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Insights into the Picuris orogeny from sediments in the lower crust

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The Yavapai, Mazatzal, and Grenville orogenies are well-documented collisional events responsible for the growth and assembly of Laurentia in the southwestern U.S. between 1800 and 1000 Ma; however, the period from ~1500–1300 Ma remains enigmatic, and magmatic rocks from this time have traditionally been considered anorogenic. A recently-proposed collisional event at ~1400 Ma, the Picuris Orogeny, may represent yet another significant crustal growth event, but the tectonic setting and geographic extent are uncertain. Here, we show that lower crustal metasedimentary xenoliths from the Potrillo volcanic field in southern New Mexico (from Kilbourne Hole and Potrillo maars) derive from sediments transported to the lower crust sometime between 1450 and 1350 Ma. Sillimanite inclusions in a garnet core and geochronology indicate that these sediments were not emplaced via subduction but were instead metamorphosed under warmer, shallower conditions, providing first-hand evidence for a collisional orogenic event at this time and pointing to the possible location of the Picuris' suture zone.