

Effects of water content on the converse piezoelectric effect in granite with an Atomic Force Microscope

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Piezoelectric effect of quartz and behavior of piezo-compensating electric charges are possible mechanism of various seismo-electromagnetic phenomena¹⁾. In order to argue such electromagnetic phenomena quantitatively on this hypothesis, it is important to know the piezoelectric effects of granites in real state: real rocks show various water contents in the actual earth's crust.

We have adopted a converse piezoelectric measurement using an Atomic Force Microscope (AFM)²⁾. By this method, we can obtain a small displacement of granite sample of a few nm ranges. Then we changed the water content of a granite sample and measured the piezoelectric coefficient using the AFM. The water content was referred as a mass difference of the sample after a few days of inundation and that after drying at 60 degrees Celsius for 2 hours.

The piezoelectric coefficient of the granite sample decreased from 6×10^{-13} C/N after the inundation to 2×10^{-13} C/N after drying. The mass change was around -0.07%. The water contributed to the decrease of sample mass was supposed as adsorption water on this experiment condition. Preliminarily, the piezoelectric effect seems to be affected by water content in the rock. In our presentation, experimental results with precise control of water content will be reported.

1) M.Ikeya:

Why do Animals Behave Abnormally before Earthquakes?

-Birth of Electromagnetic Seismology

NHK Publisher, Tokyo(1998)(in Japanese)

2) T. Matsuda, C. Yamanaka and M. Ikeya : *Jpn.J.Appl.Phys.* 44,pp.968-971(2005)