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JAMSTEC

# DONET, an Ocean-Floor Observatory Network for Earthquakes and Tsunamis

DONET, the Dense Ocean-floor Network System for Earthquakes and Tsunamis (*) developed by JAMSTEC, has started sending all seismic data to the Japan Meteorological Agency (JMA) and the National Research Institute for Earthquake Science and Disaster Prevention (NIED) as of August, 2011. The DONET system was being deployed on the seafloor at depths between 1,900 to 4,300 meters, in the Kumano Basin, off the Kii peninsula (Fig.1). The area has been known as the seismogenic zones for mega-thrust earthquakes in the past and has a 70 percent occurrence probability of the next large earthquakes, including the so-called Tonankai earthquake over the next 30 years.
Equipped with seismometers and sensors to measure pressure from the water above, the DONET's underwater sensor packages can detect precisely any changes related to seismic activity. The data collected are transmitted in real-time to JAMSTEC, JMA and NIED via the dedicated line. Pressure anomalies can warn of the possible generation of a tsunami.

The dense and real time ocean-floor monitoring network of DONET will enable researchers to respond to seismic anomalies quickly, more than ten seconds faster than with land observatories (Fig. 2).
JMA is now gearing up to incorporate the DONET data into the nation's Earthquake Early Warning systems and other disaster prevention programs. Data from pressure sensors are expected to be incorporated in the future, aiming to enhance understanding and analysis of tsunami waves. The real-time data sets retrieved from DONET will also be used for research into the seismogenic mechanism and seismic linkage along the Nankai trough.

***DONET (Dense Ocean-floor Network System for earthquakes and Tsunamis)**
DONET is a cabled ocean-floor observatory network established to achieve real time monitoring of seismic and tsunami activities, in the focal region of the Tonankai earthquake in the Kumano Basin, off the Kii peninsula. The data collected are used not only to better prepare for earthquakes and tsunamis but also for clarifying mechanisms of earthquake generation. Using wired sensor packages on the sea bottom ranging from depths of 1,900 to 4,300 meters, DONET will allow for simultaneous and real-time measurements at multiple points, which had not been possible with conventional observatory networks. The looped backbone submarine cable extends from the land station in Furue, Owase City, in Mie Prefecture, to 125 km offshore. The total length of the cable is approximately 250 km. The cable is connected with five

branching units called nodes and each node is connected to four sensor packages, making 20 observatories. Each package comes with sensors including a seismometer and pressure gauge. The power is supplied via the backbone cable, and the optic fiber in it transmits data gathered at each package to the land station. The data are then transmitted to JAMSTEC, JMA and NIED using a dedicated line.
The DONET project falls under the umbrella of the "Development of the Dense Ocean-floor Network System for earthquakes and Tsunamis" which is funded by the Ministry of Education, Sports, Culture, Science and Technology.

