NORTE BRASILEIRA RIDGE - GEBCO_08 GRID x RECENT ACQUIRED DATA

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ABSTRACT

The main **objective** of this work was a construction of a bathymetric grid with only acquired and treated bathymetric data in order to compare with GEBCO_08 grid.

This comparison was done in the region of the *Norte Brasileira* (NBR) and *Fernando de Noronha* Ridges (FNR) that are two significant ridges in the Brazilian Northeastern Continental Margin. Existing bathymetric information from several origins were integrated and the data from LEPLAC and from DHN surveys were denominated Tie Lines once they were considered as the reference for the cross check lines. When comparing this bathymetric grid created only with acquired and treated bathymetric data to the GEBCO_08 grid, it is possible to observe that from a regional point of view, the GEBCO_08 grid represents the submarine relief very well, however, when comparing local undersea features in areas where there is a great availability of acquired bathymetric data, some artifacts are observed in the GEBCO-08 grid.

The *Norte Brasileira* (NBR) and *Fernando de Noronha* Ridges (FNR) are two significant ridges in the Brazilian Northeastern Continental Margin already mapped in GEBCO_08 grid, figure 1 and 2.

The NBR structure is characterized by two E-W, around 400km in length, connected by one NW-SE lineament, around 300 km in length.

The FNR is an E-W lineament in a continuous pedestal around 550 km length and 60 km width in which *Fernando de Noronha* Archipelago and *Rocas* Atoll are inserted. The extension of this ridge to the west reaches the upper continental slope.

These two ridges present a morphology composed by sea mountains and guyots with shallow, medium and deep depths. Both divide this part of the margin into separated compartments, influencing the margin physiography, by confining part of the terrigenous sedimentation.

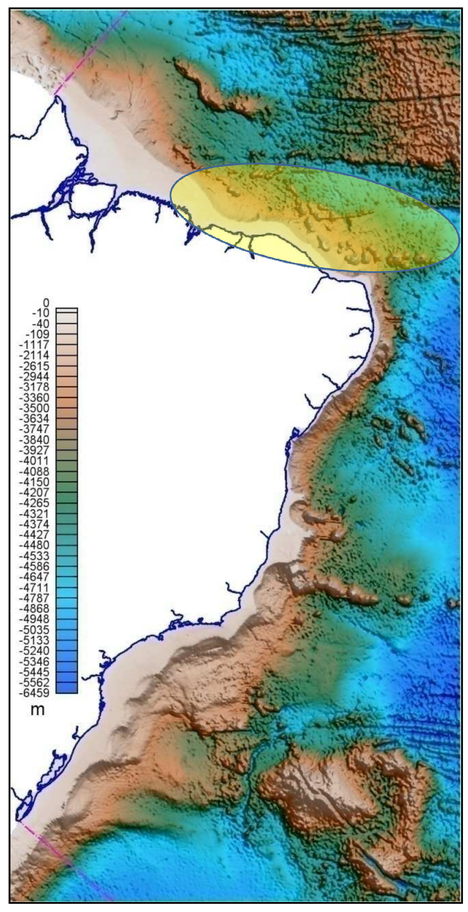

Figure 1 - Location of *Norte Brasileira* and *Fernando de Noronha* Ridges in the Southwest Atlantic.

Existing bathymetric information from several origins such as PETROBRAS (Brazilian Oil Company), Brazilian Continental Shelf Project - LEPLAC, Nautical Charts, Hydrographic surveys from Directorate of Hydrography and Navigation - DHN and GEODAS (Geophysical Data System for Marine Geophysical Data) were integrated in the database (Figure 3). All this data set increased significantly the bathymetric information of the area, allowing for a better definition of the submarine relief.

