GEOELECTRIC STRUCTURE OF THE TESZ: PROGRESS REPORT OF THE EMTESZ-POMERANIA PROJECT

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The EMTESZ-Pomerania project is a large-scale international EM sounding array experiment started in 2001 in NW Poland and NE Germany with a main goal to study the lithospheric conductivity structure of the Trans-European Suture Zone (TESZ). This zone is the first-order tectonic boundary in Europe, constituting a complex transition between European Paleozoic Platform and Precambrian Craton. The 2001-8 field campaigns resulted in a collection of more than 200 sounding sites at 6 profiles, crossing the TESZ. These observations are synchronous in large groups and connected by repeated field bases and closest geomagnetic observatories (HLP, NGK, BEL). The extended set of transfer functions (TF), including impedances, tippers and horizontal magnetic inter-station responses have been estimated reliably at almost all sites in a period range of 10-20000 s (from 0.003 s at about half of sites with AMT observations) using several modern robust data processing codes. Remote reference (RR) and extended multi-RR data processing techniques provided sufficient suppression of strong DC-train distortions and other industrial EM noise.

Sophisticated strike and dimensionality analysis indicates a preferable crustal geoelectrical strike of ~N60°W in the Polish Basin and almost western within the German TESZ segment. The influence of 3D structures is generally not strong for impedances and horizontal magnetic responses, but is rather serious for tippers at the Palaeozoic Platform. These common strikes were taken into account when selecting data sets for 2D inversion. Three different inversion approaches were used for multi-component profile data interpretation. Despite of differences in the resulting models, caused by different techniques, many common model features has been identified. These features were further investigated with quasi-3D inversion of magnetovariational data.

The strong geoelectric segmentation of the TESZ is outlined. The Cainozoic-Mesozoic sedimentary cover contains at depths up to 3-4 km saline, conductive fluids, raising its conductance to and above 1000 S. The edge of the Craton is outlined with the tipper data trough the Baltic Sea to SE Sweden. The crustal subhorizontal conductivity anomaly in the central part of the TESZ at the depth of 8-25 km is reliably resolved. It is separated from sedimentary conductors by well resistive Zechstein and Pre-Zechstein formations. The major crustal conductor, most clearly traced with the horizontal inter-station magnetic responses, changes its strike in NW Poland and continues westwards along the Baltic Sea coast. The northern edge of this conductor is well correlated on the land with the Caledonian deformation front and gives a reasonable extrapolation of this important geological line into the Baltic Sea. This structure continues till the front of Variscan orogeny and seems to be related with the Silurian-Cambrian meta-sediments. Its high conductivity may be caused by electronic conductors (graphite, alum shale) within Caledonian formations initially rich in coal facies and probably enhanced by crustal brines around deep fault systems. The upper mantle at the depth of 100-200 km at the younger Palaeozoic Platform is at least 10 times more conducting than at the Precambrian Craton.

The next phase of the EMTESZ-Pomerania experiment is to be focused on the TESZ study in the western part of the Baltic Sea with a new network of coast, island and marine soundings.

TESZ, simultaneous EM soundings, lithospheric conductivity anomalies

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