GEOELECTRIC STRUCTURE OF CENTRAL PART OF RIBEIRA BELT - CRUZEIRO REGION (SP)

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ABSTRACT

A Magnetotelluric study realized at Serra do Mar Plateu (Figueiredo et.al., 1997) identified the major tectonic blocks of the region and a crustal conductor at 10 km depth. This conductor was associated to a brittle-ductile transition zone delineating the upper-midlle crust boundary in the region. That interesting results motivated new studies along the Ribeira Belt (Brito et.al., 1997). In this work we present the preliminary results of a MT campaign realized at the central portion of the Ribeira Belt, Cruzeiro (SP) region.

The Ribeira Belt is defined as a folded belt generated during the Brazilian Orogeny. Hasui et. al. (1978) proposed a division of the belt into three different domains: Northern, extending from the States of Rio de Janeiro to Espirito Santos, Bahia and part of Minas Gerais; Southern, including the Ribeira Valley , and extending till Uruguay; Central , extending from the western portion of São Paulo State to southern part of Rio de Janeiro. In this central portion, the Ribeira Belt is mainly represented by the gnaissic rocks of Paraíba do Sul Complex and by the schist rocks of the Embú Complex (Hasui et.al., 1975).

Data was acquired at 4 single sites along a profile striking N-S. Frequencies of acquisition were in the range 0.01 to 100 Hz. At each site the coupling between the local electromagnetic fields is given by the impedance tensor. The processing was carried out in the frequency domain using a robust code (Larsen *et.al.*, 1996). The overall data quality was good for all frequency bands, as can be seen at the apparent resistivity and phases curves for site CZ04 (Fig. 1). The impedance tensor is distorted by an unknown, frequency-independent real tensor that mixes the phases representing the 2D regional structure (Jiracek, 1990). The recovery of the regional 2D structure is usually done by the decomposition of the impedance tensor into local (twist, shear) and regional (strike) parameters. In this work, we used the GB approach (Groom & Bailey, 1989). The geoelectric strike obtained, N60E, is in fully agreement with the geologic knowledge of the area. The twist and shear were fixed to a constant value where they display a near independent behavior for the entire period range. The fixed values of strike, twist and shear are used to recover the regional impedance: transverse electric (TE) and transverse magnetic (TM) modes. The electric field parallel to the strike in the TE mode is continuous across interfaces of different conductivities, so this mode is less affected by lateral changes in resistivity. This is confirmed by the inspection of the pseudosections (apparent resistivity and phase) of Figure 2. Therefore, we started the interpretation task using the TE mode data. 1D inversions was then applied to all four sites of the profile. Figure 3 illustrates the final 1D model and the comparison between data and model response for site CZ-04. The most prominent feature of the model is the conductor between 6 – 10 km depth. This conductor was observed at all sites of Cruzeiro profile. Our results are similar to those of Figueiredo et.al. (1997)., corroborating the hypothesis of a brittle-duction transition in the upper/middle crust along the Ribeira Folded Belt.

Further studies in the area include 2D inversion of TE and TM data and combination with other geophysical data in order to improve the understanding of the Central part of Ribeira Belt.

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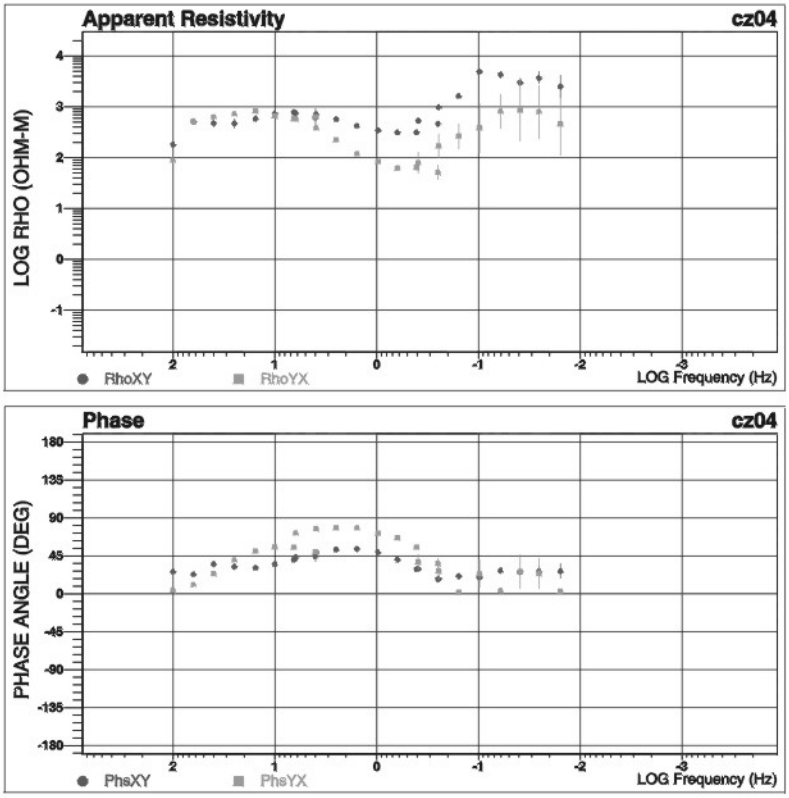

Figure 1 – Apparent resistivity and phase curves, site CZ-04.

