A Numerical Model Analysis of Environmental Load for Seafloor Resources Development

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ABSTRACT

The exclusive economic zone (EEZ) of Japan has a very wide area. Accordingly, technology for the effective exploitation and use of mineral resources in the EEZ will be a key for sustainable development in Japanese industry. When marine mineral resources are developed, it is necessary to evaluate an environmental impact on the sea area and the deep seafloor. Then, a clarification is required for an environmental impact of the particles on the sea area and the deep seafloor by mining and discharged from the platform into the ocean. We have developed an analytical tool for evaluating environmental impact of the seafloor resource development.

KEY WORDS: Resource development; environmental load; suspended particles; ecosystem model; benthic organism; sediment; Japanese EEZ.

INTRODUCTION

Japan has the EEZ with the sixth widest area in the world (Fig.1). The EEZ is expected to have promising resources such as seafloor massive sulfides, cobalt rich crust and methane hydrate, and so on through scientific explorations. As the worldwide supply and demand of mineral resources are being tight, technology for the effective exploitation and use of mineral resources in the EEZ will be a key for sustainable development in Japanese industry. Prior to development of marine mineral resources, it is necessary to evaluate its environmental impact on the water column and seafloor of ocean. However, environmental evaluation method has not been established for open ocean yet. Furthermore, Japanese EEZ is also estimated to have a possibility to secure a place for renewable energy, offshore fisheries, etc.

In order to enhance the development of resources in the vast extent of this area, the Ministry of Land, Infrastructure, Transport and Tourism of Japan (MLIT) started an R&D project of floating offshore platform technologies in 2007 (Ishida et al., 2008). The National Maritime Research Institute (NMRI) has been conducting this project under the sponsorship of MLIT. This project includes a development in the environmental load prediction tool for the seafloor resources development at deep sea with the consideration of benthic organism.

We developed the numerical model practicable to simulate the distribution of discharged particles from the platform into sea and evaluate effect of the sediments on marine organisms. This paper shows the results of a case study by the numerical analysis of environmental load for seafloor resource mining at the Izena cauldron in the Okinawa trough, southwestern region of Japan.

Figure 1. Exclusive Economic Zone (EEZ) of Japan

OUTLINE OF THE ENVIRONMENTAL LOAD ANALYSIS TOOL

In the mining process proposed for seafloor resources development, the ores excavated on seafloor are sent up to the platform as slurry, a mixture of the ore particles and seawater. After the slurry is separated