

# Fractoemission of rocks

# Akito Tsutsumi[1]

[1] Kyoto Univ.

Various electromagnetic anomalies have been reported as potential candidates for a precursor signal of earthquakes. Several physical models for the mechanism that causes the observed anomalous signals were proposed. Those include water-induced electrokinetic effect, the piezoelectric and related effect of quartz, and so forth. It can hardly be said, however, the possible theories have been established for the mechanism for the observed electromagnetic phenomena. Brittle materials emit charged particles upon fracturing, which include electrons, positive ions, and associated electromagnetic waves. These phenomena are collectively referred to as fractoemission. Recently, several papers have linked the electric anomalies accompanying rock fracture to fractoemissions. In this talk, we briefly review the previous work on fractoemission of rocks, and then show our recent experimental results of fracture tests of rocks at confined pressure conditions.

Fracture induced electric signals of rocks were measured at a confined condition within a pressure vessel. Electric signals were recorded as an electromagnetic field change between a pair of electrodes and of a coil set around a specimen. Our experimental results showed that at the moment of main failure, electromagnetic field change were observed for all tested specimens including samples that contain no quartz. For quartz-bearing rocks such as granite, the piezoelectric behavior of quartz should contribute to some extent to the observed signals during the precursory period to the fracture of dry rocks. Our results, however, confirmed that there are other important contributing factors to the observed signals.