

SEISMIC AND SEISMOLOGICAL CHARACTERIZATION OF THE AMAZONIAN SUTURE

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ABSTRACT: The Parnaíba cratonic basin is a large round-shaped depression located in northeast Brazil. It covers an area of approximately 660,000 km², comprising four sub-basins Parnaíba, Alpercatas, Grajaú and Espigão Mestre. In its western limit, the basin is in tectonic contact with the Araguaia belt and the Amazonian paleocontinent. The region is marked by normal and reverse movements of crustal blocks. The crustal framework of the Amazonian Craton, the block underlying the Parnaíba basin and the Neoproterozoic mobile belts of the Tocantins Province has been subject of study of the Lithosphere Research Lab of the IG/UnB over the past years. The recent set of seismic and seismological data of the area comes from the Parnaíba Basin WARR Experiment that is part of the research PABIP program, sponsored by BP and involving Brazilian and British universities. In this research a deep seismic refraction survey was carried out crossing the Parnaíba basin and its western and eastern boundaries. The E-W seismic profile is ca. 1,200 km long, following the same path of a deep seismic reflection survey carried out in 2013. In the western part of the profile (a ~450 km long portion), near the limit between the Amazonian Craton and the Parnaíba basin, seismic sections of six shot points were analysed together with 18 short-period seismograph stations, along the seismic profile, and 10 broadband stations south of the profile. All the seismograph stations were installed for receiver function studies. The receiver function and preliminary seismic refraction results show that the eastern margin of the Amazonian Craton has an average crustal thickness of 39 km and Vp/Vs of 1.72. The lithospheric mantle has an apparent P-wave velocity of 8.0 km/s. In the Araguaia belt domain, the crust has thicknesses between 45–53 km and Vp/Vs ≤ 1.70, defining the front of the Amazonian paleocontinent suture. The western part of the Parnaíba basin, Grajaú sub-basin, shows a crust of 42–44 km and Vp/Vs ~1.75. Under this part of the basin, the mantle has a P-wave velocity greater than 8.0 km/s. South of this seismic profile, between 10°S and 14°S, the Amazonian suture was previously imaged by the Porangatu deep seismic refraction profile and receiver function data. The new results corroborate those formerly obtained and allow suggesting that the Amazonian suture front might represent a region with duplicated crust (thicknesses above 50 km) and of felsic composition (Vp/Vs < 1.70). The suture front follows the western limit of the high Bouguer gravity anomaly from central Brazil and continuing under the basin east of the Araguaia belt. The extremely felsic crust of the suture front suggests that the lower crust of this region has been removed. The continuing joint interpretation of seismic refraction and receiver function data will allow to better image the Amazonian suture zone.

KEYWORDS: AMAZONIAN SUTURE ZONE, SEISMIC REFRACTION, AND RECEIVER FUNCTION.