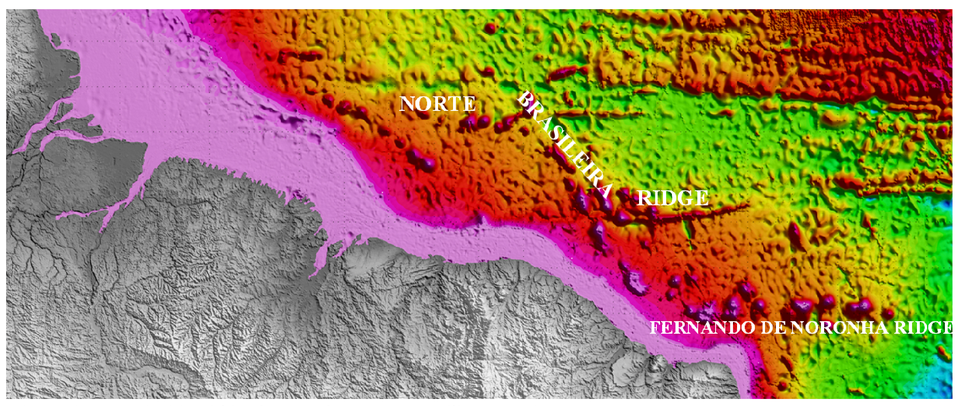

Figure 2. GEBCO_08 grid in the Northeastern Brazilian margin.

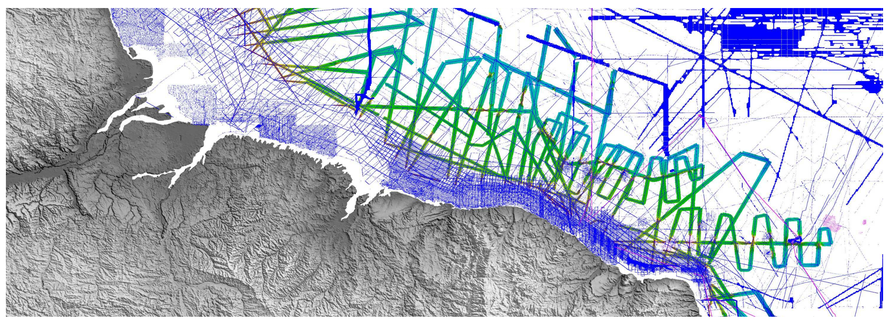

Figure 3. Bathymetric dataset composed by singlebeam and multibeam data.

The bathymetric data was analysed line by line in order to identify spurious depth values that do not have any correlation with the morphology of the area. These anomalous values were replaced by the correct values, when possible, taken from analog records as in the case of Brazilian Continental Shelf Project - LEPLAC and Hydrographic surveys from Directorate of Hydrography and Navigation - DHN. In cases where the corrections were not possible, the values themselves were eliminated, as well as part of the acquired line or even all the line Some GEODAS lines have been observed with wrong navigation, which were also discharged.

When bathymetric data is compiled it is usual to identify discrepancies in the depth values of different lines in the same position, being necessary to verify the cross error between these lines. High differences in the depths show a low quality cruiser (Wessel, 1989). To complete the analyse of the bathymetric dataset a cross error check was done (Figure 4) with the following sequence: Identification of line crossings; List of the differences between the values; and analysis of the quality of the data (Figure 5).

The data from LEPLAC and from DHN surveys were denominated Tie Lines once they were considered as the reference.

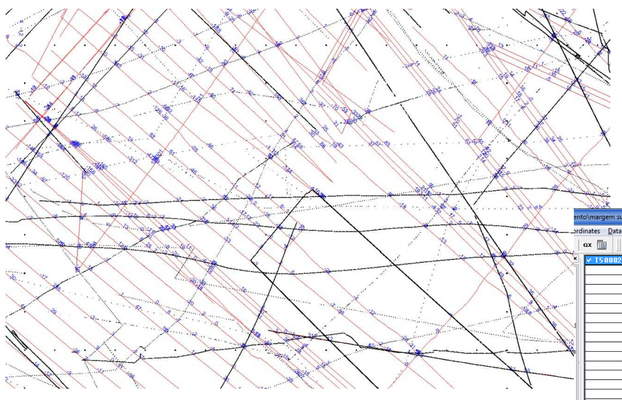

Figure 4. Differences depth values (blue) in the crossing between the references Tie Lines (red) and Public domain, PETROBRAS and others (black).

