Temporal change in the elastic wave velocity during the rock fracture evolution

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The elastic wave velocity to transmit in a rock sample under triaxial compression, is known to decrease in fracture nucleation area before fracturing (e.g., Yukutake, 1989; Masuda, 1998). Decrease in the elastic wave velocity can be explained with crack generation (e.g., Crampin, 1978), and it is suggested that increase in microcracks precedes the fracture.

There are few reports of the decrease in wave velocity preceding a natural earthquake. However, another phenomenon relating to crack generation, Yoshimitsu et al. (2007) found the wave attenuation became strong before major earthquakes. In addition, according to their result, the strengthening of wave attenuation only in the higher frequency. This suggests that there is the upper limit of crack size.

In the triaxial compression test, sensors having a strong resonance frequency of the only narrowband had been used. A new measurement system with broadband sensors having a band of ˜600kHz within -6db level was introduced by Kawakata et al. (2007).

In this study, we use this system and examine the frequency dependence of the change in the elastic wave velocity of the Inada granite under triaxial compression. Due tothe limitation of the system, we use P wave parallel to the sample axial direction which is thought to be parallel to the major axes of the most cracks. Then, remarkable velocity change cannot be expected, but we expect some new knowledge to be added.