



Title of Project : Science of Slow Earthquakes

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Research Project Number : 16H06472 Researcher Number : 40462501

【Purpose of the Research Project】

Our research will shed light on the mystery of “slow earthquakes”, which have been detected in succession in recent years. This will require an approach integrating the conventional fields of geophysics, seismology, and geodesy with materials science and non-equilibrium statistical physics, among others. By explaining the mechanisms, environmental conditions and principles of slow earthquakes, our goal is to accelerate a unified understanding of all earthquake events, from low-speed deformation to high-speed slip, and at the same time, to rebuild the way research is conducted on earthquakes.

【Content of the Research Project】

It has been less than 20 years since the discovery of slow earthquakes, and their basic mechanisms are still largely unknown. They occur deep underground, and the materials and physical conditions at that depth are also unknown. Furthermore, the physical laws governing these events clearly differ from those for regular earthquakes, and a qualitative understanding of these events is still sorely lacking. To shed light on such slow earthquakes, we will conduct research in the following areas using a multidisciplinary approach.

- Research topic (A): Explaining the mechanisms involved in the occurrence of slow earthquakes
Using temporal seismic and geodetic observations at inland and offshore areas, and advanced data analysis techniques, we will determine the size and location of slow earthquakes, as well as their spatiotemporal variation, with high precision and high resolution.

- Research topic (B): Explaining the environment in which slow earthquakes occur

By comparing geophysical data obtained from structural explorations with observations based on materials science and rock mechanics experiments, we will reveal the subsurface structure, material composition, and heterogeneity of regions where slow earthquakes occur.

- Research topic (C): Explaining the principles by which slow earthquakes occur

Combining large-scale numerical simulations with basic physical theories and analogue

experiments, we will explain physical laws governing slow earthquakes and the physical conditions at their locations.

【Expected Research Achievements and Scientific Significance】

This study will reveal the relationship between slow and huge earthquakes will enable us to provide the basic information for preventing or mitigating disasters via long-term assessment of major earthquake occurrence and other methods. As the occurrence of slow earthquakes is easier to predict than that of regular earthquakes, they are arguably at the frontier of our earthquake prediction ability. Clearly explaining slow earthquakes should serve to broaden our collective knowledge of the possibilities and difficulties of predicting typical earthquakes.

Japan is currently at world-class level in slow earthquake research. Putting our efforts toward reaching the next level will secure our leadership in international research collaboration, and the resulting research network will also be a great benefit to our international contribution by leveraging it for giving recommendations on earthquake disaster prevention policies to other countries at risk of earthquakes.

【Key Words】

Slow earthquake: An earthquake event with a fault rupture that progresses slowly compared to regular earthquakes. Since around the year 2000, various types of slow earthquakes have been found all over the world, mainly in subduction zones.

Subduction zone: Region where an oceanic plate submerges under a continental plate. Huge earthquakes occur at the interface between such plates, while the main regions generating slow earthquakes are the vicinities of huge earthquake seismogenic zones.

【Term of Project】 FY2016-2020

【Budget Allocation】 1,070,800 Thousand Yen

【Homepage Address and Other Contact Information】

<http://www.eri.u-tokyo.ac.jp/project/sloweq>