Crustal model of central Mongolia from receiver functions and gravity modeling

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Résumé

3D forward gravity modeling combined with receiver function analysis characterize the crustal structures of the southern part of the Mongolian collage. The seismic signals of the 48 stations of the MOBAL2003 and the IRIS-PASSCAL experiments were analyzed to get the receiver functions. The resulting crustal thickness variation is first compared with the topography of the Moho determined by the 3D forward modeling of the GOCE gravity gradients. The receiver function analysis revealed a significant difference between the crustal structures of the Hangay dome and the tectonic zones in the south. In addition, seismic stations south of the Hangay dome display significant signals related to the occurrence of a low velocity zone (LVZ) at lower crustal level confirmed by the gravity anomalies. Finally, these seismic analysis inputs such as crustal thickness, strike and dips of the seismic interfaces as well as the boundaries and the lithologies of the different tectonic zones constitute the starting points from the 3D forward gravity modeling. The resulting crustal density model, constrained in particular by density values from rock samples collected in the different tectonic zones, indicates: (1) the likely absence of a Precambrian basement block beneath the Hangay dome, (2) an alternation of two low density zones with high density zones in the Baydrag microcontinent interpreted as fragments of early Tonian plutons, (3) the occurrence of a low density zone at the lower crustal level beneath the Mongol-Altai Accretionary Wedge and the Trans-Altai Zone. Therefore, the combination of the seismic receiver function with gravity analysis and modeling reveals new crustal structures of the Mongolian collage and enhances the occurrence and the extent of a low velocity and a low density zone (LVLDZ) at lower crustal level. These LVLDZ may demonstrate the existence of the relamination of a hydrous material in southern Mongolian collage.

Mots-Clés: Receiver functions, gravity, 3D modeling, crustal structures, Precambrian blocks, relamination, central Mongolia

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