

【Grant-in-Aid for Transformative Research Areas (A)】

Section II



Title of Project : Science of Slow-to-Fast Earthquakes

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【Purpose of the Research Project】

Our understanding of earthquakes has been revolutionized by the discovery of slow earthquake phenomena. In ordinary ‘fast’ earthquakes faults rupture rapidly, causing strong ground shaking. Slow earthquakes are also due to fault rupture, but slip occurs more slowly and there is no strong shaking. Since their discovery at the beginning of this century slow earthquakes have been recognized in many regions of the world (Fig. 1), and we now know many of their characteristics. Slow earthquakes represent a different physical process from fast earthquakes, and they are sometimes observed before large earthquakes. However, there is no good understanding of how the two types of earthquakes are linked. Therefore, we are combining insights from multiple fields applied to a wide range of earthquake phenomena relevant to both slow and fast earthquakes with the aim of recasting our understanding of earthquake phenomena, which can enable improved forecasting for future earthquakes.

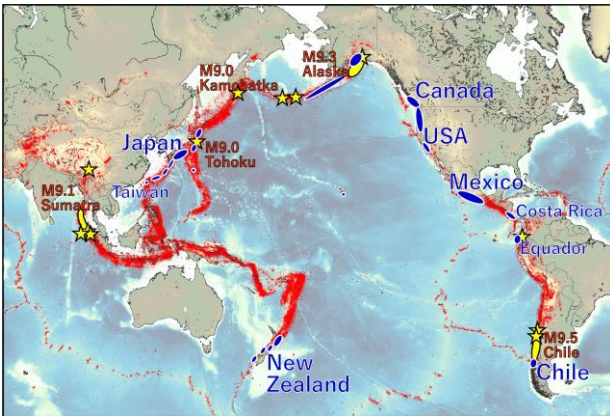


Fig. 1: Slow (blue), fast (red), and giant earthquakes in the world

【Contents of the Research Project】

This Research Area includes not only seismology and geodesy, but also geology and geochemistry needed to understand sub-surface earth materials, and the fundamental physics needed to clarify the laws of friction and fracture. Researchers from engineering with knowledge of new observation technologies and from information science and statistics with expertise in data science will also participate. To ensure effective collaboration among the different fields, six research groups were established (Fig. 2): the A01 Experimental Physics, A02 Structural Anatomy, and A03 International Comparison Groups with the aim of deepening interdisciplinary research; and the B01 New Technology

Observation, B02 Information Science, and B03 Model & Forecast Groups with the aim of expanding the Research Area. About 100 researchers and numerous students are participating in the project, including those in publicly offered research

To promote collaborative research within and outside the Research Area, we will hold numerous meetings including and annual international workshop, and promote use of shared facilities and databases. We will foster international collaboration through workshops held overseas and researcher exchange programs. We will disseminate scientific knowledge about earthquakes through outreach activities both in Japan and abroad.

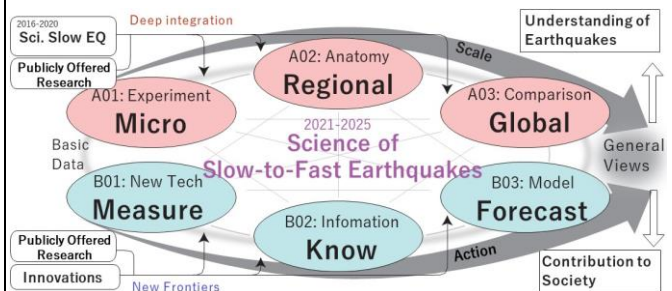


Fig. 2: Research area and six research groups

【Expected Outcomes and Scientific Significance】

We will integrate knowledge from various fields to develop an innovative scientific understanding of earthquakes, a natural phenomenon of great societal importance. We will incorporate new technologies from engineering and information science and help refine these technologies. This project will improve the ability of the research community to provide scientific advice to national and local government on future earthquake countermeasures.

【Key Words】

Slow earthquake: A geophysical phenomenon that releases strain energy accumulated by long-term plate movement through slow slip on faults. Slow earthquake duration can be less than a second, minutes, hours, days, or months. Intermittent events are called tectonic tremor, while large, long-duration events are called slow slip.

【Project Term】 FY2021-2025

【Budget Allocation】 1,092,400 Thousand Yen

【Homepage Address and Other Information】

<https://slow-to-fast-eq.org/>