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Mapping the Eastern Brazilian Continental Margin adjacent to Rio Grande do Norte state between the Muriú and Maracajaú regions and Its Role in Future Offshore Infrastructure Development

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Introduction

With advancements in technology and deep-water exploration, recognizing and understanding the geomorphology of continental margins has become essential for identifying stable zones and expanding frontiers. However, the lack of available data on the continental margin of Rio Grande do Norte limits the development of such assessments. Considering this, the present study is a pioneering effort in the region, aiming to characterize the geomorphology and sedimentary dynamics of the eastern Brazilian continental margin adjacent to Muriú and Maracajaú regions on the state of Rio Grande do Norte, and to identify suitable areas for the implementation of offshore anthropogenic structures. The study area is located on the continental slope.

Method and/or Theory

A survey was conducted aboard the Brazilian Navy Hydro-Oceanographic Research Ship Vital de Oliveira – H39 - in 2023 as part of the SeabedMap Project. The methodological approach included seabed mapping with multibeam bathymetry – MB using an equipment operating at a frequency of 12 kHz. Data processing was performed using specific processing bathymetric software to eliminate associated noise and improve resolution. The main product is a DTM (Digital Terrain Model).

Results and Conclusions

The study area is located between ~100-2900m water depth and covers 450km². It is divided into zones depending on the morphology found. The first one is classified as an avoided implementation zone representing geohazard-related morphologies and features: a) an erosive canyon with expression on the shelf edge (indented canyon head) and 22km of extension. Their thalweg ranges from 100 to 2,670 meters basinward. Also, this canyon exhibits wall gullies, slide scars and mass movement deposits; b) ~4km of a net of gullies in the shelf edge that confluences forming a prominent channel with 7km of extension basinward; c) three canyons in early stages of formation, located near the slope-basin transition beginning at ~800m, ~1100m and ~1000 northward and d) structures resembling the potential reefs found on the outer shelf, as noted in the literature, and recovering ~6km of combined areas between 490-750m water depth meters. The second zone is classified as a potential implementation zone and includes: a) non-excavated slope areas recovering ~116 km² of area absent of sedimentary dynamics presence. This area is located between ~100-1200 water depth.

Finally, the presence of various types and scales of geohazards, distinct geological features, and stable areas plays a role in offshore infrastructure planning. This is especially relevant to the expanding offshore sector in Northeast Brazil, amid the global energy transition. Thus, it's possible to delineate suitable future areas to be either avoided or considered as indicated by the classified zones.

As a recommendation, it is essential to consider the benthic arrangement of the seafloor and to assess potential environmental impacts that future infrastructure may cause.