

Characteristics and controlling factors of regional variations in ferromanganese crusts: Case study at a seamount in the NW Pacific

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Cobalt-rich ferromanganese crusts are distributed over the seafloor and are an important potential resource for cobalt, nickel, and platinum. They are chemical sedimentary rocks that precipitate directly from seawater at extremely slow rates of a few mm to a dozen mm per million years and have been studied as core samples that record long-term palaeoceanographic environments and geological events. The crusts extend over several hundred km² from seamount slope to flat top, and their thickness varies from a few mm to more than a dozen cm, apparently over various distance scales, however, the specific variations and controlling factors are not well understood. In this study, acoustic surveys using a research vessel, visual surveys of the seafloor using a ROV (Remotely operated vehicle), and rock sampling using a BMS (Benthic multi-coring system) were conducted in a part of a flat-topped seamount (Guyot) in the Marcus-Wake seamount group in the Northwest Pacific, to correlate the variation in the crust thickness on a scale of several km with the topography and geology of the seamount. The results suggest that the crust growth is strongly correlated with the history of the geological environment changes and the formation history of the seamount, such as basement instability and the foraminiferal sand deposition, because the variation in crust thickness corresponds to the topography and geology of the seamount. These results indicate that topography and geological information of the seamount are useful to predict changes in crust thickness and continuity.

Keywords: Cobalt-rich ferromanganese crusts, Northwest Pacific, Seamount, Multibeam echosounder, Visual survey, Deep-sea boring