Oral | Symbol S (Solid Earth Sciences) | S-SS Seismology

[S-SS32_1AM1]Fault Rheology and Earthquake Dynamics

Convener:*Kiyokazu Oohashi(Graduate School of Science, Chiba University), Takeshi Iinuma(International Research Institute of Disaster Science, Tohoku University), Wataru Tanikawa(Japan Agency for Marine-Earth Science and Technology, Kochi Instutute for Core Sample Research), Yuta Mitsui(Department of Geosciences, Graduate School of Science, Shizuoka University), Chair:Kiyokazu Oohashi(Graduate School of Science, Chiba University), Yuta Mitsui(Department of Geosciences, Graduate School of Science, Shizuoka University)

Thu. May 1, 2014 9:00 AM - 10:45 AM 315 (3F)

Interdisciplinary discussions on the rheology of seismogenic faults and earthquake generation processes among the following specialists; (1) fault rocks and fault zones, (2) theoretical and numerical studies on earthquake dynamics, and (3) seismology and geodesy. Presentations on fault-zone drilling projects are also welcome.

10:30 AM - 10:45 AM

[SSS32-P05_PG]Frictional property of rocks in the Izu-Bonin-Mariana Forearc under high temperature and pressure conditions

3-min talk in an oral session

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Keywords:Friction, Izu-Bonin-Mariana Forearc (IBM), slow earthquake, stick-slip, earthquake

The Kanto region lies atop of three tectonic plates: the North American Plate, the Pacific Plate, and the Philippine Sea Plate. In addition, the collision and subduction of the Izu-Bonin-Mariana (IBM) arc into the Kanto region results in a characteristic tectonic setting as compared with other convergent margins. Due to such complicated plate configuration, the different type of earthquakes including seismic slip (e.g., the Kanto earthquake) and aseismic creep (i.e., slow earthquake of Boso peninsula) occurs at the intra-plate and plate boundaries beneath the Kanto region. Moreover, the different type of events seems to take place side by side at almost same depth (probably nearly same P-T conditions). Although many factors including pore fluid pressure and fault topography can control earthquake generation, this study focus on frictional property of incoming materials to be subducted into the Kanto region in order to examine a hypothesis that the different types of slips arise from different input materials. Thus, we have performed friction experiments on rocks that constitute the IBM forearc using a high P-T gas medium apparatus at AIST. We sampled five rocks (marl, boninite, andesite, sheared serpentinite and serpentinized dunite) recovered from the IBM forearc by Leg 125, Ocean Drilling Program (ODP Site 784, 786). The rocks were crushed and sieved into 10~50 μm in grain size. Then, the rock powders were sandwiched between saw-cut alumina cylinders and sheared at temperature of 300°C, confining pressure of 156MPa, pore pressure of 60MPa and axial displacement rates of 0.1 and 1 μm/s. The sheared serpentinite and serpentinized dunite exhibit steady-state friction of 0.55 and 0.35-0.41, respectively and their velocity dependence of friction is positive (velocity strengthening behavior). On the other hand, for marl, boninite and andesite, a periodic stick-slip behavior appears at 1 μm/s. However, contrary to a stick-slip behavior at room temperature in general, rise time of the stick-slip behaviors are

quite long (3.9, 9.3 and 10.8 sec, respectively), that could be called as a " slow stick-slip". Similar slow stick-behavior were observed in halite and serpentinite slipped at high temperatures (Noda and Shimamoto, 2010; Okazaki, 2013), but this is first time to recognize this unique slip behavior in sedimentary and igneous rocks. Although it is difficult to discuss the diverse slip behaviors observed at the Kanto region based on our limited experimental results, we will examine the conditions where the transition between stable and unstable sliding appears using the input materials and explore the generation mechanisms of earthquakes at the Kanto region.