Geoelectric arrays

According to Nageswara Rao and Gupta[1], the depth of exploration of their VPDc coil–coil system is larger than that of a conventional VCc system. Their statement is not really justified. To determine the depth of investigation it would be inevitable at first to modify the VPDc parameter (in order to be able to compare various arrays), then to carry out a detailed noise investigation (including also non-instrumental noises) or/and field test measurements with the given array. Experiences from similar geoelectric arrays suggest that some arrays, in theory, have an extremely large depth of investigation, but in practice, might be completely useless due to their high noise sensitivity.

From systematic geoelectric null array studies (arrays where the primary field is zero), it is known that the depth of investigation of the some parallel dipole arrays (which correspond to the coplanar parallel configuration by the authors[1]) depends strongly on the characteristic angle θ, and it may be much larger than the depth of investigation of other arrays[2] (Figure 1). Szalai *et al.*[3] also found that any increase in the depth of investigation is accompanied with flattening of the depth of investigation characteristic (DIC) function. The DIC function (even its maximum) may fall below the noise level (see Figure 2). In such cases a large depth of investigation is completely useless, since the array is not able to detect deep bodies. This risk may exist also in the case of recommended arrays. Therefore, it is inevitable to carry out noise studies with the two arrays discussed by the authors[1]. In order to be able to compare the results of noise investigation, the VPDc parameter should be defined in the same way as VCc. If, for practical reasons, $H^{\perp}$ is determined in the field, we recommend to multiply the modified VCc value with the theoretical value of $H^{\perp}/H_P$. In this way, the authors[1] would have the same formula in case of both configurations.

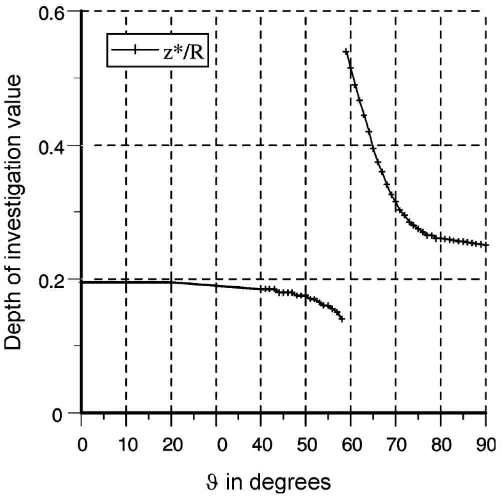

Figure 1. Depth of investigation values (z^*/R) of parallel dipole arrays, as a function of the characteristic angle ϑ (from Szalai *et al.*[3]). It is identical with that shown in eqs (1) and (2) by Nageswara Rao and Gupta[1].

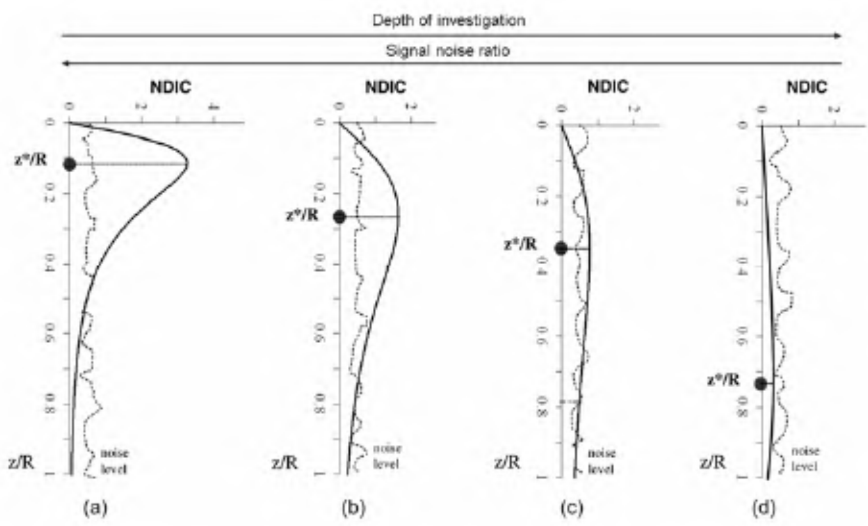

Figure 2. Types of DIC function shown on selected arrays, their depth of investigation (z^*/R) values, together with a hypothetic noise level (dashed curves). Horizontal arrows at the top point towards increasing values (modified from Szalai *et al.*[3]).

Detection abilities of arrays can be correctly compared only if their noise sensitivities are known. The noise sensitivity can be given either by field test measurements (which lead to conclusions, valid only in the given field[4]), or by theoretical noise studies, leading to conclusions of more general validity. Such studies (e.g. geometric positional errors studied by Szalai *et al.*[5]) found that the noise sensitivity is array-specific. It also means that a uniform noise level, commonly applied in numerical modelling studies, might easily lead to misleading conclusions.

1. Nageswara Rao, S. and Gupta, O. P., *Curr. Sci.*, 2007, **92**, 110–113.
2. Roy, A. and Apparao, A., *Geophysics*, 1971, **36**, 943–959.
3. Szalai, S., Novák, A. and Szarka, L., *J., Environ. Eng. Geophys.*, 2009, **14**, 15–23.
4. Szalai, S., Szarka, L., Prácser, E., Bosch, F., Müller, I. and Turberg, P., *Geophysics*, 2002, **67**, 1769–1778.
5. Szalai, S., Koppán, A. and Szarka, L., *Acta Geod. Geophys. Hung.*, 2008, **43**, 33–42.

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