

3D modeling of magnetotelluric data unraveling the tectonic setting and sources of magmatism in the northeastern corner of Borborema Province, NE Brazil

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The Borborema Province in northeast Brazil is a complex orogenic system formed by crustal blocks of different ages, origin and evolution amalgamated during the West Gondwana convergence in late Neoproterozoic-early Phanerozoic Brasiliano Orogeny. We discuss here new magnetotelluric (MT) data collected along four linear profiles crisscrossing the northeastern corner of the province to assess its deep electrical resistivity structure. Dimensionality analysis showed that a 3D electrical structure predominates in the subsurface and thus the data were modeled by a 3D MT data inversion scheme. The modeling revealed several subvertical discontinuities, with significant lateral contrast in the overall geoelectric structure, down to upper mantle depths. A major conductivity anomaly is registered in the crust beneath Neoproterozoic supracrustal rocks (Serido Group) and this anomaly deepens to upper mantle depths in the northwest direction below a zone of Paleoproterozoic plutons (Caico Complex). It has been suggested that the Serido Group was originally initiated as a sedimentary basin developed upon a Paleoproterozoic basement during a Neoproterozoic extension event related to a collisional foredeep of a south-dipping subduction slab, contrary to our northwest-dipping conductivity vergence. In case of the Caico Complex, because of the petrogenesis of its orthogneisses that indicates partial melting of a metasomatically enriched spinel-to garnet-bearing lherzolite with adakitic features, we also propose a subduction zone environment for its original magmatism. Considering the tenuous evidence indicating that this conductive anomaly could extend down into the upper mantle in the same region where teleseismic tomography register an attenuation of P waves, it can be concluded that this zone could also be the source of the metasomatic fluids and minerals observed along north-south Mesozoic volcanic plugs and flows of alkaline rocks and alkali basalts (Macau-Queimadas belt). In contrast to the general pattern in several parts of the province exhibiting a multitude of resistive and conductive zones marking the crust and upper mantle, an elongated resistive cratonic-like keel in the WSW-ENE direction is observed along the southeastern side of the study area.

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