THE SEGMENTED RECEIVER SETUP FOR TDEM

NICKLAS SKOVGAARD NYBOE, Kurt Ingvard Sørensen

Department of Earth Sciences, Aarhus University, Aarhus, Denmark,
e-mail: nicklas.nyboe@geo.au.dk

Experimentation during the development of TDEM instrumentation at Aarhus University has shown that thorough electrical shielding of the z-component receiver coil placed on the ground is of major importance due to capacitive noise related to natural electrical fields occurring at the air-earth interface. Of equal importance is maintaining a large bandwidth of the receiver to achieve unbiased measurements of early time gates, while keeping dimensions manageable for routine fieldwork. Consequently, the commonly employed receiver coil in Denmark is a rigid, multi-turn 0.5x0.5m^2 air coil shielded with a cover of semi-conducting material.
Our recent studies have demonstrated that instrument noise constitutes a considerable component of the effective noise affecting measurements. This is despite the fact that state-of-the-art low noise amplifiers and instrument design are applied. A solution is therefore to increase the effective area of the receiver coil to enhance the signal/noise ratio. Unfortunately this will inevitably reduce the bandwidth of the coil if it is to remain rigid and manageable for routine field work.
We therefore suggest a new strategy for TDEM measurements, which involve the application of a segmented receiver coil setup. One receiver coil is optimized for measuring the early time gates which is related to high frequency signals, and is placed in the central loop position. Another flexible receiver coil with larger area is optimized for measuring the late time gates, related to low frequency signals, and is placed in an offset position to avoid bias signals from leakage currents in the transmitter coil. Though still in development, the introduction of a second z-component receiver coil has shown significant increases in signal/noise ratio at late times, while early time information is maintained.
We present a case study in which the segmented receiver setup is tested in an area where seismic data have already been measured. The integrated interpretation of the seismic and TDEM data sets yields valuable lithological and structural information at depths that cannot be resolved by conventional TDEM measurements.

TDEM, Instrument development

Nicklas Skovgaard Nyboe, Aarhus University, Høegh-Guldbergs Gade 2, tel. 61381682, 8000 Aarhus C, Denmark, e-mail: nicklas.nyboe@geo.au.dk