Development and Construction of Nankai Trough Seafloor Observation Network for Earthquakes and Tsunamis: N-net

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Since the Japan Islands are located on the eastern margin of the Eurasian plate where the Pacific and the Philippine Sea plates are subducting, giant earthquakes have occurred repeatedly off the coast. Observation of earthquakes and tsunamis that occur in the ocean in the vicinity of their source area is important both for academic and disaster mitigation purposes. NIED S-net has densely monitored the area off the Pacific Ocean in eastern Japan, and in western Japan by NIED DONET and the JMA's Tokai and Tonankai cables, but the area from off Kochi to the Hyuga-nada, which is the western half of the anticipating Nankai Trough earthquakes, is a blank area of observation.

To fill in the blank, NIED is now constructing Nankai Trough Seafloor Observation Network for Earthquakes and Tsunami (N-net) (e.g., Aoi et al., 2022, AGU; Aoi et al., 2021, UT). N-net consists of two subsystems, one offshore and one inshore, connecting two landing stations in Kochi and Miyazaki prefectures. Each subsystem has 18 observatories connected by a fiber-optic cable approximately 900 and 740 km long, for a total of 36 observatories. Each observatory is equipped with two pressure gauges for tsunami observation and two accelerometers and short-period velocity meters for earthquake observation to ensure redundancy. For installation on the N-net, NIED has developed a pressure gauge that is less susceptible to pressure measurement due to seismic shaking and attitude fluctuation, a pressure-resistant enclosure that transmits pressure accurately, and an implementation of IP packets on SDH payloads. N-net is designed as a hybrid system based on the inline system, but with the node system that allows for the future addition of observation equipment. With the construction of N-net, it is expected that earthquakes and tsunamis can be directly detected up to about 20 seconds and 20 minutes earlier, respectively.

We landed the cables for the offshore and inshore subsystems and installed the offshore subsystem mainly from October 2023 to January 2024. Experimental observations of the offshore subsystem began in July 2024 to confirm the quality of the data from which earthquakes and tides are observed. NIED operates a nationwide observation network for earthquake, tsunami and volcano (MOWLAS) which now consists of seven networks with more than 2,100 observation stations throughout Japan (Aoi et al., 2020, EPS). The offshore subsystem will begin full operation in the fall of 2024 and will be integrated as the eighth observation network of MOWLAS. As with other MOWLAS networks, the data will be open to the public and is expected to be utilized for earthquake and tsunami early warning as soon as possible. The inshore subsystem will be installed from the fall of 2024 to the beginning of the new year, and the construction of the N-net is scheduled to be completed in the spring of 2025. In this presentation, we will introduce an overview of N-net and the observed data.