Therefore, tipper element magnitudes as well as the phase of all MT functions due to small-scale extraneous structure will be limited to high frequencies, so that one may 'see through' such structure with these functions to target responses occurring at lower frequencies. About a 3-D conductive body near the surface, interpretation using 1-D or 2-D TE modeling routines of the apparent resistivity and impedance phase identified as transverse electric (TE) can imply false low resistivities at depth. This is because these routines do not account for the effects of boundary charges. Furthermore, 3-D bodies in typical layered hosts, with layer resistivities that increase with depth in the upper several kilometres, are even less amenable to 2-D TE interpretation than are similar 3-D bodies in uniform half-spaces. However, centrally located profiles across geometrically regular, elongate 3-D prisms may be modeled accurately with a 2-D transverse magnetic (TM) algorithm, which implicitly includes boundary charges in its formulation. In defining apparent resistivity and impedance phase for TM modeling of such bodies, we recommend a fixed coordinate system derived using tipper-strike, calculated at the frequency for which tipper magnitude due to the inhomogeneity of interest is large relative to that due to any nearby extraneous structure.

H. Soininen. *The behaviour of the apparent resistivity phase spectrum in the case of a polarizable prism in an unpolarizable half-space*

In the application of the broadband induced polarization method, it is necessary to know how a petrophysical resistivity spectrum is transformed into an apparent spectrum measured in the field. Investigated in the present work was the forming of an apparent spectrum in the case of a polarizable three-dimensional prism embedded in an unpolarizable half-space for gradient and dipole-dipole arrays. The computations were done numerically using the integral equation technique. The frequency dependence of the resistivity of the prism was depicted by means of the Cole–Cole dispersion model. With this simple model geometry, the phase spectra of apparent resistivity resemble quite closely in functional form the original petrophysical phase spectrum of the Cole–Cole dispersion model. The apparent spectra have shifted on the log-log scale downward, owing to geometric attenuation, and toward lower frequencies. The apparent Cole–Cole parameters have been inverted from the apparent spectra. The apparent chargeability is generally noticeably smaller, owing to the geometric attenuation, than the chargeability of the original petrophysical spectrum. The apparent frequency dependence, on the other hand, is very close to the value of the original frequency dependence. The shift of the apparent phase spectrum toward lower frequencies partly compensates for the decrease in the apparent time constant caused by attenuation of the spectrum. The apparent time constant is thus close to the true time constant of the petrophysical spectrum. It is therefore possible in principle to obtain by direct inversion from an apparent spectrum measured in the field a reasonable estimate of the frequency dependence and time constant of the true spectrum of a polarizable body.

Fang-wei Yang and S. H. Ward. *Inversion of borehole normal resistivity logs*

This paper reports on an investigation of the inversion of borehole normal resistivity data via ridge regression. Interpretation is afforded of individual thin beds and of complicated layered structures. A theoretical solution is given for a layered model containing an arbitrary number of layers in the forward problem. Two forward model results for resistive and conductive thin beds indicate that for high-resistivity contrasts, the departure between true and apparent resistivity may be more important than the effects caused by the variations in borehole diameter and mud resistivity. Four normal resistivity logs were chosen to test the inversion scheme. Two of the logs were theoretical logs with and without random noise added, and the remaining two were field examples. Theoretical model results and field examples indicate that the inverse method can be used to obtain the resistivity for each layer when the boundary position is known, but it also can be used to obtain the thickness and resistivity for each layer simultaneously.