NIED Observation Network for Earthquake, Tsunami and Volcano: MOWLAS

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Lessons from the 1995 Kobe earthquake, earthquake observation system in Japan has dramatically changed since then. The Headquarters of Earthquake Research Promotion was established, and NIED has constructed and operated nationwide land observation networks. These are composed of High Sensitivity Seismograph Network Japan (Hi-net: around 800 stations), Full Range Seismograph Network of Japan (F-net: 73 stations), Kyoshin Network (K-NET: around 1050 stations), and Kiban Kyoshin Network (KiK-net: around 700 stations) that started to operate since 1996 a year after the 1995 earthquake, and the networks was completed around in 2000.
On the other hand, seafloor observations were largely delayed than land observations. Seafloor cable system observations for earthquake and tsunami were installed in off Tokai in 1979 (JMA), off Boso in 1985 (JMA), Sagami bay in 1996 (NIED), off Sanriku in 1996 (ERI, Univ. Tokyo), off Muroto in 1997 (JAMSTEC), Kushiro/off Tokachi in 1999 (JAMSTEC), off Hatsushima in the Sagami bay in 2002 (JAMSTEC), off Tonankai in 2008 (JMA). However these observation systems have only several stations without spatial distribution. Toward the spatial observation, JAMSTEC started to install DONET1. During the 2011 Tohoku-Oki earthquake, 10 stations obtained the data. Finally, 51 stations in total were installed including DONET2 to cover off Kii peninsula. DONET was transferred from JAMSTEC to NIED. For Eastern Japan, NIED established Seafloor realtime observation network for earthquakes and tsunamis along the Japan Trench (S-net: 150 stations) to cover off Hokkaido to off Boso peninsula was established for earthquake and tsunami early warning as well as information delivery. The above six observation networks and Fundamental Volcano Observation Network (V-net), NIED has started integrated operation of MOWLAS (Monitoring of Waves on Land and Seafloor) as the NIED Observation Network for Earthquake, Tsunami and Volcano.
Direct observation above the hypocenter has an advantage from both research purpose and earthquake and tsunami early warning. By using S-net and DONET observation data, the ground motion and tsunami detection can be earlier around 30 s and 20 min, respectively. This will contribute to increase lead time and accuracy for JMA operation and control systems by private companies. NIED preliminary analyses show to increase the detection capability of offshore seismicity that may contribute the discovery of new offshore phenomena. Seafloor observation needs the cost rather than land observations. Due to severe observation condition, number of stations and data quality is limited. It is important to consider the balance between land and seafloor observations, as well as to promote the methods for analyses of integrated land and seafloor observation data.
The density of seafloor observation is not enough to cover necessary seafloor regions. From western Nankai Trough to Hyuga-nada regions where the potential of megathrust earthquakes exists, the observation is not densely done, and discussion started for future plan of new observation networks. In the discussion, extended function to connect observation system of seafloor crustal deformation is also proposed. Considering the cost, development of best-effort observation system is expected.

Keywords: MOWLAS, NIED Observation Network for Earthquake, Tsunami and Volcano, land observation network, seafloor observation network