Electromagnetic studies of Banggong-Nujiang suture architecture from INDEPTH magnetotelluric profiles and magnetovariational data

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During the years 1995 and 1999, broadband (BBMT) and long period (LMT) magnetotelluric data were collected and interpreted for two profiles crossing the Banggong-Nujiang Suture, as a part of InterNational DEep Profiling of Tibet and the Himalaya project (INDEPTH). These profiles cross the Banggong-Nujiang suture, which separate Qiangtang and Lhasa terranes, along approximately longitudes of 89°E (longer 500 line) and 92°E (shorter 400 line). These data have been combined with available magnetovariational data from permanent geomagnetic observatories situated within or close to investigated area.

Strike and dimensionality analyses show predominantly two-dimensionality of the regional geoelectrical structures with approximately an east-west direction. Both magnetotelluric TE and TM modes with the vertical field geomagnetic transfer functions (GTF) have been derived for the defined regional azimuth angle. The local geomagnetic depth soundings (GDS) responses and responses from generalized horizontal spatial gradient (gHSG) method for mid-latitude INDEPTH region have been derived.

These input data have been inverted separately and simultaneously with different 2D inversion algorithms to obtain several two-dimensional geoelectrical models depending on the inversion parameters selected. The preferred model of the 500 profile confirms the previous observations of Wei et al. (2001) and Solon et al. (2005) that the region is characterized by resistive upper crust and conductive middle to lower crust that extends from the Lhasa terrain to the Qiangtang terrain with varying depth. The conductive layer is relatively uniform along whole profile except for two breaks in the region of the Banggong-Nujiang suture and 50 km south of it. Absence of high conductive crustal layers in these short parts of the 500 line profile and combination of long period MT and magnetovariational responses allows us to obtain information about deeper structures and reveals the existence of a high conductive layer localized at a depth of 100 km and deeper.

The same conductive structure setting is also present on the shorter 400 line. Other models show focused information about the Banggong-Nujiang suture and its changes in geoelectrical structure between the longitudes of 89°E and 92°E. The eastern profile (400 line) exhibits a shallower crustal conductive layer and a sharp horizontal jump in conductivity just below the surface trace of the Banggong-Nujiang suture in comparison with western 500 line. These along-strike differences represent varying conditions, such as temperature, partial melt content and connectivity, and fluid content and connectivity, and/or varying rock types.

References

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