# Real-time Monitoring of Strain Change around the Nankai Trough for Early Seafloor Crustal Deformation Detection

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JAMSTEC (Japan Agency for Marine-Earth Science and Technology) detected pore pressure changes at borehole stations off Kumano-nada in real-time in March 2018. This observation suggests that slow slip events (SSEs) have occurred repeatedly (Araki et al., 2017). The detection was made possible by integrating borehole array along dip direction with the DONET-1 (Dense Oceanfloor Network System for Earthquakes and Tsunamis) observatories near the source region of the 1944 Tonankai earthquake.

In November 2023, JAMSTEC installed pore pressure gauges and borehole fiber optic strain-meters at a new borehole observatory approximately 500 meters below the seafloor off the Kii Channel, using the deep-sea scientific drilling research vessel Chikyu. Subsequently, from December 2023 to January 2024, during the research vessel Shinsei Maru cruise, an unmanned research vehicle (ROV) named Hyper Dolphin was employed to lay submarine cables and connect the borehole observatory to DONET-2. This enabled the first real-time observation of crustal deformation around the source region of the 1946 Nankai earthquake through pore pressure and fiber optic strain changes

Hydraulic pressure gauges, both on the seafloor and in boreholes, capture not only crustal deformations, such as leveling changes and volumetric strain, but also atmospheric and oceanographic phenomena (Ariyoshi et al., 2024). Additionally, strain in the fiber optic cable is affected by seafloor temperature. The termination and updip-ward slip propagation of some SSEs also appear to be influenced by oceanographic variations, such as the Kuroshio meander (Ariyoshi et al., 2021b, 2024). To assess the impact of oceanic conditions on seafloor pressure, we have incorporated an ocean state nowcast/forecast system (JCOPE-T DA: Japan Coastal Ocean Experiment with Tidal current for Data Assimilation) into JAMSTEC's monitoring system for SSEs along the Nankai Trough.

In this presentation, we introduce examples of the observed SSEs and discuss current challenges in their early detection, such as the contribution for extra information about megathrust earthquakes along the Nankai Trough.