



SBGf Conference

18-20 NOV | Rio'25

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Submission code: K9VY5GZMPV

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Use of Seismic Data to Support the Installation of Offshore Wind Farms in the Icaraí Sub-Basin (CE), Brazilian Equatorial Margin

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Introduction

Climate change and the growing demand for clean and sustainable energy sources are driving the global energy transition, highlighting the importance of offshore wind generation. In Brazil, the extensive coastline and favorable wind conditions make the northeast coast, especially the Equatorial Margin, a strategic region for the development of offshore wind farms. However, the safe and efficient installation of these structures depends on detailed knowledge of the geological conditions of the seabed. Areas such as the Ceará Basin, in particular the Icaraí Sub-Basin, have high energy potential, but the region lacks studies on the seabed and sub-seabed. In this context, this study aims to characterize the seabed of the Icaraí sub-basin, contributing to the mapping of features conducive to underwater geohazards and subsidizing the safe installation of offshore wind farms.

Method and/or Theory

For this purpose, 2D seismic data from the National Agency of Petroleum, Natural Gas and Biofuels (ANP) are being interpreted using the software Petrel. The first reflectors are being carefully interpreted and features with different morphologies and seismic facies are being compiled. Geospatial data are also being organized in a GIS environment to support the characterization of the seafloor surface and the production of the final map of the study area.

Results and Conclusions

The preliminary results highlight geological features with potential risk to the instability of offshore infrastructures, such as paleo valleys, mounds, sinkholes, and the presence of outcrops of rocky substrates. In the continental shelf break zone, heads of submarine canyons were mapped as regions of greater slope.

Through the 2D seismic line grid, the seabed surface of the Icaraí Sub-basin continental shelf is being interpreted. This surface shows the heterogeneities of the study area. It is concluded that the results already contribute to the identification of areas unsuitable for the installation of offshore wind turbines in the Ceará Basin, providing technical support for the installation of offshore wind farms. However, a high-resolution seismic survey is suggested for a better assessment of the study area. In the context of the energy transition, this study reinforces the importance of geological and geophysical analyses for the sustainable viability of wind energy in Brazil.