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Geologic and Geodetic Evidence of Present-Day Rapid Motion on the Baton Rouge Fault and Its Relationship to the Ongoing Evolution of the Gulf of Mexico "Passive" Margin

Mapping using LIDAR technology, geodetic leveling, and field work provides new constraints on the geometry, kinematics, and geodynamics of the Baton Rouge fault (BRF). LIDAR topographic mapping shows that BRF can be traced from the Mississippi River floodplain to the Pearl River near the Louisiana-Mississippi border. Re-leveling of vertical control monuments straddling the BRF was conducted in spring 2002 and compared with 1994 results. Three leveling lines were measured east of the Mississippi River and showed that the south side of the fault has moved ~32-40 mm down relative to the north side. An additional leveling transect conducted just west of the river showed similar results and indicates that the fault traverses the levee system of the Mississippi River. These data demonstrate that the fault is currently active and has moved vertically at a rate of 4-5mm/year during the interval 1994-2002. Field examination revealed no appreciable lateral displacement of Holocene landforms, indicating that slip on the BRF has been fundamentally normal (down dip) and south directed. Because the south trending slip vector is inclined ~70º, measured vertical displacements imply 34-43 mm of slip measured in the plane of the fault and 12-15 mm of lateral extension oriented perpendicular to the strike of the fault. Finally, motion detected along the westernmost traverse implies that the fault cuts the Mississippi River thus posing a threat to the flood control levees in downtown Baton Rouge.

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