JOINT 2D MT/MV INVERSION IN HIGH MOUNTAINES: IMITATION STUDIES

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The geoelectric studies of high mountains are usually carried out in the profile mode. Even in the case of elongated orogens, where the validity of 2D approach is expected, the profile inversion of MT/MV sounding data meets serious difficulties: topography effects, other 3D near surface features, superposed responses of deeper anomalies. Modern 2D inversion techniques with adaptive parameterization of multi-stage inhomogeneities; various stabilizing tools and instruments to down weight 3D effects struggle with these obstacles. Nevertheless, it is advisable to investigate imitation model of specific profile experiment to tune inversion procedures and improve its resolution.

This imitation approach is implemented to enhance the multi-component MT/MV inversion at the NARYN transect crossing the Tien Shan at 76°E. The analysis was done in the frames of robust 2D inversion algorithm [Varentsov, 2002, 2007] taking into account the real structure of the ensemble of ~100 MT/MV soundings in the period range of 0.1-16000 s carried out by the Research Station RAS (Bishkek).

Initially, true 2D imitation data were analyzed in a simplified model focused on topography effects. Then 2D model with more details from the real data interpretation was considered. Finally, 3D imitation data were inverted taking into account 3D topography and near surface effects as well as variations in strike direction of crustal 2D structures. The following aspects of 2D inversion procedure were examined: the topography approximation accuracy; the structure, density and component composition of the inverted data ensemble; the structure of the starting model; the parameters, controlling the inversion stability. The convergence of inversion solutions towards “true” models was traced both in the data space and in the space of model parameters. The criteria to select quasi-optimal model iterations in the inversion course are discussed.

With the use of 3D imitated data the strictness of near surface effects was estimated for different data components and period ranges and the procedure to reduce 3D distortions by the extension of error bars in 2D inverted data proportionally to skew estimates and strike deviations of transfer operators was examined.

The presented results are useful for NARYN transect data interpretation and for planning of other experiments in high mountain regions.

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