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Space and time evolution of the interaction system between Tristan da Cunha hotspot and South Mid-Atlantic Ridge.

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Abstract

In this work we have studied the space and time evolution of the Tristan hotspot and south Mid-Atlantic Ridge interaction system. The Tristan hotspot and its associated topographical features (Walvis Ridge, Rio Grande Rise) are one of the most significant features of the south Atlantic ocean. However, this system is not as well studied as the systems in the North Atlantic (Azores and Iceland).

Data compilation of the available surveys from the National Geophysical Data Center (NGDC) and satellite-derived bathymetry were treated to generate a Digital Elevation Model (DEM) for the entire south Atlantic ocean . Satellite-derived gravity data and sediment thickness data were used to calculate the mantle Bouguer anomaly (MBA) and digital isochrons of the ocean floor were used to calculate the residual mantle Bouguer anomaly (RMBA) and residual bathymetry.

The relations between gravity anomalies and residual bathymetry variations along the Mid-Atlantic Ridge axis and along the isochrons were determinate and used as indications in terms of lateral density variations in the mantle, and this of space and time variations of the hotspot influence. A data base compilation of the available isotope ratios and trace-element data were interpreted in terms of contamination of the mantle composition by a plume term and both data sets are used to constrain the ridge-hotspot temporal evolution.

A plate tectonic reconstruction, yields a framework for a model of evolution of the interaction system the Tristan hotspot and the Mid-Atlantic Ridge accounting for all the geophysical and geochemical observations.