Cable arrangement to reduce EM coupling effects in spectral induced polarization studies

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Spectral induced polarization (SIP) is widely used for environmental and engineering geophysical prospecting and hydrogeophysics, but one major limitation concerns the EM coupling effect (Wynn and Zonge 1977; Wynn 1979). The phase angles related to EM coupling may increase even at frequencies as low as 1 Hz, depending on the ground resistivity, the array type and geometry.

To reduce EM coupling effects, one solution is to take into account the cable geometry and configuration. This has been done with the software CR1DMOD (Ingeman-Nielsen and Baumgartner 2006) – see Fig. 1. In a previous study we showed how to reduce, with the use of an appropriate cable arrangement, EM coupling effects both for modelling and for experimental data (Schmutz et al. 2014). In this presentation we try to explain why the software CR1DINV does not correct all the EM coupling effects: soil inhomogeneity, approximation in numerical resolution, non 1D medium, optic fibre (not taken into the modelling software account), cables modelled as for points.

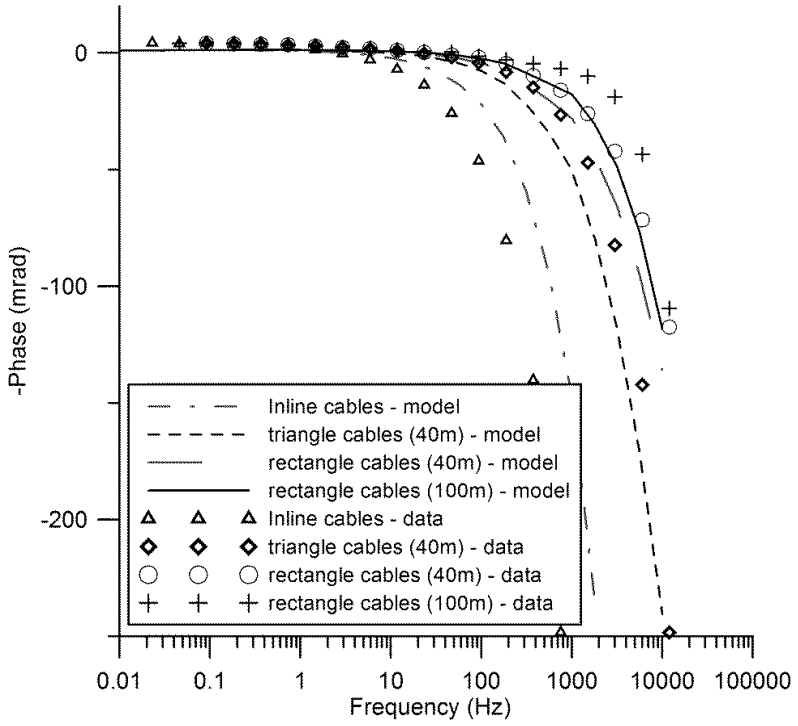

Fig. 1: Modelled and measured SIP phase spectra for Schlumberger array. Distance between the injection electrodes AB = 30 m and between the measurement electrodes MN = 4 m. The error bars are smaller than the symbol size. The solid lines are the spectra calculated by Cr1Dmod.

References

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