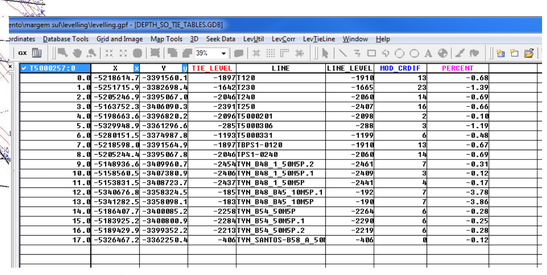

Figure 5. Information regarding the crossings between the Tie Lines with others lines.

After this qualification, 15 cruisers were partially deleted and 16 cruisers from GEODAS were totally deleted due to the quality of the data. Some lines from PETROBRAS were also deleted.

The bathymetric grid was created using minimum curvature interpolating surface with a cell size of 3500 meters, so that each node was assigned a depth and position value equally spaced on the surface and an internal tension of 0.5.

The figure 6 presents submarine relief maps in the Brazilian Northeastern Continental Margin, in the NBR and FNR region. The top ones present the bathymetric grid (left) and the contour map showing isobaths with 50m interval (right), and the bottom one presents the composite map with the bathymetric grid and the contour.

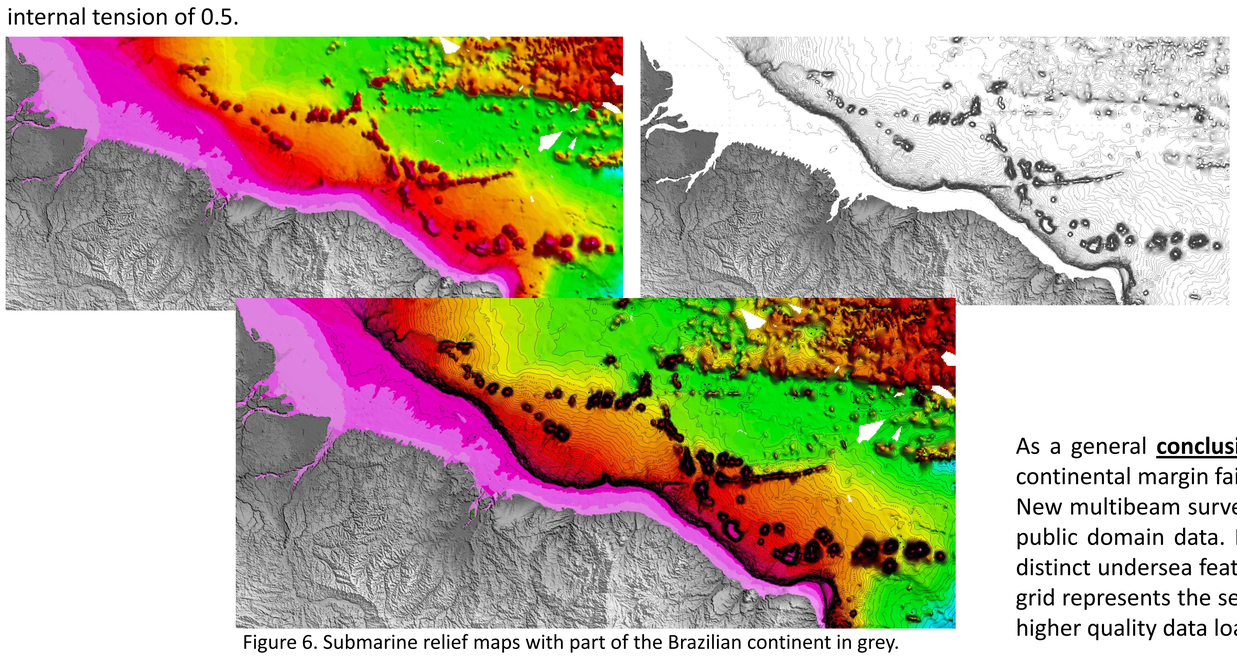

Figure 6. Submarine relief maps with part of the Brazilian continent in grey.

