Methane gas amount released by rock fracturing -comparison between field and laboratory data to quantify gas anomaly -

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Methane gas anomaly is one of the precursory phenomena to earthquakes. This phenomenon can be interpreted as the result of intensification of micro-fracturing due to stress increasing during pre-earthquake period. Methane gases exist in crust in general, for example, in spring water as a component of dissolved gases or in fracture zone as a component of crustal gases. Continuous monitoring of methane and other gases have been done at spring wells and fracture zones to detect gas anomaly correlated with earthquake, because spring wells and fracture zones play a major role in conducting methane and other crustal gases in crust. The fact is that while some observations detected methane gas anomaly correlated with earthquakes, other observation did not detect methane anomaly. Including these uncertainty, there remain many open questions regarding the mechanism of methane gas anomaly due to uncertainty of conduit or amount of methane in crust. The aim of this study is to compare methane gas amount in the field and in laboratory, which considered to be released by rock fracturing.

We compared field observational data and laboratory experimental data. Field observational data shows methane gas amount extracted from drilled core, which plotted against depth from 50 m to 200m at Miyagawa, located in eastern part of Atotsugawa fault (Shimada et al., 2005). This data revealed the concentration pattern in cracks in fracture zone. Laboratory experimental data show the maximum amount of methane included in rock taken from Miyagawa drilled core (Saito and Tanaka, 2007). To compare methane amount in the same scale, we normalize methane gas amount to mol/kg. However, there are differences in this normalized methane amount between field and laboratory data. Normalized amount in the filed can be interpreted as amount in 1kg rock core which have been already fractured and normalized amount in the laboratory can be interpreted as amount in 1kg rock core when all 1kg sample was fractured. In presentation, we will discuss these differences in more detail.

References

Shimada, K., Saito, T., and Tanaka, H., (2005) H2 gas within the drilling core from the Atotsugawa active fault zone: preliminary report, *2005 JPGU abstract*

Saito, T., and Tanaka, H., (2007) Experimental study on chemical interaction between solid and fluid using core penetrating Atotsugawa fault fracture zone, *2007 JPGU abstract*