

【Grant-in-Aid for Specially Promoted Research】

Science and Engineering (Mathematics/Physics)



Title of Project : **Uncover processes of slips-to-the-trench, their past and present**

Ryota Hino

(Tohoku University, International Research Institute of Disaster Science, Professor)

Research Project Number : 26000002 Researcher Number : 00241521

Research Area : Solid earth and planetary physics

Keyword : Earthquake phenomena, Crustal movement/Sea floor crustal movement, Tectonics

【Purpose and Background of the Research】

The huge coseismic slip of the 2011 Tohoku earthquake (Mw 9.0) near the Japan Trench caused devastating tsunamis along the northeast coast of Japan. Since then, the mechanical behavior of the shallowest part of the plate-boundary fault has drawn worldwide attention. We conduct a multidisciplinary research project to elucidate the history of recurring tsunamigenic slips near the trench (slips-to-the-trench, STT) before the 2011 earthquake and transient processes on the fault since the massive rupture of 2011.

【Research Methods】

In the 5-year project, we will: 1) Conduct high-resolution seismic surveys and use the resultant data to both elucidate the spatial extent of past STT events and identify deformation structures characteristic of STT events. 2) Determine the timing of past STT events by collecting sub-seafloor sedimentary core samples and identifying and dating earthquake-generated turbidite layers. 3) Identify postseismic deformation processes in the Japan Trench by

(OBS), monitoring absolute pressure (OBP), and monitoring relative motion of the seafloor across the plate-boundary fault, by acoustic distance measurement (ADM).

【Expected Research Achievements and Scientific Significance】

Systematic studies on past STT events will improve our understanding of the space-time history of large earthquakes, which has mostly derived from geological studies on tsunami deposits along coasts. The space-time history of large earthquakes will provide clues to understanding why earthquakes of $M < 8$ have been frequent and those of $M \sim 9$ infrequent in the same subduction system, a fundamental question raised by the 2011 Tohoku earthquake.

Since STT increases size of tsunamis associated with megathrust earthquakes, history of past STTs is crucial for evaluating tsunami hazard in regions facing to subduction zones. This project will establish a methodology to clarify reliable recurrence history of STTs in subduction zones in the world.

【Publications Relevant to the Project】

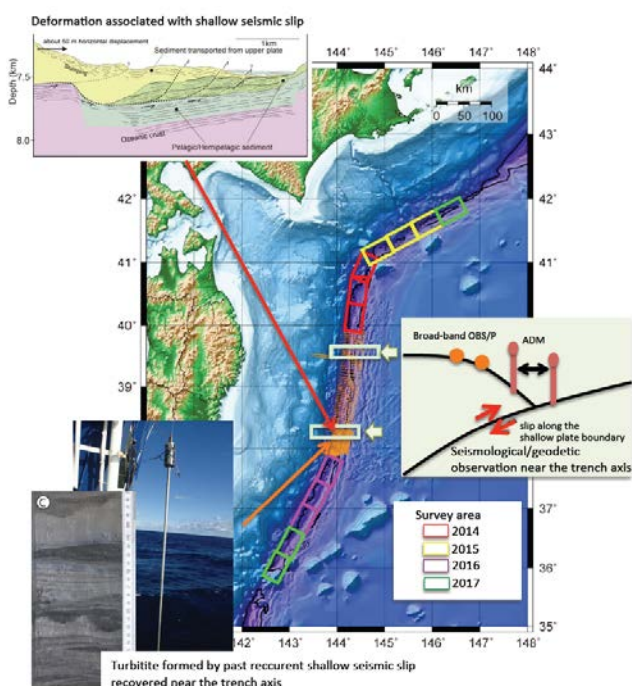
- Ito, Y., T. Tsuji, Y. Osada, M. Kido, D. Inazu, Y. Hayashi, H. Tsushima, R. Hino, and H. Fujimoto (2011), Frontal wedge deformation near the source region of the 2011 Tohoku-Oki earthquake, *Geophys. Res. Lett.*, 38, L00G05, doi:10.1029/2011GL048355
- Kodaira, S., T. No, Y. Nakamura, T. Fujiwara, Y. Kaiho, S. Miura, N. Takahashi, Y. Kaneda, and A. Taira (2012), Coseismic fault rupture at the trench axis during the 2011 Tohoku-oki earthquake, *Nature Geoscience*, 5(9), 646-650, doi:10.1038/ngeo1547

【Term of Project】 FY2014-2018

【Budget Allocation】 426,100 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.jdash.org>



using dense arrays of broadband seismic sensors