Geoelectric Complexity of the Northern São Francisco Cratonic Lithosphere, Central South America, Revealed by Magnetotellurics

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In the northern São Francisco Craton, central South America, extensive Proterozoic and Phanerozoic sedimentary cover and lack of deep-probing geophysical surveys have prevented to establish unequivocally the cratonic character of the Archean-Paleoproterozoic lithosphere. Broadband and long period magnetotelluric (MT) soundings were conducted along a 580 km long east-west profile in this region of the craton. 2D and 3D inversions show extensive upper crustal horizontal conductors beneath the intracratonic Irecê Basin and the Rio Preto marginal belt, interpreted as associated with a combination of high porosity and high fluid salinity in the sedimentary package and fractured metasedimentary rocks at the top of the craton basement during the Neoproterozoic marginal collision, respectively. The deepest part of the crust presents pronounced electrical complexity and heterogeneity, an indication that the cratonic lithosphere was multiply reworked in the past by tectonothermal events. Lithospheric resistive blocks bounded by subvertical major conductive zones are identified. Constrained by geochemical and isotopic data, these conductive interfaces are interpreted as cryptic suture zones related to the large-scale fusion of continents and microcontinents during the Paleoproterozoic craton assembly. At upper mantle depths, high conductivities are observed below most of the profile and interpreted as effects of metasomatism or refertilization processes with incompatible elements during Paleoproterozoic subduction processes and subsequent Mesoproterozoic-to-Neoproterozoic upwelling of deep fluids and melts.

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