

EGU22-11306

<https://doi.org/10.5194/egusphere-egu22-11306>

EGU General Assembly 2022

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## **Southern Tibetan rifting controlled by basal shear and heterogeneities of the underthrusting Indian lithosphere**

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The dominant driving forces for the east-west extension of the Tibetan Plateau since the mid-late Miocene remain vigorously debated. Proposed hypotheses encounter difficulties in reconciling the geological observations of more developed north-trending rifts in southern Tibet as well as the discrepant extension magnitudes among them. With seismic recordings collected from our recently deployed and existing seismic arrays, we locate a mid-crustal simple shear zone characterized by convergence parallel anisotropy beneath the southern plateau, which is likely caused by the underthrusting of the Indian Plate. Furthermore, a zone of reduced S-wave velocity is also resolved between the two rifts with highest extension rate, indicative of the convective removal of the lower Indian mantle lithosphere. Taken together, our results suggest that the enhanced extension occurring in southern Tibet are controlled by both the shear tractions induced by the advancing Indian Plate and the increased buoyancy due to asthenospheric upwelling.