

MT Array Investigations of the Transition Zones in the São Francisco Craton Orogenic Belts of Southeastern Brazil

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SUMMARY

A comprehensive multiphysics project (sponsored by Petronas Petroleo Brasil) is underway in southeastern Brazil integrating several geophysical datasets with the aim of elucidating/unravelling the deep lithospheric structure of onshore orogenic belts connecting with an extensive offshore margin where the major petroleum-bearing Campos Basin is located. The onshore megastructures of the São Francisco Craton and the Ribeira Fold Belt were investigated using a total of 100 long-period MT stations. Data were recorded at periodicities ranging from 10^1 to 10^5 seconds, with spacings varying from 15 to 25 kilometers and distributed in an NW-SE orientation covering an area of 400 km x 350 km. MT time series were processed using robust methods followed by dimensionality analyses using the phase tensor scheme, indicating a predominantly three-dimensional character of the study area. 3D resistivity models were derived from non-linear regularized inversion using the complete impedance tensor and tipper data. This 3D model shows an excellent data fit, revealing prominent geo-electric signatures in the suture zone between the São Francisco Craton and the Ribeira Fold Belt, as well as in contact with the exotic terrain of Cabo Frio. Noticeable variations in resistivity between the crust and the lithospheric mantle were observed, helping to identify the compartmentalization of the internal domains of the Ribeira Fold Belt, consistent with surface geology. A multiphysics approach integrating this resistivity model with potential field and heat flow data is now being developed to obtain more reliable inferences about the structural boundaries between different domains to contribute to the assessment of the tectonic evolution of this region.