

MAGNETOTELLURIC MONITORING EXPERIMENT AT THE NORTHERN TIEN SHAN SEISMOGENIC ZONE

ANATOLY RYBIN, Vladislav BATALEV, Elena BATALEVA, Vitaly MATUKOV

Research Station of Russian Academy of Sciences in Bishkek-city, Bishkek, Kyrgyzstan
e-mail: rybin@gdirc.ru

High-density array MT soundings of the crust in the seismically active northern Tien Shan were performed using Phoenix MTU-5 stations in the Bishkek Geodynamic Polygon, at the junction of the Chu basin and the Kyrgyz Range. The MT transfer functions were determined to an accuracy of 1–2% (amplitude) and about 0.5–0.8 deg (phase) in most of 145 soundings. Preliminary analysis of the collected data aimed at estimating the geoelectrical dimensionality. The Bahr decomposition analysis indicated the presence of local 3D structures in the crust of the area superposed on the regional 2D structure.

As a result of 2D inversion of amplitude and phase data with Randy Mackie codes, the geoelectric cross-sections along MT profiles have been constructed. Inversion models image upper-mid crustal zone of enhanced conductivity of the Issyk-Ata fault. Resistivity of this conductive zone is not exceeding 100 ohm-m. The conductor is connected to the surface structure and its upper part coincides with the line of Issyk-Ata fault on the surface. The low resistivity zone in the southern part of the investigated area is gently plunged into the southern direction beneath the rise of the Kyrgyz Range. Apparently, this zone represents large crust's zone of tectonic decollement and weakening with high fluid-gas environment permeability with properties of the waveguide.

Next actual implication reveals from comparison of local seismicity spatial distribution and resistivity structure. One can clearly see the high seismicity clustering around the edge of conductive zones, thus we suggest that the local seismicity results either from the migration of the fluids to less permeable crust or from local stress concentration near the structural boundaries. So, presented results of high resolution magnetotelluric survey show that geoelectric imaging of fault zones deliver us the unique information of deep structure features and sometimes it can give us new unexpected tectonic explanations for studied objects.

In addition to these structural EM investigations in 2003 Research Station RAS (Bishkek, Kyrgyzstan) and Phoenix Geophysics (Toronto, Canada) jointly installed two permanent stations at the seismogenic zone near Bishkek for monitoring natural and artificial electromagnetic fields, using Phoenix magnetotelluric equipment MTU-5D. MT parameters computed daily for the whole period of these observations are presented.

Wavelet analysis was executed for the time series of daily average values of apparent resistivity (modules and phases) for two stationary stations of MT measurements since autumn of 2003. The time intervals till a few months duration with abnormal behaviour of apparent resistivity variations in the period sounding range $T=5-100s$ are marked, but for all that the maximum of change makes only the first percents. Such long-term change of resistivity has correlation with seismic activity in the region and, probably, can reflect the activation period of the structures in the mid-low crust at the Northern Tien Shan.

The work was supported by RBRF grant 07-05-00594a.

magnetotelluric soundings, active crustal zone, Tien Shan

Anatoly Rybin, Research Station of Russian Academy of Sciences in Bishkek-city, 720049, Kyrgyzstan, Bishkek-49, RS RAS, tel: 996-312-613140, fax: 996-312-611459,
e-mail: rybin@gdirc.ru