

Implication of resistivity structure for the formation of rifts in southern Tibet

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SUMMARY

Since the Miocene, the Tibetan Plateau has experienced the development of north-south rifts, suggesting a shift from north-south compression to east-west extension, possibly signaling the plateau's transition to a collapse phase. However, the rifts' extension direction deviates from the traditional collapse model, prompting various hypotheses on their formation. Recent Vs model studies reveal significant variations in low-velocity anomalies beneath different rifts, suggesting the rifts may not indicate a plateau collapse but are instead a product of north-south compression and deep crustal dynamic processes.

To better understand the rifts' formation through electrical conductivity, we inverted magnetotelluric (MT) data to determine the resistivity structure in southern Tibet. Prior studies, including shear wave splitting (SWS) and isotropic resistivity inversion, have identified anisotropy. Our 2D anisotropic inversion revealed two sets of orthogonal anisotropy. The Lhasa block's southern part shows north-south anisotropy, contrasting with the east-west anisotropy associated with the Indian plate's subduction. These features likely arise from complex regional stress environments. The Indian plate's subduction and eclogitization may induce lithospheric mantle bending and fracturing. Meanwhile, the Lhasa block, influenced by north-south stress, forms east-west extension, leading to north-south rift structures. Partial melting in the lower crust of the Lhasa block may fill microcracks from east-west extension, creating north-south anisotropy and contributing to the region's unique orthogonal anisotropic structure.

Keywords: Formation of rifts, resistivity structure, electrical anisotropy, MT method, southern Tibet

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