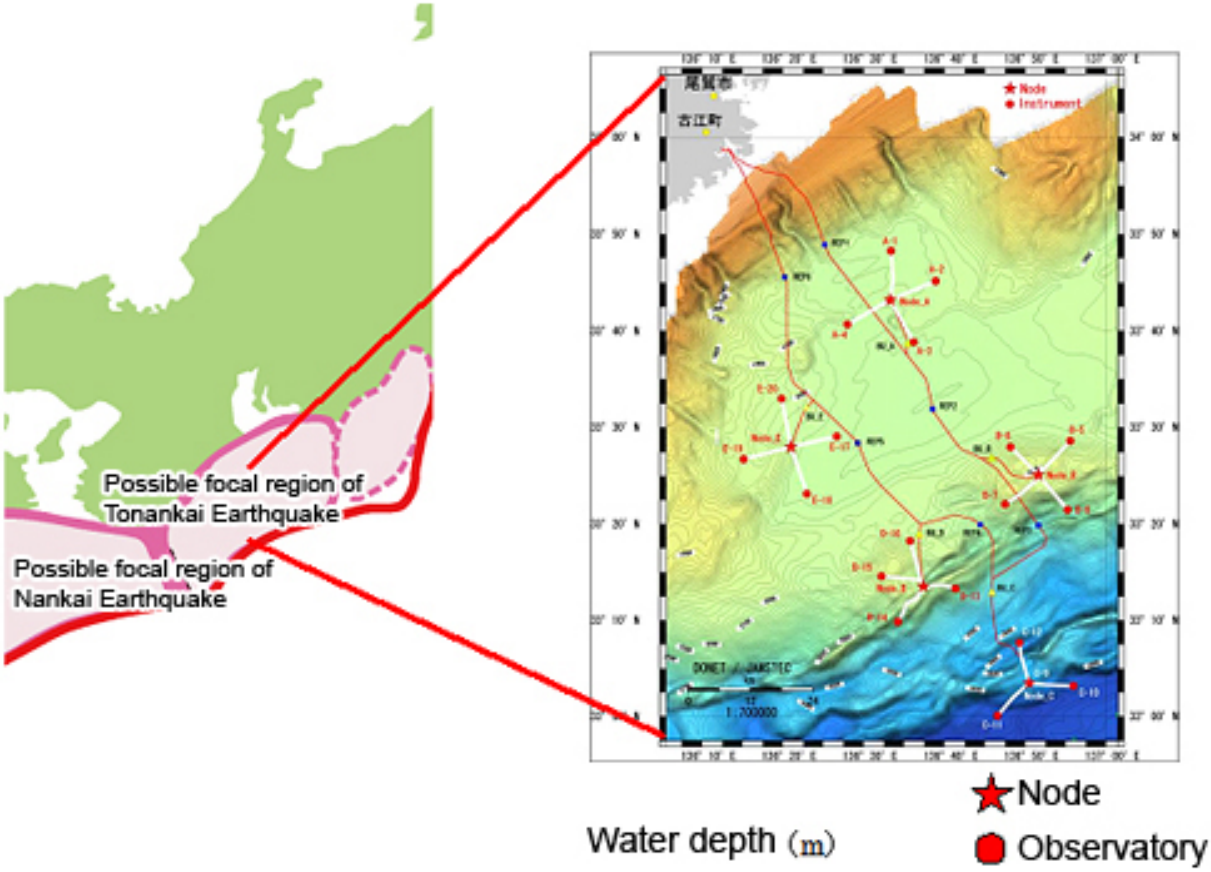


**Figure 1. DONET deployed site and the image of its Network**
The system is built in the possible Tonankai earthquake zone. Each observatory is equipped with a seismometers and pressure gauge

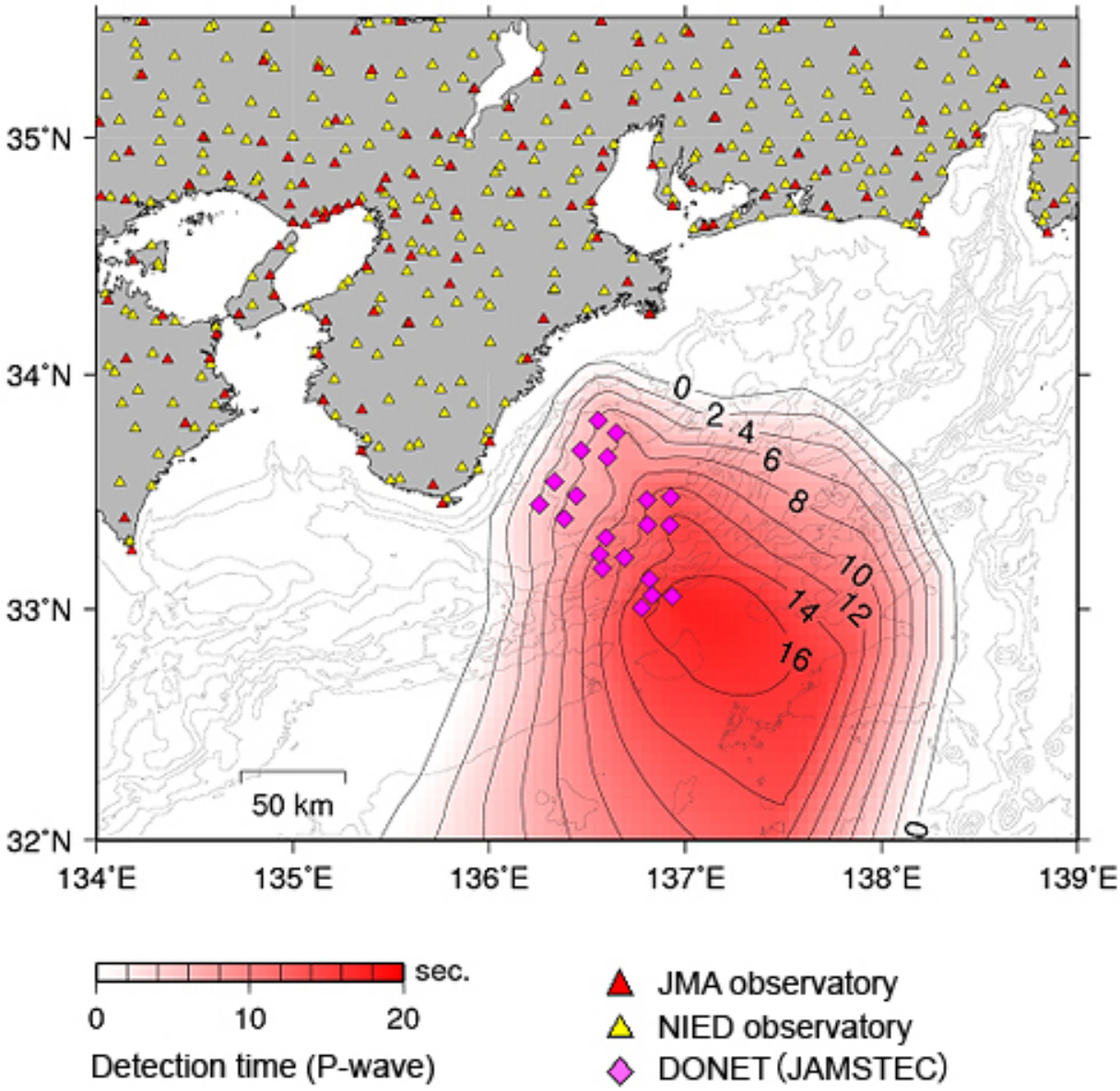


**Figure 2. Estimation of the difference of the arrival time (detection time) of seismic signals between DONET and land observatories**
The contour lines denote the difference in time between the detecting seismic signals of DONET and existing land observatories. Figures on the contours represent the time difference. For instance, when an earthquake occurred along line "16", the DONET system could detect seismic signals 16 seconds faster than its land counterparts. The difference in detection time is also shown in red. The denser the red is, the faster the DONET can detect seismic signals.
(Simulated by JAMSTEC)

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