Advances in deep geoelectric modeling for SE Baltic shield with integrated geophysical and geological interpretation

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The Baltic (Fennoscandian) Shield is characterized by strongly inhomogeneous deep conductivity structure, with abundant crustal conductors which can serve as bright markers of the Precambrian crustal architecture. The results of last decade magnetotelluric experiments in the central part of the Shield have successfully underwent cross-verification with available CCP seismic materials and helped to fill up seismic structural patterns by material properties. While in the absence of high resolution seismic data in SE Fennoscandia, the progress in crustal structure imaging was achieved mostly due to the magnetotellurics.

The geoelectric modeling for the area of Lake Ladoga conductivity anomaly - LLA, one of the strongest anomalies in East European Craton (EEC), studied already more then 3 decades - has proceeded to a new stage after recent magnetotelluric measurement campaigns. They have been started 5 years ago from synchronous MT/MV soundings at Vydorg-Suojarvi profile along the Northwestern bank of the lake, in strike to the main anomaly. The limitations of earlier MT data analyses have been generally overcome due to increased resolution of new LLA resistivity cross-section enable thoughtful geological interpretation. The latter has demonstrated that the anomaly is caused not by a single source, but is due to several objects of different geological and structural identity, most probably connected with graphite in highly metamorphosed granulites of South Finland Granulite-Shist Belt and graphitized sedimentary and volcanic rocks of lower metamorphic stages in Raahe-Ladoga pericratonic zone.

The paper presents recent advances in LLA area geophysical studies, including:

1). current results of 3D MT/MV inversion for Vyborg-Suojarvy profile data with incorporation of limited tipper array over adjacent Finnish territory into inverted data set, which have generally verified former 2D results and helped to recognise some 3D features of conductivity distribution out of profile;

2). 2D inversion of the MT/MV data set at the segment of 1-EU transect in SE Lake Ladoga area, completed to the North-East by new long-period measurements of 2016 year, to follow Eastern continuation of LLA conductors under the sedimentary cover of EEC;

3). correlation analyses of LLA forming material and structural crustal complexes with those causing anomalies in the potential fields: from classification of fields’ spatial patterns over SE Fennoscandian and LLA regions to multi-component cluster analyses in the profile cross-sections with following interpretation of revealed significant clusters in petrologic terms on the base of the information on the physical properties of the rocks in the region;

4). demonstration of very low believability level for fluid LLA nature hypotheses (which is still discussed by some fraction of MT research community) on the base of integral conductivity estimates for crustal geoelectric models developed.

**Keywords:** crustal electrical conductivity, Eastern Fennoscandian shield, Lake Ladoga conductivity anomaly, integrated geophysical and tectonic interpretation

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