A Remote-Predictive Approach to the Geodynamic Evolution of the Coriolis Troughs

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Seafloor massive sulfides (SMS) are a modern analogue of volcanogenic massive sulfide (VMS) deposits which provide a window into the metallogeny of these deposits. SMS deposits are formed via the circulation of hydrothermal fluids in the oceanic crust and have been previously found in extensional settings such as mid-ocean ridges and backarc basins. However, it is not clear at what stage large hydrothermal systems develop relative to backarc development. This knowledge gap will be addressed with a remote-predictive approach in the southern Vanuatu Coriolis Troughs—a nascent backarc rift that extends between ~17°41′S and 20°3′S. Additionally, the structural and magmatic evolution of the Coriolis Troughs may be influenced by the many tectonic processes it hosts, such as ridge collisions, hinge retreat, and slab tear. As such, this study aims to improve our understanding of the structural and magmatic evolution of nascent backarc rifts through a remote-predictive mapping approach. The structural and geological mapping was completed at a scale of 1:100,000 in ArcGIS Pro, using available ship-track bathymetry, satellite altimetry, and geophysical datasets. For optimal visualization of structures, the bathymetric data was transformed using geoprocessing tools. Geologic units are identified and classified based on the completed structural map, seafloor morphology, and geophysical datasets, including vertical gravity gradient (VGG), Earth Magnetic Anomaly Grid (EMAG), and side-scan sonar data. In seismically active regions, shallow centroid moment tensors (CMTs), will be compared with the mapped structures to interpret fault kinematics, their stress regimes, and how geodynamic events control the formation and development of new structures. The mapping outcomes of this study will help us to better understand the geodynamic evolution of nascent backarc rifts and their spatial and temporal relationship with metallogeny. This will help improve future exploration strategies.