

Deep originated (mantle-derived) CH₄ release by fracturing of rock obtained from Miyagawa shallow drilled core in Atotsugawa Fault

Tomohiko Saito[1]; Hidemi Tanaka[1]

[1] Dept. of Earth and Planet Sci., Univ. Tokyo

Methane gas anomalies with earthquakes have been observed in spring well or observation well around active fault, however few experimental studies have been done for this problem. Therefore the fundamental processes remain an open question. For example,

- (1) Where in rock the methane gas is?
- (2) What is the type of methane origin?
- (3) Where or not methane are necessarily released by rock fracturing

In order to examine the methane emission process and answer these questions, we performed grinding experiments under wet condition using fault rocks taken from Miyagawa shallow drilled core penetrating Atotsugawa fault.

Miyagawa drilled core was 200m in depth including several fault gouge concentration zones (fault core) and damaged zone. We took WPAR (Weakly Pulverized and Altered Rocks) from damaged zone as experimental samples. For the purpose of this experiment, WPAR were most appropriate samples because WPAR were most unfractured rocks in Miyagawa drilled core. We performed grinding experiment using these WPAR samples.

Result of the experiments show that positive relationships between surface area

[S] and amount of gas [n]. and the relationships can be expressed

as: $n = A(1 - \text{EXP}[-kS])$. The equation corresponds to solution:

$dn / dS = k(A-n)$. This differential equation indicates that methane gas contained in the rock sample was released by fracturing and release ratio (dn/dS) proportionate (A - n) which means the amount of methane gas remains in the rocks. And then A will be max amount of methane contained in a sample and k shows degree of evolution of gas when samples are crushed.

Isotope ratio of methane shows that these methane are primordial methane such as forming in mantle.