FAULT KINEMATICS AND EXTENSION DIRECTION IN THE OBLIQUE RIO GRANDE RIFT, NORTH-CENTRAL NEW MEXICO

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Abstract

The Rio Grande rift is a late Cenozoic oblique rift that is influenced by pre-existing lithospheric weaknesses. Its extension direction is debated and raises some key questions: Was there rotation of the stretching axes, or could a fixed extension direction produce different orientations of faults? How did preexisting weak zones influence rift structures? This study aims to answer these questions based on fault slip analysis from the Rio Grande rift in north-central New Mexico, where three en echelon half grabens (San Luis, Española, and Albuquerque) preserve well-exposed border (older) and internal (younger) normal faults with negligible block rotation. Border faults are subparallel to basement structures in adjacent rift shoulders, whereas internal faults are predominantly north-south striking.

Preliminary mapping along an oblique border fault and internal faults in the southwestern San Luis basin yields a continuous west-northwest extension. Published fault slip data from southern Española and Albuquerque basins show a similar result. This is consistent with analog models in which a single-phase extension can create different orientations of border and internal faults with the presence of pre-existing weakness. However, whether this conclusion holds at regional scale is unclear. I propose to collect fault kinematic data in the San Luis and northern Española basins, including attitudes of fault planes, slickenlines, beddings and foliations, and fault throw. Then I will analyze their spatial pattern on geologic maps using rose diagrams and rake distribution histogram. This work will exemplify how to distinguish the extension direction in an oblique rift.

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