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Basement structures over Rio Grande Rise from gravity inversion

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In this study, we show that from satellite-derived gravity field, bathymetry and sediment thicknesses, it is possible to give a 3-D model of the basement over oceanic areas, and for this purpose, we have chosen the Rio Grande Rise, in South Atlantic Ocean, to build a gravity-equivalent basement topography.
The advantages of the method applied in this study are manifold: does not depend directly on reflection seismic data; can be applied quickly and with fewer costs for acquiring and interpreting the data; and as the main result, presents the physical surface below the sedimentary layer, which may be different from the acoustic basement.
We evaluated the gravity effect of the sediments using the global sediment thickness model of NOAA, fitting a sediment compaction model to observed density values from Deep Sea Drilling Program (DSDP) reports. The Global Relief Model ETOPO1 and constraining data from seismic interpretation on crustal thickness are integrated in the gravity inversion procedure.
The modeled Moho depth values vary between 6 to 27 km over the area, being thicker under the Rio Grande Rise and also in the direction of São Paulo Plateau. The inversion for the gravity-equivalent basement topography is applied for a gravity residual data, which is free from the gravity effect of sediments and from the gravity effect of the estimated Moho interface.
A description of the basement depth over Rio Grande Rise area is unprecedented in the literature, however, our results could be compared to in situ data, provided by DSDP, and a small difference of only 9 m between our basement depth and leg 516 F was found. Our model shows a rift crossing the entire Rio Grande Rise deeper than previously presented in literature, with depths up to 5 km in the East Rio Grande Rise (ERGR) and deeper in the West Rio Grande Rise (WRGR), reaching 6.4 km.
We find several short-wavelengths structures not present in the bathymetry data. Seamounts, guyots and fracture zones are much more clearly defined in the basement than in the bathymetric model. An interesting NS structure that goes from 34S and extends through de São Paulo Ridge is interpreted in the basement model, and we propose that this feature can be related to the South Atlantic opening, revealing an extinct spreading center.