

A COMPARATIVE EVALUATION OF MANGANESE NODULES IN ORE PROVINCES OF THE OCEANS

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ORE GRADE NODULES ARE ENRICHED IN MN, NI AND CU. IN THE PACIFIC OCEAN, THESE DEPOSITS OCCUR UNDER WATERS OF INTERMEDIATE PRODUCTIVITY AT THE MARGINS OF THE EQUATORIAL HIGH PRODUCTIVITY ZONE ON SEA FLOOR NEAR THE CALCIUM CARBONATE Compensation Depth (CCD). This DISTRIBUTION IS THOUGHT TO RESULT FROM LABILE ORGANIC MATTER BEING SUPPLIED BY THE ELEVATED BIOLOGICAL PRODUCTIVITY IN THE OVERLYING WATERS AND BEING CONCENTRATED IN THE SEDIMENTS NEAR THE CCD AS A RESULT OF CALCIUM CARBONATE DISSOLUTION. THE DECAY OF THIS MATERIAL PROMOTES DIAGENETIC MN, NI AND CU ENRICHMENT IN THE NODULES. SIMILAR METAL ENRICHMENTS DO NOT APPEAR TO OCCUR IN PACIFIC NODULES FROM AREAS OF EITHER HIGHER OR LOWER PRODUCTIVITY, THE FORMER BECAUSE ABUNDANT BIOGENIC SILICA REPLACES CALCIUM CARBONATE AS THE MAIN SEDIMENT BUILDER AT DEPTHS NEAR THE CCD UNDER HIGHEST PRODUCTIVITY WATERS THEREBY DILUTING THE LABILE ORGANIC MATERIAL, AND THE LATTER DUE TO INSUFFICIENT DIAGENETIC ACTIVITY TAKING PLACE ON THE SEA FLOOR UNDER LOW PRODUCTIVITY WATERS. IN THE INDIAN OCEAN, MN, NI AND CU RICH NODULES ALSO OCCUR IN THE CENTRAL INDIAN OCEAN BASIN. THESE TOO ARE THOUGHT TO OBTAIN THEIR METALS THROUGH EARLY DIAGENETIC PROCESSES OCCURRING IN THE SEDIMENTS. BY CONTRAST, SIMILAR METAL ENRICHING CONDITIONS OCCUR LESS EXTENSIVELY IN THE ATLANTIC OCEAN AND MN, NI AND CU RICH NODULES APPEAR TO BE RARE THERE.