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3-D MT modelling and HMT analysis for the north-west part of Poland

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The area covered by magnetotelluric survey is a part of the Trans-European Suture Zone (TESZ). The TESZ is the largest tectonic boundary in Europe, extending from the British Isles through Poland to the Black Sea. Several two-dimensional (2-D) models of the electrical resistivity distribution have already been constructed for this area but it turned out that the region had a complicated, three-dimensional structure. Thus a three-dimensional (3-D) inversion model appears to be relevant and interesting to investigate. In cooperation with the Berlin Magnetotelluric Work Group several additional long-period magnetotelluric (LMT) sites were assembled in 2012 and 2013. The mesh was located in the north-west part of Poland (Pomerania region). As a result we obtained 17 new sites over the surface area of approximately of 100 km $\times$ 50 km, in addition to 9 stations set up earlier.
The collected data were converted to a uniform format and the initial processing was executed. By using the latest software the transfer functions (impedances) and the ellipses of the phase tensor for the sites of our mesh have been calculated. The apparent resistivities and phase responses as functions of period are calculated from the impedance components.
The computer program ModEM (Egbert G.D., Kelbert A., 2012), which is used for this work, is a parallel 3-D inversion program for magnetotelluric data. The inversion code employs MPI and, besides impedances, includes tippers and magnetic tensor.
The main result of this work is a 3-D model with a good RMS fit of $\sim$2.2 which we could compare with previous outcomes. In this model two prominent, NW-SE striking conductive lineaments located in the mid-crustal levels are noticed. These structures we relate tentatively to the Variscan and Caledonian deformation fronts. Also the analysis of the invariants of the Horizontal Magnetic Tensor (HMT) obtained from previous results (Jozwiak, 2012) allowed us to examine the TESZ in more detail.