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# Moho beneath Tibet based on a joint analysis of gravity and seismic data

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The Tibetan Plateau, known as the roof of the Earth, is considered as the “Golden Key” for understanding plate tectonics, continental collisions and continental orogenic formation. A reliable Moho structure is also vital for understanding the deformation mechanism of the Tibetan Plateau.

In this study, we use improved Parker−Oldenburg’s formulas that include a reference depth into the exponential term and employ a Gauss-FFT method to determine Moho depths beneath the Tibetan Plateau. The synthetic models demonstrate that the improved Parker’s formula has higher accuracy with the maximum absolute error less than 0.25 mGal.

Two inversion parameters, namely the reference depth and the density contrast are essential for the Moho estimation based on the gravity field, and they need to be determined in advance to obtain correct results. Therefore, the Moho estimates derived from existing seismic studies (Stolk et al., 2013) are used to reduce the non-uniqueness of the gravity inversion and to determine these parameters by searching for the maximum correlation between the gravity-inverted and seismic-derived Moho depths.

Another critical issue is to remove beforehand the gravity effects of other factors, which affect the observed gravity field. In addition to the topography, the gravity effects of the sedimentary layer and crystalline crust are removed based on existing crustal models, while the upper mantle impact is determined based on the seismic tomography model.

The inversion results show that the Moho structure under the Tibetan plateau is very complex with the depths varying from about 30 ~ 40 km in the surrounding basins (e.g., the Ganges basin, the Sichuan basin, and the Tarim basin) to 60 ~ 80 km within the plateau. This considerable difference up to 40 km on the Moho depth reveals the substantial uplift and thickening of the crust in the Tibetan Plateau.

Furthermore, two visible “Moho depression belts” are observed within the plateau with the maximum Moho deepening along the Indus-Tsangpo Suture and along the northern margin of Tibet bounding the Tarim basin with the relatively shallow Moho in central Tibet between them.

The southern “belt” is likely formed in compressional environment, where the Indian plate underthrusts northwards beneath the Tibetan Plateau, while the northern one could be formed by the southward underthrust of the Asian lithosphere beneath Tibet.

Stolk, W., Kaban, M., Beekman, F., Tesauro, M., Mooney, W. D., & Cloetingh, S. (2013). High resolution regional crustal models from irregularly distributed data: Application to Asia and adjacent areas. Tectonophysics, 602, 55-68. https://doi.org/10.1016/j.tecto.2013.01.022