主　論　文　要　旨

論文題名

The study on applicability of the rock fracture experiments to seismology

ふりがな　　なな　　よしみつ
氏名　　Nana YOSHIMITSU

主論文要旨

The preparation process prior to an earthquake has to be revealed to understand physics of earthquake generation. However, it is difficult to clarify the detailed rupture process through seismic observations deployed away from the source region. Thus, laboratory experiments have been performed to investigate a faulting process through direct observation and elastic wave observations in the vicinity to the source. We developed a broadband recording system for triaxial experiments, and achieved to apply seismic analysis techniques for elastic waves in laboratory. With this system, we repeatedly transmitted elastic waves through a fracturing rock sample, and found seismic attenuation change in the fault zone corresponding to the rupture development. Despite such findings, it is still unclear weather the findings in laboratory could be used for field scales. We analyzed the temporal changes in repeating earthquake spectra transmitted through a source fault zone in a South African gold mine, where seismographs were installed nearby a fault. The seismic attenuation showed an increase in pre- and co-seismic periods, as was observed in laboratory, which suggested the rupture preparation process in field scale is identical to that for rock samples. Before applying findings obtained in laboratory to field scales, we should know whether the self-similarity that is well-known for earthquakes is held down to micro rupture scales in rock samples, because there is a large scale gap. We developed a multi-channel, broadband, and continuous recording system which enabled us to estimate the source parameters of micro ruptures in rock samples. The source parameters obtained in the triaxial rock fracture experiment satisfied the same self-similar relationship as that for natural earthquakes. This implies that micro ruptures in laboratory and natural earthquakes are the same physical phenomena. Therefore, we concluded that the findings obtained in laboratory experiments could be used to understand natural earthquakes.