When comparing this bathymetric grid created only with acquired and treated bathymetric data to the GEBCO_08 grid, it is possible to observe that from a regional point of view, the GEBCO_08 grid represents the submarine relief very well in the Brazilian northeastern continental margin, however, when comparing local undersea features in areas where there is a great availability of acquired bathymetric data, some artifacts are observed in the GEBCO-08 grid. Sometimes, in areas with seamounts occurrence, some real features are not shown and non existing feature are created. Figure 7 presents both grids with the same colour table, the top one being the GEBCO_08 grid and the bottom one the created grid.

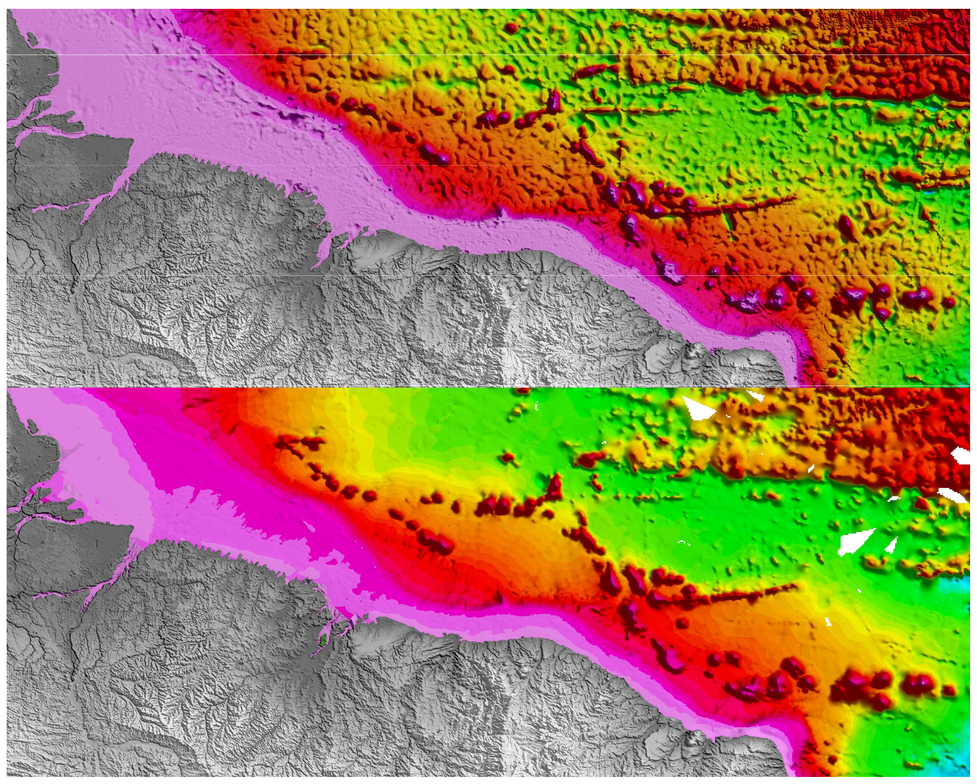

Figure 7. GEBCO_08 grid and Brazilian grid using the same colour table.

Some examples that better illustrate the comparison between the two grids in the region of NBR and FNR are shown in figures 8 and 9.

