

## Three-dimensional electrical structure beneath the epicentre zone of the 1931 M8.0 Fuyun earthquake and its tectonic implication

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### SUMMARY

The Fuyun fault zone is located on the south side of Altay Mountain in northeastern Xinjiang, China. It is a right-lateral strike-slip fault with an approximate NNW direction and an important active fault zone within the Central Asian continent. The scale of the Fuyun fault is small, but strong earthquakes occur frequently. The 1931 M8 Fuyun earthquake happened in this fault zone. The Fuyun Fault is characterized by its small scale, low slip rate, distinct segmentation, and recurrent large earthquakes at the same location. It is an excellent area for studying fault segmentation deformation, low-speed large earthquakes, and characteristic earthquakes. Current research on the Fuyun fault zone primarily focuses on surface geology, providing fundamental parameters for the geometry and kinematics of the Fuyun fault. To clarify the seismogenic structure of the M8 Fuyun earthquake and the seismogenic mechanisms of the Fuyun Fault Zone, we have conducted a three-dimensional magnetotelluric array survey in the Fuyun Fault Zone area. Using the 3D magnetotelluric inversion and visualization software client toPeak, we obtained the study area's reliable three-dimensional electrical structure model by applying a nonlinear conjugate gradient 3D inversion algorithm (ModEM), including topography.

The model shows significant differences in the electrical structures of the northern, middle, and southern segments of the Fuyun fault. The resistivity values are lower in the north and southern segments and higher in the middle segments. Both the M8 and M7.3 earthquakes occurred in the central segment of the Fuyun Fault, possibly due to the higher strength of the medium in this area, which allows for the accumulation of greater stress, making it more prone to large earthquakes under strong fault activity. The Fuyun Fault Zone is a prominent electrical boundary at mid-to-lower crustal depths, indicating a deep fault with significant cutting depth. In the southern part of the Fuyun Fault Zone, a large, high-resistivity anomaly has prevented the surface rupture of the M8 Fuyun earthquake from extending southward. The southwestern side of the Fuyun Fault Zone contains a relatively intact, high-strength, high-resistivity medium less prone to deformation. In contrast, the northeastern side has a significant low-resistivity weak material anomaly, which is lower in strength and more prone to deformation. Under the action of the NNE-SSW directional regional stress field, the block on the northeast side of the fault is more likely to move. Integrating other geological and geophysical results, we believe that the current tectonic deformation in the Fuyun area is primarily driven by the northern Mongolia-Siberia plate, with the impact from the relatively minor southern India-Eurasia plate collision.

**Keywords:** M8 Fuyun earthquake; Fuyun fault zone; Magnetotelluric; Electrical structure; Three-dimensional inversion

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