SEAFLOOR INFRASTRUCTURE FOR HIGH DENSITY EARTHQUAKES AND TSUNAMIS MONITORING

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1. Introduction

The Nankai trough where the Philippine Sea plate slips in the Eurasia plate suffers from huge earthquake and associated tsunami every 100-150 years. The latest earthquake in this region hit in 1944 and 1946, more than sixty years have already passed from the disaster. The Japanese Government's Earthquake Research Committee has assessed the provability of occurrence of earthquake in this area in the next 30 years is about 60%. It is necessary to improve disaster prevention in this region promptly as much as possible. The precise real-time and long-term monitoring capability on seafloor is effective to understand and forecast the mega-thrust earthquake activity near plate boundary accurately. The deployment of high density real-time seafloor sensor network is suggested to realize this requirement.

2. Summary

The maintenance of large scale system extend over a long period of time is one of a great challenge of underwater technology. There are results that have already been used in-line sensor equipped submarine cable observatories for 30 years in Japan. However, these conventional high reliability seafloor real-time observation systems design are not suit for keeping up a large scale system long time. A noble system design concept and practical system management is necessary to make the seafloor sensor network turn into a reality. To aims at the improvement of observation capability of the Nankai trough, the project DONET (Development of Dense Ocean-floor Network System for Earthquakes and Tsunamis) is funded by MEXT (Ministry of Education, Culture, Sports, Science and Technology) and performed by JAMSTEC (Japan Agency for Marine-earth Science and Technology) from 2006. The DONET is mainly focuses to monitor the earthquake, tsunami and crustal movement on seafloor that related to the activity of plate boundary. This network is scheduling to install at least 20 sensor units on seafloor, which will be deployed at the interval of 15-20km to obtain a precise monitoring ability that surpasses the land base earthquakes observation network. The growth in sensor unit exerts a large influence on the decrease in total system reliability because of the sensors are most critical parts of the system to secure the reliability. A new design approach is necessary to surely manage a large scale system for long observation period (20-30 years). Replaceable, maintenanceable and extendable system configuration, and redundancy for the internal or external system failure are key technologies to provide for this network development. The concept of DONET is consists of three system component with different reliability. High reliability backbone cable system, replaceable science node, and extendable advanced sensor unit are major component of this system. Twenty sensor units will be installed in the seismogenic zone with mega-thrust earthquakes in the four year period from 2006.

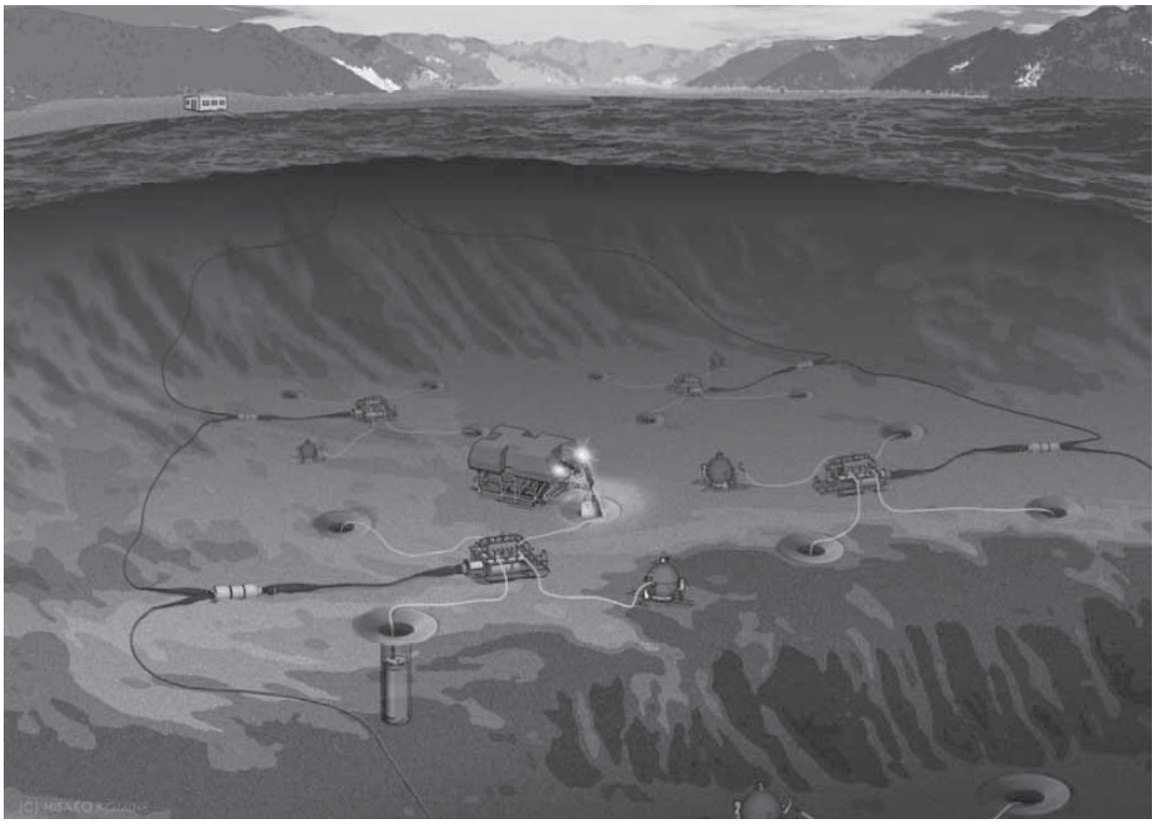

Figure 1 Image of Dense Ocean-floor Network System for Earthquakes and Tsunamis (DONET).