Preliminary stratigraphic interpretations of the Soledad Rojo formation in the lower Colorado River Extensional Corridor, western Palo Verde Mountains, southeastern California

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Abstract
This study presents preliminary geologic mapping, stratigraphy, and provenance data from the “Soledad Rojo Formation”, an informal name given by previous workers to a moderately east-dipping section of early Oligocene (?) pre-Bouse Formation red beds on the western side of the northern Palo Verde Mountains of southwestern California. This unit has been correlated to the Tolbod Fanglomerate, located <13 SW of the study area, which was likely deposited during early Miocene extensional deformation in the lower Colorado River region; however, this association is uncertain due to the lack of depositional age controls and the geographic distance between these two formations. The Soledad Rojo formation likely represents deposition in adjacent alluvial fan and braided fluvial systems in a normal fault basin that developed during regional early Miocene extension. This basin is bounded by Oligocene-age intermediate volcanic rocks of the Palo Verde Mountains to the east, and the late Oligocene tuff of Black Hills to the west. The base of the formation is generally not exposed; however, in one locality it overlies a welded tuff that is similar in appearance to the tuff of Black Hills. Our study addresses the formation into these stratigraphic units: (1) a lower alluvial unit, consisting primarily of trough cross-beded block red coarse-grained lithic arkose and granule-pebble conglomeratic sandstone, interbedded with matrix- and clast-supported, subrounded-subangular, moderately-poorly sorted cobble conglomerate with meta-plutoic and volcanic clasts; (2) a middle fluvial unit of clast-supported, reworked, rounded-subrounded, moderately-well sorted, cobble-boulder conglomerate with primarily meta-plutoic clasts, interbedded with block red lithic arkose similar to lower unit; and (3) an upper alluvial unit of light gray-granula conglomeratic lithic arkose and interbedded matrix- and clast-supported pebble-cobble conglomerate with subangular-subrounded meta-plutoic and volcanic clasts. In the northern study area, homoclinal volcanic rocks are intersected in the section. Following (and possibly during) deposition, the Soledad Rojo formation was extended and gently tilted south by NW-trending, W-dipping normal faults. In the northern part of study area, a younger ductile intrusion crosses the tilted section.

Figure 3: Preliminary stratigraphic column of the Soledad Rojo formation, described below. The legend provides a key to the various lithologic units described.

Figure 4: Geologic map of the lower Colorado River Extensional Corridor in the Midway Mountains, showing the evolution of the Soledad Rojo formation and the location of the study area. The map is oriented southwest to northeast, with the study area indicated by the outlined box.

Figure 5: Measured stratigraphic section of the Soledad Rojo formation near Tadpole Tanks (Fig. 3B). Dashed lines indicate the boundary between roughened, rounded-subrounded clast-supported cobble-boulder conglomerate and light red dacitic intrusion.

Figure 6: Photos of Soledad Rojo formation middle-orange sandstone/conglomerate unit (T1). (A) Conventional cross-bedded sandstone, dipping a channel in underlying conglomerate. Red-brown sandstone with interbedded siltstone and minor siltstone. (B) Cross-bedded sandstone with interbedded reddish-brown siltstone. (C)Granular sandstone with interbedded red-brown siltstone. (D) Cross-bedded sandstone with interbedded greenish siltstone. (E) Cross-bedded sandstone with interbedded red-brown siltstone.

Figure 7: Geologic map (A) and satellite image (B) of the Soledad Rojo basin in the western Palo Verde Mountains/Black Hills. The Soledad Rojo formation in the basin is generally moderately (<20–45°) tilted towards the east, and is affected by several NW-striking, W-dipping normal faults. The basin is bounded on the west by a poorly exposed NE-striking, NW-dipping normal fault, with the late Oligocene tuff of Black Hills to the east. The map shows the proposed correlation of the Soledad Rojo formation to the Tolbod Fanglomerate in the Midway Mountains.

Figure 8: Panoramic photograph looking NW at the western margin of the Soledad Rojo basin. The red line on the photograph represents a resistant sedimentary unit (tuff of Black Hills), which overlies white tuffaceous volcanic rocks in the low-lying area to the west. East of the central hill is the basin-boundary NE-dipping normal fault, with E-dipping and Soledad Rojo formation sedimentary rocks in the hanging wall to the east.

Figure 9: Location of the Soledad Rojo formation near Tadpole Tanks (Fig. 3B). Dashed lines indicate the boundary between roughened, rounded-subrounded clast-supported cobble-boulder conglomerate and light red dacitic intrusion. (A) The map shows the general orientation of the Soledad Rojo formation and the location of the study area. (B) The map shows the location of the Soledad Rojo formation within the Lower Colorado River Extensional Corridor, southeastern California.

Preliminary Interpretations
The Soledad Rojo formation was primarily deposited in a proximal-clast alluvial fan system that developed in a normal fault basin.

• Sediment in the alluvial fan deposits was mainly derived from the metamorphic basement and mafic-silicic volcanic rocks exposed in the areas adjacent to the basin; however, the different texture and clast compositions of the rounded conglomerate layer (Fig. 5) suggest it may have been derived from more distal sources transported into the basin by incursions of a moderate-energy fluvial system.

• Growth strata suggests synextensional deposition of the Soledad Rojo formation, with main downslope on the eastern side of basin.

• Bimodal volcanic rocks at the base of the formation and post-depositional dacitic intrusions also suggests coeval extension and magmatism (samples have been submitted for 40Ar/39Ar geochronology to constrain depositional timing).

• Future work will consist of sandstone point-counting, conglomerate clast counts, and detrital zircons from the Soledad Rojo formation to further constrain the provenance of basin sediments.

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References Cited