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Lateral variations of crustal thickness and eclogitization beneath the south-central part of the Tibetan Plateau from seismological constraints and gravity anomalies

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We investigate the lateral variations of the crustal structures at the southern border of the Tibetan Plateau along three geometrically well constrained profiles from seismological experiments. We gather estimates of the Moho depth obtained by receiver functions and seismic reflexion from the Hi-CLIMB, HIMNT and INDEPTH experiment lines, at longitudes 85°E, 86.5°E and 89°E, respectively. We also compile a Bouguer anomaly dataset from several sources to obtain a good spatial coverage. Then we perform forward gravity modelling using a multi-layer density-model including the mantle, the upper and lower crust as well as the sediments of the foreland basin.
Comparison of the calculated profiles and datasets suggests lateral variations including both the Moho depth beneath Tibet and the steepness of the India Plate at the southern margin of the Plateau. Detailed modelling of the gravity anomaly signature of the Indian lower crust reveals that it is impossible to achieve isostasy without the presence of eclogites beneath the Tibetan Plateau. Based on thermal structure, petrogenetical grids and gravity anomaly modelling, we find that the zone of transition towards complete eclogitisation roughly matches the descending part of the lower crust. The spatial difference in the position of the transition zone, combined with the velocity of underplating, allows us to estimate the kinetics needed for the eclogitisation process.