

SEISMIC DATA PROCESSING OF THE REGIONAL VIBROSEIS DATA ACQUIRED ALONG THE PARNAÍBA BASIN

Manenti, R. R.¹; Souza, W. E.¹; Porsani, M. J.¹

¹Universidade Federal da Bahia

ABSTRACT: Located in the Northeast of Brazil, the Parnaíba basin has an area of 600,000 km², and it is one of the three largest sedimentary basins of the Phanerozoic. It lies between two cratons – the Amazon craton and the San Francisco craton. Located far from main economic and research centers of the country, and with low perspectives for petroleum and natural gas, is not well explored when compared to passive margin basins from the Brazilian coast, having only a few seismic lines and exploratory wells. Working along with Global Geophysical Services Incorporated, BP acquired a great seismic line with vibroseis trucks as seismic source, covering an extension of 1,430 km, from the State of Ceará (northeast of Brazil) to the State of Pará (north of Brazil). It is important to detect the Mohorovicic discontinuity because it reflects the evolution and formation of the basin, heat flow and subsidence. On its stratigraphic chart, there are two great igneous spills: the Mosquito Formation; and the Sardinha Formation. The occurrence of those igneous spills are spread through the whole basin, in the shallower regions, characterizing them as diabase sills. The presence of those sills usually make difficult the imaging of structures present underneath those magmatism bodies, due to their high acoustic impedance (high seismic velocity and high density) since this physical property impairs the propagation of seismic waves to deeper parts of basin. Delimiting diabase sills, in seismic images, is important because they have two main functions in this basin: (1) the supply of geothermal heat for organic matter maturation, being an aggravation for hydrocarbon generation; (2) the sealing of hydrocarbons traps, preventing oil or gas to get to surface. The seismic processing of the regional line, for better imaging the deeper and shallower parts of the basin, represents the main objective of this presentation. We used the vibroseis data of the project PABIP sponsored by BP to test different kinds of data filtering along with a technique of automatic stacking, with the objective of attenuating coherent noise present in our data, and generating a more reliable seismic image for geology and deep structures of the basin. Directional radial derivative filtering was used to attenuate coherent noise, such as ground-roll. Singular value decomposition (SVD) was used for enhancing reflectors continuity. Those two filterings approaches together enhanced data resolution and continuity in shallower portions of data. The automatic stacking gave us an image with lower computational cost and results that are equivalent to regular processing. Results of processing in a small portion of the regional seismic line show the efficiency of proposed methodology.

KEYWORDS: Parnaíba Basin, Reflection Seismic, Diabase sills.