（学校用）

様式 A-1

平成25年11月16日

サイエンス・ダイアログ　実施報告書

1. 学校名・担当者氏名: 佐賀県立致遠館高等学校・尊田和寿

2. 講師氏名: Yayan SOFYAN

3. 同行者氏名: 有馬

4. 実施日時: 平成 25 年 11 月 16 日（土）　10:00～12:00

5. 参加生徒:　2年生 32 人
備考: 理数科・普通科理系の生徒

6. 講演題目: Let's discover our earth !! 地熱と火山エリアにおける重力モニタリング
Gravity monitoring in volcano and geothermal area

7. 講演概要:

The population of people on the earth is going to increase, energy demand also increases in spite of limited energy resource. The energy resource of fossil fuel (oil, gas, coal) will be over in the near future while nuclear energy still has a big question about the safety of radiation. Green, renewable and sustainable energy is the future energy resources. These energies can be developed without any significant negative impact to the environment, derived from natural processes that are replenished constantly and high efficiency in the long term use. One of these energies is geothermal energy as an alternative potential energy to replace the fossil fuel. In the view of energy saving, according to Lund (2000) the total geothermal electricity produced in the world is equivalent to saving 12.5 Mt (million tons) of fuel oil per year. The long-term sustainability of geothermal energy has been demonstrated in the Lardarello geothermal field in Italy since 1913, in the Wairakei geothermal field in New Zealand since 1958, and at The Geysers field in California since 1960. Monitoring study over the geothermal field for a sustainable production reason is his interest research. This monitoring method also can be applied to monitor volcanic activity.

Indonesia and Japan have similarity huge geothermal energy resources that lies between the ring of fire that have a large number of volcanoes. Indonesia is one of the largest geothermal resource potential countries in the world, with a total energy potential of about 27.5 GWe of 256 geothermal areas (Japan has about 19.14 GWe). Geothermal energy in Indonesia is mostly used for electricity generation and a small portion is directly used. Electricity was generated from geothermal energy on a large scale from the early 1980s. The total installed capacity at the end of 2012 is about 1195 MWe.

Repeat gravity measurement (RGM) is an effective and good monitoring method. Gravity is a basic physical property of Newton that explains the interaction force between two masses. The RGM is generally used to distinguish data in the range of 1 –

500 μGal from those in geophysical prospecting. A common unit of gravity used in geophysics is the *Gal* (named after the astronomer Galileo), and derived from the old cgs system of units: 1 Gal = 1 cm/s^2 = 10^{-2} m/s^2. This method calculates gravity changes in the surface of the geothermal and volcanic field. They also calculated gravity force from many factors as correction factor. The monitoring of 4-D gravity enabled detection intrusion or hydrothermal flow in active reservoirs (geothermal or volcanic) of the subsurface. The Gravity variation could be assumed as mass-transport processes at depth. They used relative and absolute gravimeter for repeated measurement. The relative gravimeter (Scintrex and LaCoste Romberg) had high accuracy and low residual drift but estimate relative value. Gravimeters needed to calibrate to the gravity absolute points. The absolute gravimeter (A10) had absolute value with high accuracy but heavy and difficult to carry. The combination of relative and absolute gravimeter generated more accurate data in the monitoring. They applied this hybrid method in some geothermal field and volcanic field.

8. 使用言語: 英語

9. 講演形式:

(1)講演時間 100 分　　質疑応答時間 20 分

(2)講演方法 電子黒板による講演

(3)通訳 なし

(4)事前学習時使用教材(事前学習を行った場合のみ)

講師からの概要プリント・キーワードの確認

10. 学校からの支給経費(該当がある場合): なし

11. その他特筆すべき事項: なし