Discussion on: Conductivity-depth transform of GEOTEM data

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I was brought to my attention that the publication on the conductivity-depth transform of GEOTEM data by Wolfram and Karlik (1995) included a rather sparse literature review. I acknowledge that there are some related publications that should have been mentioned although a comprehensive literature review was never intended. The following addendum throws light on the history of the technique and includes references to similar developments.

The deconvolution is based on an expansion of the response into exponential basis functions. The idea of this expansion has been used for rapid Fourier transformation of electromagnetic (EM) data (Lamontagne, 1975; Holladay, 1981). I am not aware of any publications on the use of this idea for a parametric deconvolution of EM data such as detailed in Wolfram and Karlik (1995) with the exception of my co-author's Ph.D. thesis (Karlik, 1995).

There is no unique closed expression for the conductivity of a halfspace in terms of the data (voltage) measured in transient EM techniques. This preempts a simple transforamtion of multichannel TEM data into pseudo sections of apparent conductivity. The roots of some approaches to a fast conductivity depth imaging technique lie in various estimations of apparent conductivity and skin depth or 'depth to equivalent current filaments' (Lee, 1977; Kameneckij and Porstendorfer, 1983; Raiche and Gallagher, 1985; Spies and Eggers, 1986; Fullagar, 1989).

The method reported in Wolfram and Karlik (1995) uses the idea of conductivity depth imaging via fitting the static magnetic field of a receding image dipole to field data. This idea appeared first in unpublished notes by Lamontagne Geophysics and was subsequently elaborated in several publications (Polzer, 1986; Macnae and Lamontagne, 1987; Eaton and Hohmann, 1989; Macnae et al, 1991; Smith et al, 1994). Street and Roberts (1995) show a conductivity depth section for airborne EM data that may have been generated by a similar algorithm.

Liu and Asten (1993) avoid the deconvolution of airborne EM data by fitting the amplitudes measured at two adjacent channels directly to the thin sheet solution for the given transmitter waveform. The result is a conductance depth section which can be differentiated into a conductivity depth section.


REFERENCES


Holladay, J.S., 1981. YVESFT and CHANNEL: a subroutine package for stable transformation of sparse frequency domain electromagnetic data to the time domain: Research in Applied Geophysics 17, Univ. of Toronto.


