcial fm)

Terrace stratigraphy away from Milligan’s Gulch, Fort Craig quadrangle

Allostratigraphic units

- **Qsg3**: Older, San Marcial fm (early-middle part of middle Pleistocene)
- **Qsg2**: Middle, San Marcial fm (latter part of middle Pleistocene)
- **Qsg1**: Youngest, San Marcial fm (latest middle to early late Pleistocene)
- **Qit**: Intermediate-level terraces, post-San Marcial fm (latter part of late Pleistocene)
- **Qay**: Low-level terraces, Qayo (latest Pleistocene-Holocene transition)

Subdued paleochannel forms

Palomas Fm

Lorem ipsum

May correlate to Jaral Largo terrace (27-29 ka surface age; Sion et al., 2020)

Source: Fort Craig geologic map (OF-GM-288)
The intermediate unit (Qit) cross-over on the Sawmill Canyon fan
Cross-over of intermediate-level unit from terrace to piedmont
CONCLUSION

Mapping and age-control observations

San Marcial fm
1. Three main allostratigraphic deposits recognized that span the Middle to Late Pleistocene.
2. Geomorphic surfaces are closely spaced (1-6 m vertical distance).
3. Surfaces and deposits converge upstream into a compound unit (Qsp).

Intermediate geomorphic unit
1. May correlate to a Late Pleistocene unit in Socorro basin (Jaral Largo Fm, surface age of 27-29 ka) If so, then deposit is probably in range of 30-60 ka.
2. Occupies well-incised terraces near river, but upstream transitions to a piedmont-lobe unit that covers large areas of the Sawmill Canyon fan.

Interpretations
1. Although prominent erosional surfaces are present, most of extensive geomorphic surfaces are related to aggradation.
2. Upstream convergence of deposits and surfaces indicate that base level for smaller drainages is strongly controlled by fluctuating Rio Grande, and the influence of these base level changes is muted >6-7 km away from the river.
3. Three Rio Grande-driven incisional events since ~0.5-0.6 Ma, paleovalleys filled over time scales of several 10s of k.y. to possibly >100 k.y.