

Research outline of the examination about the effects of heat and hydrothermal water on surroundings by geological repository (3)

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1. Research purpose

For sites selection of geological repository of nuclear waste, the places where the influence of the heat and hydrothermal water by magma is predicted should be excluded from the candidates. In order to grasp the future extent and characteristics of the influence, it is necessary to establish the methods for appropriate surveys and assessments on the effects to surroundings by heat and hydrothermal activities. This study is carried out as the contract work from NUMO.

2. Research outline

(1) An examination of earth scientific characteristics of high-temperature areas (HTA)

1) Information gathering on earth scientific characteristics and 2D-3D visualization of data

The distribution maps concerning topography, geology, seismic hypocenter, electric resistivity, Curie-point isotherm, and subsurface isotherms were collected and summarized as input data for 2 and 3-D visualization in FY2004. The datasets were collected from Tohoku and Chugoku-Shikoku districts, and some HTA were extracted. Tsugaru and Kamikita plains in Aomori prefecture are extracted as examples of HTA. Complementary survey in these plains is carried out for revision of modeling in FY2005.

2) Characterization on regions including HTA

Tohoku and Chugoku-Shikoku districts including HTA were classified respectively into 5 types as characterized regional zones; forearc lowland, forearc mountain country, Quaternary volcanic terrain, backarc lowland and backarc mountain country. Conceptual models for representative cross sections of both districts were presented respectively. This classification is re-investigated and revised in FY2005.

(2) An examination of genetic origin by the wide scale fluids flow simulation

The sensitivity analysis for multi-components and multi-phases simulators was applied first to clarify the degree of effects to the simulation results using the assumed model at the E-W cross section in of Tohoku in FY2004. The simulators are verified whether HTA could be reconstructed or not in FY2005.

(3) An examination of survey, analysis and evaluation methods

In order to confirm the effectiveness and most optimum assemblages of survey, analysis and evaluation methods, the following items are investigated in FY2005.

1) Examinations of extraction of thermal anomaly and comprehension method of characteristics based on discharged heat from hot springs

The relationship among occurrences of hot springs, depths of reservoirs and heat discharge, is investigated in detail. The characterization of heat discharge and other parameters such as geology, topography and so on, is compared for revision of classification for HTA.

2) An examination of construction of database for rock alteration, and partially construction of database

The control factors for distribution of alteration zones are investigated. The extents and characteristics of alteration zones are summarized.

3) Analytical method for deep subsurface structures by electromagnetic survey

The electromagnetic survey datasets collected in FY2004 are compared with HTA and micro seismic distribution data, and summarized.

4) Analytical method of deep subsurface structures by hypocenter distribution

The references on analyses of micro seismic activity occurred in Tohoku district are collected and the applicability of analysis method using seismic waves is investigated.

5) Analytical method of long-term change of geothermal system by radiometric dating method

The applicability of ESR signal from E prime center to the estimation of paleo-temperature is investigated based on heating tests, dating of unaltered samples, information gathering and so on.

6) Evaluation method for heat and hydrothermal activity effects based on fluids geochemistry

Characteristics and diversity of fluids in sedimentary formations are simulated under the condition of various fluids sources and various degrees of water-rock interaction using the geochemical simulator.