Structure Controlled Seismicity on the Mid-to-South Segment of the Red River Fault, China, Revealed by High-resolution Seismic Imaging

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Abstract

The Red River Fault on the southeast Tibet is a highly active fault with intense seismicity. However, a seismic gap was observed in the middle section with a seismically active zone to the southeast. We conducted seismic imaging of these two segments using dense seismic arrays, and found pronounced structural differences with high Vp, Vs, and Vp/Vs structures beneath the seismic gap and widespread low Vp, Vs, and high Vp/Vs anomalies under the active zone. The mafic rocks belonging to the Emeishan Large Igneous Province with high velocity and Vp/Vs ratios in the seismic gap are likely to serve as large asperities that are responsible for the long earthquake recurrence interval. In contrast, fluids and/or melts invading the seismogenic layers may expedite the evolution process and thus trigger freguent seismic events beneath the active zone. We speculate future strong earthquakes are prone to occur in the seismic gap which is presently locked, attracting sufficient attention for seismic hazard mitigation.