

SCORE Drilling: Preliminary results of Expedition 912-Leg 1 at Tokai, Nankai Trough, southwest Japan

*KanHsi Hsiung¹, Toshiya Kanamatsu¹, Ken Ikehara², Io Miura³, Juichiro Ashi³, Shuichi Kodaira¹, Kohsaku Arai², Natsumi Okutsu¹, Kan Aoike¹

1. Japan Agency for Marine-Earth Science and Technology, 2. Institute of Geology and Geoinformation, National Institute of Advanced Industrial Science and Technology, 3. The Atmosphere and Ocean Research Institute, The University of Tokyo

Chikyu Shallow Core Program (SCORE) is a short and shallow ocean drilling program, providing opportunities for scientific ocean drilling test and project which can complete in a short period of time by using the ocean drilling vessel (D/V) Chikyu except for IODP expedition period. The title of Expedition 912-Leg 1 is “Enigmatic recurrence pattern of Tokai earthquake in the Nankai Trough, southwest Japan: the link between great earthquakes and ridge subduction”. The objective of our program is to investigate the past earthquake occurrence from a continuous sedimentary sequence at a local tectonic basin (i.e., Kanasunose Trough) in the Nankai Trough. The target of this drilling program is to find an enigmatic recurrence pattern of Tokai earthquake in the Nankai Trough, southwest Japan. Hydraulic Piston Coring System (HPCS) of the D/V Chikyu can provide an opportunity to obtain an excellent long and continuous sedimentary record to unravel the earthquake recurrence pattern of this study area.

Expedition 912 was conducted by D/V Chikyu sailing from Shimizu to Sasebo, Japan from 4 January - 15 January 2020. The Leg 1 of Expedition 912 was cored Hole A and B in Site C9035. The penetration depth at site C9035 is 80.19 meters with HPCS drilled from 5 January to 8 January 2020. The site of Hole A is at 34°5.7000' N, 138°8.0300' E with 2413.5 meters of water depth in the Kanasunose Trough, the Nankai Trough. Because mud line cannot be identified in Hole A, Hole B was drilled in 10-m southeast to Hole A. Hole B is at 34°5.6962' N, 138°8.0346' E with 2414.0 meters of water depth. The cores including 9.5 m thick of Hole A and 80.0 m thick of Hole B was retrieved. Core recoveries are 105.3% and 104.7% of Hole A and Hole B, respectively. The shipboard measurements of whole-round cores involved X-ray CT scan and multisensory core logger (MSCL). After splitting, we conduct measurements including visual core description, smear slides, split surface image, paleomagnetic measurement by superconducting rock magnetometer, penetration strength, and moisture and density measurements, and Vane shear test.

The sedimentary succession is dominated by silty sediments with numerous coarse-grained (coarse silt–very fine sand) layers and some volcanic ash layers and spots. Two lithological units (Unit I and II) can be distinguished based on sedimentary facies. Unit I (0–42.1 m) consists of bioturbated silt and layered coarse silt–very fine sand with massive silt. Three ashes were founded in Unit I and will provide good age control. Layered coarse silt–very fine sand beds with fining upward pattern can be regarded as turbidite beds. Unit II (42.1 m–80.19 m) is characterized by matrix-supported gravelly mud–muddy gravel and angular mudstone gravel. In the downhole variation changes in around 42 m also can be observed in the GRA density, Natural Gamma radiation, and Electric resistivity. The future work will focus on the significant turbidite beds which could be related to earthquakes, and to evaluate the recurrence intervals of earthquakes in Unit I. After integration of post-cruise measurements, the relationship between great earthquakes and ridge subduction of Tokai earthquake in the Nankai Trough will be expected.

Keywords: Turbidite, Paleoseismology, Tokai earthquake, Nankai Trough