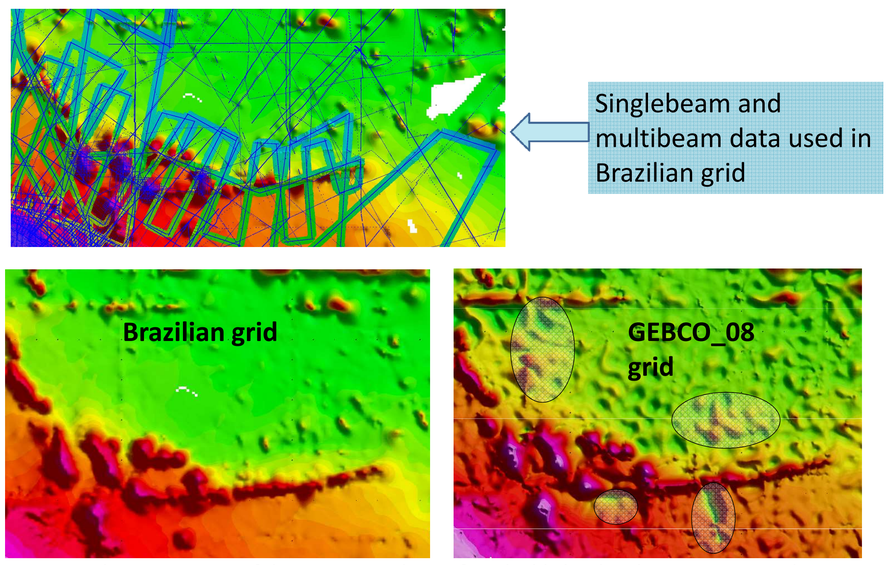

Figure 8. The E-W portion of the NBR. Note the artifacts highlighted in the GEBCO_08 grid picture.

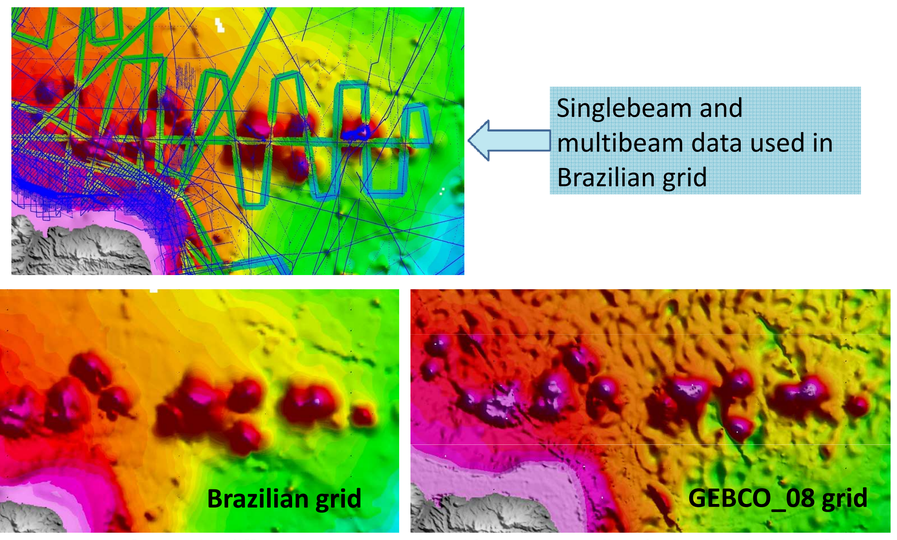

Figure 9. In the region of FNR, the differences between the grids was too small, only the morphology of the seamounts could be better defined.

As a general **conclusion**, the GEBCO_08 grid in its marine portion presents the submarine relief of the Northeastern Brazilian continental margin fairly well, since all the most prominent undersea features are easily identified.

New multibeam surveys recently conducted by LEPLAC in this region were essential to qualify the data already existent, including public domain data. From this compilation it was possible to improve the bathymetric grid in this area where there are many distinct undersea features like ridges, plateaus, guyots, terraces, banks and canyons. This comparison also showed that GEBCO_08 grid represents the seafloor with very good precision but small details and some minor artifacts are still present. Therefore, of the higher quality data loaded in the GEBCO database, the more reliable will be the final product, that is, the GEBCO grid.