Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SVC49-01 Room:104 Time:May 24 15:30-15:45

Geotherml system of Maruo Hot Spring in Kirishima Volcano, Kyushu , Japan

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Water samples from Maruo hot spring in Kirishima Volcano were collected and analyzed geochemically. Besed on geochemical results, a geothermal system in this hot spring area was revealed; upwelling from northeastern side and moving to southwestern side with mixing with stem-heated waters along NE-trending fractures.

Keywords: Maruo hot spring, Geochemistry, Kirishima volcano, Geothermal system

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SVC49-02 Room:104 Time:May 24 15:45-16:00

Conductivity distribution of the surface layer around Kirishima Volcanic Group - on the aspect of failed eruptions

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Kirishima volcanic group consists more than 20 volcanoes; Shinmoe-dake, Ohachi, Iwo-yama, etc. Many geophysical and geological researches have been carried out since the large eruption of Shinmoe-dake in 2011. The authors carried out VLF-MT survey around Kirishima to clarify electrical conductivity distribution in the surface layer and also carried out repeated observation of electrical conductivity of hot spring water in and around Iwo-yama. The results are as follows.

1) High conductive areas were found around Iwo-yama, and along the trend of volcanoes from Shinmoe-dake to Ohataike. This trend is followed by the trend from Ohjibaru to Chishanoki hot spring in the east of Kirishima. Seismic activity is also determined along these trends. This result indicates magmatic gas is supplied along the fault system in Kirishima. On the other hand, low conductivity was found around the volcanoes in the southeastern Kirishima; Ohachi, Takachiho-nomine. High conductive area is also found on the southwestern flank of Kirishima.

2) Repeated measurement indicates gradual increase in conductivity of hot spring water around Iwo-yama. This may reflect the increase of supply rate of magmatic gas.

Keywords: Kirishima Volcanic Group, Conductivity distribution, volcanic activity, failed eruption

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SVC49-03 Room:104 Time:May 24 16:00-16:15

Evaluation of Geothermal Reservoir from the Gravity Changes at the Takigami Geothermal Field, Oita Prefecture, Japan

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When the geothermal power plant starts electricity generation, various surveys are conducted in the geothermal area in order to monitor the geothermal reservoir behavior. It is important to understand the geothermal reservoir behavior in order to produce geothermal fluid for a long time. Micro-gravity measurement is one of the methods for geothermal reservoir monitoring. The production of geothermal fluid and the reinjection of hot water cause mass changes and redistributions, which can cause measurable gravity changes on the ground surface. In Takigami geothermal area, we have conducted repeat micro-gravity measurements using Scintrex CG-3 and CG-3M relative gravimeters since before the commencement of Takigami geothermal power plant. We detected gravity changes in the both production and reinjection areas. These gravity changes are consistent with the changes in mass balance in the geothermal reservoir. This study suggests that repeat gravity measurement is an effective method to monitor geothermal systems. We, however, had measured only relative gravity measurements by using relative gravimeters, so we have not been able to evaluate the gravity change at the reference station of the relative gravity measurements. Hence, we introduced an A10 absolute gravimeter (Micro-g LaCoste, Inc.) in 2008. Though it was impossible that the A10 absolute gravimeter was applied at all of the stations because the condition of the measurement was strict, we utilized the A10 gravimeter for not only the assessment of the gravity changes at the reference station, but also the detection of the absolute gravity change caused by the subsurface fluid mass changes at some other measurement stations. We chose 4 stations (T13B, T22A, T26A and T27A) to conduct the repeat absolute gravity measurement. T26A lies in the reinjection area, and there are the other 3 stations in the production area. We have applied the relative gravimeters in such strict situations in which it was difficult to install A10. Thus both absolute gravimeter and relative gravimeter can complement each other.

As a result of absolute gravity measurements, the gravity change at the reference station of the relative gravity measurements is small enough for this evaluation, within about 10 microgal. Therefore, we estimated that this reference station is appropriate for the relative gravity measurements. Because we judged that the gravity change detected by the relative and absolute gravity measurements illustrated the mass transfer in the geothermal reservoir, we divided the Takigami geothermal area into 3 areas from the pattern of the gravity change after the commencement of the Takigami geothermal power plant, and we estimated the 4 stages of geothermal fluid flow pattern from temporal gravity change. Based on these classifications, we led a conceptual reservoir model of the Takigami geothermal area.

Keywords: Repeat Gravity Measurement, Absolute Gravimeter, Relative Gravimeter, Takigami Geothermal Area

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Gravity-gradients measurements of Mt Aso using a laser-interferometric gravity-gradiometer

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A laser-interferometric gravity-gradiometer has been developed at the Institute for Cosmic Ray Research of Tokyo University for a couple of years and their laboratory test showed that the instrument had a resolution of about 1 microGal/m. As the first practical application of the newly developed instrument, we plan to measure gravity gradients at observation sites near Mt Aso. By carrying out the gravity-gradient measurements, we intend to study possible flows of volcanic fluids beneath the area of Mt Aso. We will report the current status and future prospects of the measurements.

Keywords: measurements of gravity-gradients

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Investigations for the hydrothermal system of the Yumugi area in the Kuchinoerabujima volcano

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The Kuchinoerabujima volcano forms Kuchinoerabujima Island, Kagoshima Prefecture, which is located west of Yakushima Island, and is the andesitic volcanoes which include an active volcano, Shin-dake. Development of hydrothermal system is inferred because there are some hot springs in the island. The plan of binary cycle power generation by using the hot springs is in process, and according to the results of the former research and investigation, the Yumugi area is a geothermal prospect area. Following these investigation results, the authors had conducted gravity surveys, soil carbon dioxide concentration measurements, 1m-depth ground temperature measurements at the Yumugi area, and estimated heat discharge rate from Shin-dake in August 2011. And we constructed a conceptual model of the hydrothermal system of the Kuchinoerabujima volcano, mainly in the Yumugi area.

Keywords: Kuchinoerabujima, gravity, soil carbon dioxide concentration, ground temperature, heat discharge rate

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Water-rock Interaction of Enhanced Geothermal System

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At EGS system, production fluid geochemistry depends on mineralogy of reservoir rock and circulation system.
During closed-loop circulation test at Habanero EGS site, South Australia, Na, K and Cl concentration were gradually increasing
and highwer than those of the previous open flow production test.
In this system, increasing of Na, K may be due to dissolution of feldspars of granite rock at reservoir depth.
Similar trend is shown in production well at Hijiori EGS site, Japan. In Hijiori system, at first 3 month of 2000-2002 long term circulation test, Na,K,Cl were increased and about half concentration of Habanero site. And Ca and SO4 are slightly higher.
This difference is due to the circulation system. At Hijiori, open loop system and injection fluid was supplied from near river water. Then, anhydrite (CaSO4) was dissolved.
On the other hand, at Habanero, closed loop system and no fluid was supplied during circulation. In addition the chemical composition of the granite in which the fluid is circulating is also different, with low-calcium granite at Habanero and high calcium
tonalite/granodiorite at Hijiori.

Keywords: geothermal, EGS, Fluid chemistry, Rock minerals, Water rock Interaction