Long Term Strategy for the Development of JAMSTEC Cabled Observatories

Hitoshi Mikada, Katsuyoshi Kawaguchi, Tadanori Goto, Ryoichi Iwase, Kyohiko Mitsuzawa, Kenji Hirata, Yuka Kaihom Kiyoshi Suyehiro

mikada@jamstec.go.jp, kawak@jamstec.go.jp, tgoto@jamstec.go.jp, iwaser@jamstec.go.jp, mitsuzawak@jamstec.go.jp, hiratak@jamstec.go.jp, kaihoy@jamstec.go.jp, suyehiro@jamstec.go.jp
Japan Marine Science and Technology Center

Around Japan, 5 cabled systems were constructed; off-Omaezaki in 1980 and off-Boso in 1985 by JMA, off-Sagami in 1995 by NIED, off-Ito in 1993 and off-Sanriku in 1997 by ERI. In the past years, JAMSTEC started a project to build submarine seismic/tsunamic stations offshore Japan to aid the Japanese national plan to construct cabled submarine seismic observatories in the other 5 candidate areas for promoting earthquake research. Three JAMSTEC real-time cabled observatories are now operating on the seafloor, (i) off-Hatsushima (8 km cable length; test site), (ii) off-Muroto (120 km cable length), and (iii) off Kushiro-Tokachi (240 km cable length) in the course of our long term strategy in the development of on-line realtime seafloor systems.

In the course of the installation of cabled seafloor observatories, we have considered three development phases in terms of the information transmission and power supply mechanisms. In the first phase of the development, the Off Muroto system was installed in 1997 by gathering the-state-of-the-art information technologies in optical-fiber signal transmission systems to estabilish a uni-cable observation system composed of an in-line seismic station and cable-end observatory with multi-purpose sensors. Power supply system is of constant current system which had been used in many other seafloor telecommunication lines. The second phase is the establishment of main-cable branching. The off Kushiro-Tokachi system belongs to early second phase product and was built in 1999 about a year ago. Power supply system is of the constant current and the branched observatories must have independent power from the main cable system. In 2001 or lator, a mobile seismic observatory will be connected to the main cable using deep-tow cabling system which is capable to extend an optical cable up to 10 km length, although the power supply capability still remains as a hurdle for the real branching of the system. The third phase of the cabled system would be of multi-landing, fail-safe, realtime observatories which includes star-topology network after the hurdle of the power supply system has been cleared.

The accumulation of advanced technologies for the installation using cabling vessels, maintenance using ROV, collaboration with ODP, etc., is still on-going along with the data analysis using the existing cabled systems. As the national plan was originally for promoting earthquake research, micro-seismicity which may not be detected by developed land seismic observation network, etc., has become clear using these cabled systems. On top of these achievements, it turned out that the long-term sea floor observation had opened a variety of applications such as oceanological deep current observation, micro-pressure fluctuation possibly due to atmospheric earth tides, etc. We believe the continuing development of the system towards the third phase would be of great importance not only to understand processes in seismogenic zones but to inaugurate new geophysical studies including earthquake, global, offshore-technological researches. We are now also thinking that the introduction of new sensor technologies, the international collaboration during the development of systems or the standardization of branching interfaces would also be very important for developing future areas in the frontier of the earth science.