



## **Structural Imaging around the SMS Deposits by the Series of New High-resolution Seismic Surveys**

Eiichi Asakawa (1), Kenji Tara (1), Shutaro Saito (1), Masafumi Kato (1), Fumitoshi Murakami (1), Hitoshi Tsukahara (1), Tomonori Sumi (2), Kazuyuki Kadoshima (3), and Masami Kose (4)

(1) J-MARES/JGI, Tokyo, Japan (eiichi.asakawa@jgi.co.jp), (2) J-MARES/NSENGI, (3) J-MARES/MMTEC, (4) J-MARES/JAPEX

In 2014, the Strategic Innovation Promotion Program (SIP) was launched by "the Council for Science, Technology, and Innovation (CSTI)" in Japan. It is an interdisciplinary program among government, academy and industry. It addresses eleven issues selected by consideration of the critical social need. "Next-generation technology for ocean resources exploration (Zipangu in the Ocean program)" is one of the biggest SIP issues. There are four main subjects; integrated survey system, scientific research, technology development and ecological studies. Two private sectors, J-MARES and JAMSA, are involved in the integrated survey system. It aims to establish the survey protocol for buried SMS deposit exploration. As a part of this subject, J-MARES has proposed multi-stage and integrated approach for SMS exploration. It includes not only seismic survey but electromagnetic, gravity, magnetic, and so on.

Among the geophysical tools, seismic surveys are very important from the viewpoint of its resolution. Moreover we found seismic facies gives us the more information to specify the location of SMS deposit. We propose the package of three reflection seismic surveys to focus the SMS potential area, especially for buried SMS deposits. It consists of ACS (Autonomous Cable Seismic) and 3DVCS (3D Vertical Cable Seismic) and which we have proposed so far and ZVCS (Zero-offset Vertical Cable Seismic) which was first conducted in this research. ZVCS is a deep-tow exploration system using an upstanding cable. It is possible to easily separate and extract only a reflection wave from just below the ZVCS by vertically arranged hydrophones.

In 2016, we carried out a Multi-Stage Exploration in the Izena Hole, which is one of the most promising hydrothermal SMS areas around Japan. One of the purpose of this study is to understand the characteristic seismic facies of hydrothermal field and to show that the SMS deposit can be detected by this method. The results of these high-resolution surveys show the follows: First, the lower boundary of the massive sulfide in the sedimentary layer can be identified by negative-polarity reflections. Second, a strong hydrothermal alteration zone can be identified as a low amplitude area. Third, massive sulfide deposits in hydrothermal activity area can be identified by velocity model and characteristic seismic facies. These results provided variable information to geologists and we conclude the series of seismic surveys is a promising survey method for SMS deposits exploration.