RELATIONSHIP OF

MORPHOLOGY AND TRANSITION METAL CONTENT OF

MANGANESE NODULES TO AN ABYSSAL HILL

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ABSTRACT

A University of Hawaii oceanographic cruise, Abyssal Hills 69, with the R/V MAHI, was carried out to study the association of manganese nodules with an abyssal hill. Manganese nodules from three dredge hauls on an abyssal hill located at 36°N and 157°W exhibited differences in morphology and composition between stations only three miles apart. The morphology of the nodules suggests that nodules from a single site have similar morphologies because they began growth at the same time, probably because of a volcanic event. Differences in morphology between stations indicates a local supply of elements. Atomic absorption analysis for manganese, iron, cobalt, nickel, and copper revealed that nodules nearest to a probable fault line and source of volcanism have a lower manganese to iron ratio than nodules farther removed. This finding supports the theory that volcanism contributes to the formation of some nodules. Additional evidence showing association with volcanism consists of volcanic nuclei in nodules, crusts formed on layers of volcanic ash, and basalt encrusted to various degrees. The variation in cobalt, nickel, and copper contents of the nodules from a single dredge is two-to threefold, but iron content is more uniform. Four of the six cores from the area increased in manganese concentration with depth, suggesting that diffusion is concentrating manganese in the upper zone of the sediments or in nodules. The author concludes that volcanism is contributing to the formation of nodules by supplying nuclei and transition elements, but is not necessary for the formation of manganese nodules.