CHARACTERIZING THE LITHOSPHERIC ARCHITECTURE OF THE PARNAIBA BASIN WITH PASSIVE-SOURCE SEISMOLOGY

Coelho, D.L.O.[1]; Julià, J.[1]
[1]Universidade Federal do Rio Grande do Norte;

RESUMO: Understanding the structure and deep dynamics of the lithosphere is key for improving our comprehension of the major geological processes operating in the planet. Lithospheric-scale processes, such as the origin and evolution of large cratonic basins, can create big footprints or signatures in the subsurface that can be observed by geophysical means. With a huge potential for natural resources, the equatorial margin of NE Brazil has motivated many geophysical investigations by the oil industry. Our study area is the Parnaíba Basin, one of the largest cratonic basins of the world, which has been the focus or recent investment by BP Energy do Brasil. The main goal of our study is to provide new images of the crust and lithosphere under the basin and highlight seismic discontinuities within, in order to improve our understanding of its architecture and help constrain models for its origin and evolution. A total of 8 broadband seismographic stations were installed in April 2016 by the Universidade Federal do Rio Grande do Norte along an approximately 500 km-long profile within the basin, with interstation spacing of around 70 km. The profile was densified near the current depocenter of the basin with 10 short-period temporary seismological stations to provide increased resolution in this area. The stations are planned to operate continuously for about 2 years, and the data collected during the experiment is to be quality-controlled regularly to allow for reliable processing during the acquisition phase. The receiver function technique is probably one of the most successful methodologies in broadband seismology for imaging of the crust and lithospheric mantle in continental areas, and we will map crustal thickness in the Parnaíba Basin by developing P-wave receiver functions from the acquired dataset. For shallow structures, on the other hand, we will rely on the cross-correlation of ambient seismic noise recordings, a relatively recent approach that does not require recording of actual earthquakes. Rayleigh-wave group velocities will be measured from the cross-correlations at all possible station pairs within our temporary network, and with additional stations from the Brazilian Seismological Network if available. We expect to infer details about the lithosphere architecture of the Parnaíba basin and contribute towards a better understanding of its origin and evolution.

PALAVRAS-CHAVE: BROADBAND SEISMOLOGY, PARNAIBA BASIN, LITHOSPHERIC ARCHITECTURE