The Fra Cristobal range is a north-south oriented horst block situated between the San Marcial and Engle basins to the west and the Jornada del Muerto basin to the east. Towards the southern part of the range, Precambrian basement rocks (~1.5 Ga granites; Condie, 1981) are overlain by the Phanerozoic section of central New Mexico, including syn-Laramide Love Ranch basin fill (Seager et al., 1997). Within our study region at the northernmost point of the range, the Phanerozoic section has been stripped and the Precambrian basement is in contact with the Cretaceous McRae formation, resulting in 7000 ft (~2100 m) of eroded stratigraphy. Previous authors have interpreted this contact relationship as either depositional or due to normal fault offset (McCleary, 1960; Nelson, 1986). We use high-resolution (1:5000) geologic mapping to reexamine this contact relationship. Mapping efforts reveal: i) volcanic tuffs and previously unrecognized limestones, ii) a silicate geothermal system that has hydrothermally altered much of the lithology, and iii) a stratigraphic relationship that implies thick-skinned thrusting of Precambrian basement over Paleozoic(?) sedimentary rocks. Our results suggest that previous models for the development of the northern Fra Cristobal range may not capture its true structural complexity. We hypothesize that the thick-skinned thrust fault formed during the Laramide orogeny (~75 Ma; Seager et al., 1997). The volcanic tuff was emplaced after cessation of thrust faulting, followed by deposition of syn-Laramide McRae formation. Hydrothermal alteration followed McRae deposition. Regional thermochronological constraints (e.g. Gavel et al., 2021) and a close association with local mineralized fault planes suggest that hydrothermal alteration occurred during Rio Grande rift extension. Preliminary conclusions from this study include: i) evidence of thick-skinned thrust faulting ~10 km north of currently mapped north-south-striking, west-verging thrust faults associated with Laramide orogenesis (Nelson, 1986) and ii) evidence for widespread geothermal alteration of basement rocks and Phanerozoic cover, with significant implications for regional thermochronological studies. Reexamination of the ages proposed for the evolution of the study area will be necessary to better constrain the timing of the range’s evolution.

References:

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