[JJ] Evening Poster | S (Solid Earth Sciences) | S-CG Complex & General

[S-CG63]Rheology, fracture and friction in Earth and planetary sciences

convener:Osamu Kuwano(Japan Agency for Marine-Earth Science and Technology), Ichiko Shimizu(Department of Earth and Planetary Science, Graduate School of Science, University of Tokyo), Hidemi Ishibashi(静岡大学理学部地球科学専攻, 共同), Miki Tasaka(Shimane University)

Sun. May 20, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

The aim of this session is to join people from various research area in the earth and planetary sciences and to stimulate discussion beyond the boundaries of each research area. Our goal is to deepen our understanding of dynamics in geosciences by looking over whole areas in the earth and planetary sciences from the viewpoint of PHYSICS OF DEFORMATION, FLOW, AND FRACTURE. We welcome any field (e.g., earthquake, volcano, earth surface, crust, mantle and the core, and other planets and satellites) and any approach (e.g., laboratory experiments, numerical simulations, field observations, and theories).

[SCG63-P08]Dilatancy of ultra-mafic and mafic rock under triaxial compression test

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The Moho is defined as a discontinuity in terms of P-wave velocity and regarded as the boundary between crust and mantle, however its objective substance hasn’t been revealed perfectly. Some anomalies of seismic wave velocity were observed at the oceanic Moho by the reflected wave observation, which doesn’t correspond to the Moho as such a sharp boundary (e.g. Kasahara et al., 2008). Therefore, a valid substantial model of the Moho to explain the seismic wave velocity structure has been demanded. Seismic wave velocity is greatly affected by porosity, thus it is possible that dilatancy: inelastic volume dilation induced by opening of axial micro-cracks in deformed rocks, causes decrease in seismic wave velocity leading to the anomalies at the Moho. In this research, physical properties about dilatancy of mafic rock and peridotite which are typical substances of crust and mantle respectively were experimentally investigated under tri-axial compression.

Tri-axial compression tests were conducted on cylindrical specimens of mafic granulite and peridotite collected from Horoman. All the experiments were done with Intra-Vessel Deformation and Fluid-Flow Apparatus at constant strain rate (4.2×10^{-6} s^{-1}), confining pressure (20 MPa) and room temperature. During tests strain measurements were performed with strain gauges stuck on the specimens.

The experimental results showed that the onset of dilatancy of mafic rock ranged from 40 % to 65 % of the maximum differential stress and the volume dilation ranged from 0.6 % to 1.0 %, which are similar to those of granite (e.g. Brace et al, 1966). On the other hand, the onset of dilatancy of peridotite was higher than 75 % and the dilation was less than 0.3 %. Furthermore, it seemed that the onset of dilatancy delays and the volume dilation decreases with increase in Young’s modulus. This relation is considered to be reasonable from the theoretical mechanism of crack behavior in deformed rocks (e.g. Bieniawski, 1967). These differences of dilatant behaviors indicate that the crack distributions and/or geometries are different between crust and mantle and the seismic anomalies can be induced at the Moho.