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Similarities of the Scotia and Caribbean Plates: Implications for a common plate tectonic history?!

Christian Burmeister¹, Paul Wintersteller², and Martin Meschede¹

¹Institute for Geography and Geology, University of Greifswald, Greifswald, Germany

²MARUM/Geoscience department, University of Bremen, Bremen, Germany

The active volcanic arcs of the Scotia Plate and Caribbean Plate are two prominent features along the otherwise passive margins of the Atlantic Ocean, where subduction processes of oceanic crust is verifiable. Both arcs have been, and continue to be, important oceanic gateways during their formation. Trapped between the large continental plates of North- and South America, as well as Antarctica, the two significantly smaller oceanic plates show striking similarities in size, shape, plate margins and morphology, although formed at different times and locations during Earth's history.

Structural analyses of the seafloor are based on bathymetric datasets by multibeam-echosounders (MBES), including data of the Global Multi Resolution Topography (GMRT), Alfred Wegener Institute (AWI), MARUM/Uni-Bremen, Geomar/Uni-Kiel, Uni-Hamburg and the British Antarctic Survey (BAS). Bathymetric data were processed to create maps of ocean floor morphology with resolution of 150-250 meters in accuracy. The Benthic Terrain Modeler 3.0 (BTM), amongst other GIS based tools, was utilized to analyse the geomorphometry of both plates. Furthermore, we used the bathymetric datasets for three-dimensional modelling of the seafloor to examine large-scale-structures in more detail.

The modelling of ship-based bathymetric datasets, in combination with the GEBCO 2014 global 30 arc-second interval grid, included in the GMRT bathymetric database, delivered detailed bathymetric maps of the study area. With the help of the fine- and broad-scale bathymetric position index (BPI), comparable to the topographic position index (Weiss, 2001), we present the first detailed interpretation of combined bathymetric datasets of the Scotia Sea, including the entire Scotia Plate and adjacent areas, such as the East Scotia Plate. We identified typical morphological features of the abyss, based on the determination of steep and broad slopes, ridges, boulders, flat plains or flat ridge tops and depressions in various scales. Additional data analyses of gravimetric and magnetic properties of the crust should help to understand the plate tectonic history of both areas in more detail.

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