COMPARISON OF TECHNIQUES TO EXTRACT GEOMAGNETIC FIELD COMPONENTS FROM ARRAY OF INDUCTION ARROWS USING SPLINES AND HILBERT TRANSFORMS

WALDEMAR JOZWIAK 1, Svetlana Kovacikova 2, Krzysztof Nowozynski 1, Ivan Varentsov 3

1. Institute of Geophysics, Polish Academy of Sciences, Warsaw, Poland,
   email: jozwiak@igf.edu.pl
2. Institute of Geophysics, Academy of Sciences of the Czech Republic, Prague, Czech Republic,
   email: svk@ig.cas.cz
3. GEMRC, Institute of Physics of the Earth Russian Academy of Sciences, Troitsk, Russia,
   email: igemi@mail.transit.ru

Magnetovariational (MV) sounding results are commonly presented in the form of induction arrows (tippers). However, many examples show that horizontal magnetic inter-station (perturbation) responses look more informative and effective, especially in the tracing of elongated crustal and upper mantle conducting structures. These responses may extend capabilities of joint MT/MV inversion and their invariants can directly map conductivity anomalies. The only drawback is the requirement of simultaneous observations, thus conventional tipper data sets may be estimated from single station records and spatially denser. To this extent it is desirable to develop techniques capable to restore magnetic field components from tipper data arrays. These techniques exploit the potential representation of magnetic field in non-conducting atmosphere and conventionally apply spline approximation and Hilbert transform routines. In 2D this approach leads to direct integral equation solution (Vanyan, Varentsov, Sokolova), while in 3D it applies iterative schemes (Banks et al., Ritter)

In this paper we describe two new implementations of such 3D iterative procedure (Kovacikova; Nowozynski, Jozwiak). Details of data interpolation and boundary conditions as well as iterative techniques are discussed. New procedures are used to calculate horizontal MV responses for tipper data sets of the EMTESZ-Pomerania sounding array. Also 2D calculations of this kind are performed along central profiles of this array. These calculations are compared with direct estimates of horizontal MV responses available at many sites of this array.

The obtained results show that it is possible to reconstruct quite accurately horizontal MV responses from sufficiently dense tipper arrays. However, special attention is to be paid to peripheral tipper anomalies caused by geoelectric structures located outside of the recalculation grid. Also obvious is the need for the robust smoothing of tipper responses.

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Waldemar Jozwiak, Institute of Geophysics, Polish Academy of Sciences, Ksiecia Janusza 64,
02-953 Warsaw, Poland, email: jozwiak@igf.edu.pl