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

[S-CG57]Dynamics in mobile belts

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The dynamic behaviours of mobile belts are expressed across a wide range of time scales, from the seismic and volcanic events that impact society during our lifetimes, to orogeny and the formation of large-scale fault systems which can take place over millions of years. Deformation occurs on length scales from microscopic fracture and flow to macroscopic deformation to plate-scale tectonics. To gain a physical understanding of the dynamics of mobile belts, we must determine the relationships between deformation and the driving stresses due to plate motion and other causes, which are connected through the rheological properties of the materials. To understand the full physical system, an integration of geophysics, geomorphology, and geology is necessary, as is the integration of observational, theoretical and experimental approaches. In addition, because rheological properties are greatly affected by fluids in the crust and fluid chemical reactions, petrological and geochemical approaches are also important.
After the 2011 great Tohoku-oki earthquake, large-scale changes in seismic activity and regional scale crustal deformation were observed, making present-day Japan a unique natural laboratory for the study of the dynamics of mobile belts. This session welcomes presentations from different disciplines, such as seismology, geodesy, tectonic geomorphology, structural geology, petrology, and geofluids, as well as interdisciplinary studies, that relate to the dynamic behaviour of mobile belts.

[SCG57-P29]Simultaneous measurements of elastic wave velocity and electrical conductivity in brine-saturated rocks under confining pressures

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Keywords:elastic wave velocity, electrical conductivity, crack

Geophysical mapping of fluids is critical for understanding crustal processes. Seismic velocity and electrical resistivity structures have been revealed to study the fluid distribution. However, the fluid distribution has been still poorly constrained. Observed velocity and resistivity should be combined to make a quantitative inference on fluid distribution. The combined interpretation requires a thorough understanding of velocity and resistivity in fluid-saturated rocks. We have made measurements of elastic wave velocities and electrical conductivity in brine-saturated rocks under confining pressures, and examined pore structures with SEM.
Measurements and observations were made on two granite (Aji and Ohshima), one peridotite (Horoman) and one serpentinite (Hakuba). Cylindrical rock samples (D=26 mm, L=30 mm) were filled with 0.1 M KCl aqueous solution, and velocity and conductivity were simultaneously measured by using a 200 MPa hydrostatic pressure vessel. The pore-fluid was electrically insulated from the metal work by using plastic devices. The confining pressure was progressively increased up to 150 MPa, while the pore-fluid pressure was kept at 0.1 MPa. It took 3 days or longer for the electrical conductivity to become stationary after increasing the confining pressure.
Two granitic samples showed moderate increase in velocity and large decrease in conductivity under confining pressures. Electrical conductivity steeply decreased at low pressures (<20 MPa) and then showed gradual decreases. Grain boundary cracks are pervasive in granite rock samples. The increase in

velocity and decrease in conductivity at low pressures is caused by the closure of grain boundary cracks with small aspect ratios ($<10^{-3}$). SEM images show that the aperture of a grain boundary crack varies along its width. Large aperture parts can be open even under high pressures to be conduction paths. The difference in conductivity at high pressures must reflect the difference in the amount of large aperture parts. Peridotite and serpentinite samples showed small increase in velocity and small decrease in conductivity. Compared with granite samples, there must be a few cracks in these rock samples. Large aperture parts provide interconnected paths for electrical conduction.