

## Geochemical variations of spring waters in the vicinity of fault before and after 1995 Kobe Earthquake in Japan

NISHIO, Yoshiro<sup>1\*</sup>, KAZAHAYA, Kohei<sup>2</sup>, YASUHARA, Masaya<sup>2</sup>

<sup>1</sup>JAMSTEC, <sup>2</sup>AIST

The 1995 Kobe earthquake (M7.2) is one of destructive intra-arc earthquake in the past 100 years. The geochemical results have demonstrated that chlorine contents of underground water in Kobe area increased since August 1994, which is 6 months before the earthquake, January 1995 (Tsunogai and Wakita, 1996). The highest Cl content was observed in water sample recovered at end of February, which is 90 days after the earthquake. It may be explained that the higher Cl contents observed in underground waters are attributed to the Cl-enriched deep crustal fluids. To reveal the relationship between earthquake and deep fluids, we have investigated variation of the chemical composition of spring water in the vicinity of the Kobe earthquake fault since 1952. The results show that the Na-K-Ca geochemical temperature increased at one year before the 1995 Kobe earthquake. After that, the geochemical temperature has decreased with the time. These results indicate that the fluid derived from the deeper part was detected in the spring water in the vicinity of fault in Kobe area.

### References:

Tsunogai and Wakita, 1995, Science 269, 61-63.

Keywords: geochemical thermometer, spring water, fault, geofluid, intra-arc earthquake, Southern Hyogo Earthquake

## Hot springs water and radon observations with the 2011 Tohoku Earthquake

TASAKA, Shigeki<sup>1\*</sup>, MATSUBARA, Masaya<sup>1</sup>, TSUNOMORI, Fumiaki<sup>2</sup>, MATSUMOTO, Norio<sup>3</sup>, HORIGUCHI, Keika<sup>3</sup>

<sup>1</sup>IMC, Gifu Univ, <sup>2</sup>GCRC, Univ. Tokyo, <sup>3</sup>Geological Survey of Japan, AIST

This report is the results of observation of changes in dissolved radon gas and hot spring water with the 2011 Tohoku earthquake, four in the hot springs of the central region, Japan.

The purpose of this study is to show the relationship between radon concentration and crustal strain variation and the hot water from the viewpoint of earthquake prediction, to clarify the relationship between groundwater and the occurrence of the earthquake.

Keywords: The 2011 Tohoku earthquake, Radon, Water, Hot Spring, Earth Quake Prediction, Crustal Strain

## Survey of Radon-222 Concentration in Groundwater in Miura Peninsula

MORITA, Masaaki<sup>1\*</sup>, MATSUYAMA Ryotaro<sup>1</sup>, TSUNOMORI, Fumiaki<sup>2</sup>, MORI, Toshiya<sup>2</sup>

<sup>1</sup>Univ. of Tokyo, School of Sci., Dept. of Earth Planetary Phys., <sup>2</sup>Univ. of Tokyo, Grad. School of Sci., Geochem. Res. Center

Active faults in Miura Peninsula, Kanagawa Prefecture, attract an attention from the Headquarters for Earthquake Research Promotion. Before Izu-Oshima-Kinkai Earthquake (Wakita et al., 1980) and Kobe Earthquake (Igarashi et al., 1995), anomalies of radon-222 concentration have reported. Surveys have conducted to know a better place for a continuous observation of radon concentration in groundwater in Miura Peninsula.

Samples of groundwater were taken in bottles and were shaken enough, then concentrations of radon in gas phase was measured with RTM1688 (SARAD). These concentrations were converted to concentrations in groundwater with water temperature and measurement time.

Average of radon concentration around active faults in Miura Peninsula was  $10 \pm 9$  Bq/L, which was higher than a background level of  $3 \pm 2$  Bq/L in Shonan area, Kanagawa Prefecture (Saito et al., 1993). Two reasons are supposed. The first is that the fault fracture zone is permeable for fluids (Lockner et al., 2000). The second is that radium-226, which is a parent nuclide of radon-222, concentrated in an aquifer (Saito and Takata, 1994).

Keywords: radon, active faults in Miura Peninsula, groundwater

## Relationship between chemical composition of hot springs and geological structure at Kyushu, Japan

TERUSAWA, Shuji<sup>1\*</sup>, SUGIMOTO, Masaaki<sup>1</sup>, TANAKA, Hidemi<sup>1</sup>, TSUNOMORI, Fumiaki<sup>2</sup>, MURAKAMI, Masaki<sup>3</sup>

<sup>1</sup>School of Science, The University of Tokyo, <sup>2</sup>Laboratory for Earthquake Chemistry, Graduate School of Science, University of Tokyo, <sup>3</sup>OYO Corporation

Hot springs are composed of hot water from underground, water vapor and other gases, and defined as those its temperature at the gushing point is above 25 degrees centigrade or containing more than specified amount of components. And chemical composition of hot springs reflects the geology (Maki 1994).

Because of much seismic activity and volcanic activity in Japan, there are approximately 30000 hot springs in Japan, various kinds of studies of hot spring have been performed, but most of these studies had performed in narrow region with smaller number of samples.

However, in comparative studies about the relationship between topography and geological structure and chemical composition of hot springs studies, many chemical composition data in broad region is required.

In Japan, it is obligated to analyze hot springs chemically and create official sheets of chemical analysis by law. Oguma(2009) obtained 715 data of hot springs in Kanto-Koshinetsu area using this sheet, showed the relevance of the chemical composition of hot springs and plate subduction. And Otsu(2010) obtained 1026 data of hot springs in Tohoku area, showed the relevance of chemical composition and active fault. These studies were performed using temperature, pH and amount of chemical components data recorded in official sheets of chemical analysis.

The target of this presentation is Kyushu area. There are many volcano and active faults in Kyushu, so many hot springs exist. 1963 data of chemical composition hot springs are collected from whole Kyushu area, Japan, and chemical trend corresponding to the various geological setting are spatial analyzed on GIS. In this presentation, we report new insights about the relevance of several active faults and chemical composition of hot springs.

Keywords: hot springs, Kyushu, active fault

## The observation of ground- gasses and water in a borehole of Fast breeder reactor research and development center Monju

WATANABE, takahiro<sup>1\*</sup>, MURAKAMI, Masaki<sup>1</sup>, MIWA Atsushi<sup>1</sup>, TATEISHI Ryo<sup>2</sup>, SHIMADA Koji<sup>2</sup>

<sup>1</sup>OYO Corporation, <sup>2</sup>Japan Atomic Energy Agency

We observed ground- gasses and water quality in a borehole of Fast breeder reactor research and development center Monju, Fukui prefecture. The purpose of this observation was to investigate a connection between groundwater and oceanwater. This observation was started from 23th November 2011, and will be finished to late February 2012. We will issue the result of this observation.

Keywords: Ground water data analyzing system, GROWDAS, groundwater quality, groundgasses

## The 2011 development report of Groundwater data analyzing system (GROWDAS)

MURAKAMI, Masaki<sup>1\*</sup>, WATANABE, takahiro<sup>1</sup>, MIWA, atsushi<sup>1</sup>

<sup>1</sup>OYO Corporation

We developed a Quadrupole Mass Spectrometer into a GRowndWater Data Analyzing System (GROWDAS) in order to measure gasses underground continuously. We started to observe nitrogen, oxygen, argon, carbon dioxide, methane and helium gasses by the GROWDAS at the Atotsugawa fault, Gifu prefecture on December 2010. We also developed a new GROWDAS with a new control system operated in a PC, and installed it in the Monju site. We report 2nd GROWDAS, and show its development.

Keywords: gas measurement, fault zone