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Exploration Inputs for Exploitation of Manganese Nodules in Central Indian Basin

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ABSTRACT

Large reserves of manganese nodules have been identified in the Central Indian Basin, as a result of extensive exploration comprising more than 2000 shipdays, 7 research vessels, 9000 samples, 400,000 km of narrowbeam echosounding, 300,000 sq km of multibeam sounding, over 50,000 photographs, 450 hours of vedio data and 1130 km of deeptowed SBP and SSS data.

Spatial variation of nodule abundance and grade, their inter-relationship with one another, as well as the bathymetry of the seabed were the prime considerations for selection of the 'Pioneer Area' of 150,000 sq km, which was allocated to India in 1987. An environmental impact assessment experiment has also been initiated to evaluate the possible effects of mining activity on the deepsea environment.

Key words : Manganese nodules, spatial distribution, seafloor features, application to mining.

INTRODUCTION

As a result of a planned approach and extensive exploration activity, India became the first country to be allocated an area of 150,000 sq km in the Central Indian Basin (Fig. 1), by the International Seabed Authority in 1987. Beginning with the regional surveys (at 100 km grid), and followed by closer sampling (at 25 km grid), detailed bathymetric surveys and large number of deeptow profiles, have resulted in a large database for identification of potential areas for mining in future.

This paper describes the inputs from exploration related activities and their application for exploitation of the deposits, which are being carried out at the National Institute of Oceanography. Development of metallurgical process for extraction of metals as well as R&D on various subsystems of the mining system are underway at different laboratories under this multi-agency project, which is financed by the Department of Ocean Development (Govt. of India).

DISTRIBUTION CHARACTERISTICS AND SEAFLOOR FEATURES

Spatial distribution of nodules

Nodule fields are concentrated between 9°30'S to 16°30'S and 72°30'E to 82°30'E. There is an inverse relation between the nodule abundance and grade in the Central Indian Basin (Sudhakar, 1988). Three genetic types of nodules are identified in the area, exhibiting distinct mineralogy, Mn/Fe ratios and surface texture, viz., type A, type AB and type B (Sudhakar, 1993). Type A and type AB nodules are economically more important ore grade deposits , the mean grade values (Cu+Ni+Co) in type A nodules and AB nodules being 2.82 % and 2.47 % respectively (Table 1). These nodules predominantly occur in the sub-equatorial belt, where the surface biological productivity is between 100-150 mg C/sq. m/day. These nodules grow mostly on abyssal plains and are underlain by siliceous sediments between 10°S and 14°S. To the east of the 79°E fracture zone, type A nodules are sparse.