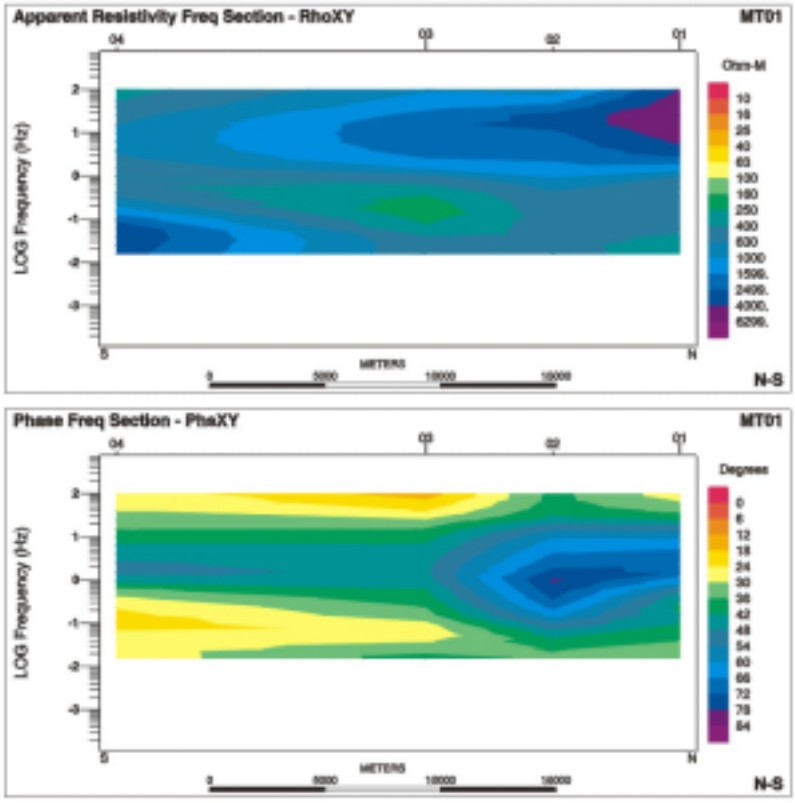

Figure 2 – Pseudosections of apparent resistivity and phase for the TE mode of Cruzeiro profile. XY component corresponds to the Transverse Electric mode.

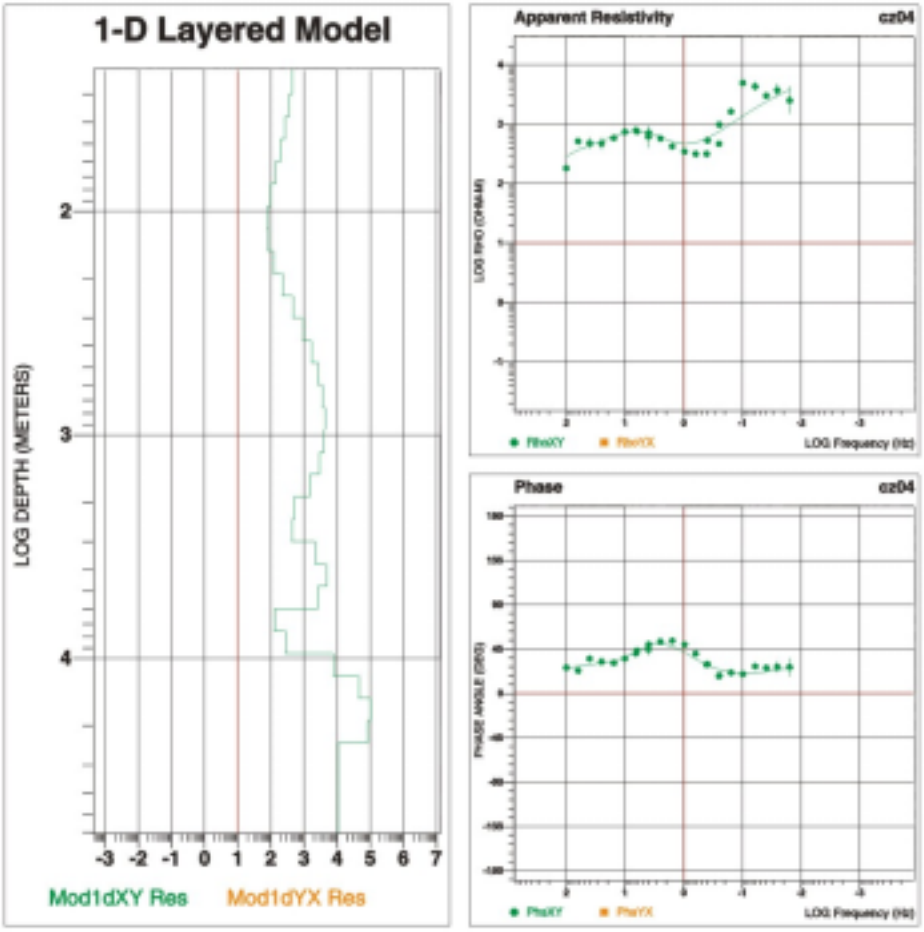

Figure 3 – 1D inverse model and comparison between data and model response for site CZ-04.