Comparison of Seabed Features within the Azores and Nearby Mid-Atlantic Ridge

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BACKGROUND

From May 11 through August 18, 2022, NOAA Ocean Exploration and numerous partners conducted a series of three telepresence-enabled ocean exploration cruises on the NOAA Ship Okeanos Explorer. The voyage to the Ridge expedition’s mission was to collect critical baseline information and improve knowledge about unexplored deep-water areas of the Charlie-Gibbs Fracture Zone, the Mid-Atlantic Ridge, and the Azores Plateau in the North Atlantic Ocean (NOAA Ocean Exploration 2022c). This information was used to inform management needs for sensitive habitats, geological features, and potential resources, as well as to collect data to enhance predictive capabilities for vulnerable marine habitats, seafloor composition, island formation, plate tectonics, hydrothermal vents, critical minerals, and submarine geohazards (NOAA Ocean Exploration 2022b). During the expedition’s third and final cruise (EX2206, July 22–August 18, 2022) ROV Deep Discoverer and seabed mapping (NOAA Ocean Exploration 2022a) were conducted in the region of Azores, Portugal exploring the Azores Plateau and Mid-Atlantic Ridge (MAR) northeast of the Azores.

METHODS

Sonar data were processed using CARIS HIPS and SIPS 11.4. All dives and 3D bathymetric surveys were generated with 35 and 18 m resolutions. Depth profiles were made to better compare geophysical features.

RESULTS

The Azores, an autonomous region of Portugal, is an archipelago of nine volcanic islands in the Micronesia region of the North Atlantic located roughly 1,510 km west of the Portuguese mainland. The islands are situated on a basaltic submarine plateau that is subdivided by the Mid-Atlantic Ridge (MAR), and falls along a triple junction—a place where three mid-ocean ridges meet, separating the North American, Eurasian, and African Plates. Portions of the plateau formed by enhanced melt production along the ridge between 10 and 4 mya (Stich et al. 2020). Several geomorphological features are found on the plateau including a range of escarpments and deep axial valleys.

The Azores Plateau sits along the Azores Plateau Escarpment (A) which has an elevated seafloor at an area below 2000 m by May et al. 2020). This triple junction is marked by a ~50% decrease in MAR seafloor spreading rates (May et al. 2020). The plateau lies in an area of the Azores-Gibraltar Transform Fault (AGFF), a major seismic zone. The purpose of this study is to use bathymetry, depth profiles, and seabed facies data to characterize the seafloor geomorphology and interpret the regional impact of plate tectonics.

REFERENCE


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