COMPARATIVE STRATIGRAPHY OF THE DAKOTA SANDSTONE ACROSS THE PICURIS–PECOS FAULT SYSTEM SOUTH OF LAMY, NEW MEXICO: DEFINITIVE EVIDENCE OF LARAMIDE STRIKE-SLIP

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The Picuris–Pecos fault of northern New Mexico is the largest known fault in the Rocky Mountain region with 37 km of dextral strike separation of Proterozoic lithotypes. The timing of dextral slip is disputed. The Picuris-Pecos fault system continues southward from Lamy, New Mexico, as a complex zone of faults that cuts strata of Mesozoic age and is intruded by the unfaulted, 27 Ma Galisteo dike. On the San Cristobal Ranch, ~20 km south of Lamy, a ~2 km dextral step in the fault system is characterized by numerous, steep NNE-striking faults that exhibit normal separation and form an en echelon array (A. Lisenbee, 2000, NMBMMR OF-GM-39). Many of the fault blocks in this en echelon array include outcrops of the Dakota Sandstone (Upper Cretaceous, ~95 Ma), thus affording a unique opportunity to stratigraphically evaluate Laramide strike-slip across much of the Picuris–Pecos fault system.

On the San Cristobal Ranch, eight detailed measured stratigraphic sections (separated from each other by 0.1 to 2.0 km) of the Oak Canyon and Cubero Members of the Dakota Sandstone display significant stratigraphic differences between adjacent fault blocks. Comparison to six control sections (separated from each other by 0.6 to 3.5 km) measured in unfaulted areas west of the Picuris–Pecos fault system (two sections near Lamy; four near Galisteo Dam) indicates the across-fault stratigraphic differences observed on the San Cristobal Ranch are too great to be attributed simply to lateral facies variation, but instead require strike-slip juxtaposition of dissimilar Dakota Sandstone sections. The role of strikeslip juxtaposition is indisputably displayed on two faults in the Hub Canyon area of the San Cristobal Ranch that exhibit only minor (<2 m) dip separation but divide markedly different, well-exposed Dakota Sandstone sections. We estimate the minimum dextral Laramide slip on the Picuris–Pecos fault to be several kilometers; the upper slip limit has not yet been determined.

Limited kinematic data for minor faults within blocks bounded by the en echelon fault system on the San Cristobal Ranch show mostly fault-normal (approximately E-W) extension, similar to Laramide fault-normal shortening or extension observed elsewhere on nearby segments of the Picuris-Pecos fault system (Erslev, 2001, GSA Bulletin). Reconciliation of stratigraphic evidence for significant strike-slip between fault blocks with minor-fault evidence for fault-normal deformation within fault blocks indicates that Laramide dextral-oblique deformation was partitioned into discrete strike- and dip-slip components. Slip partitioning occurs in numerous, modern zones of oblique deformation, but is best documented for the San Andreas system of California. The widespread importance of slip partitioning indicates that components of strike-slip in orogenic regions cannot be reliably assessed by minor-fault analysis.