Basic Research to Reconstruct Paleo-geological Evolution Model Around KURT Area

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1. Introduction

Disposal facilities for radioactive waste shall be sited to provide isolation from the accessible biosphere. The features shall aim to provide this isolation for several tens to hundreds of years after closure. For the safety assessments of repository, the long-term natural evolution and possible events of the site, that can cause disturbances to the facility over the period of interest, should be considered. The objective of this research is to reconstruct the paleo-tectonic evolutions for pre-research of long-term safety and of developing the effective methodology of constructing a geological evolution model.

2. Literature investigation

2.1 Research area

The research is performed around the KURT (Korea Underground Research Turnnel), Daejeon, Korea. Regional scale of the target area is defined by [1]. For the study of geological evolution, regional and site scale area boundaries are used. The regional scale area is called “Yuseong area” and the site scale area is called “KURT site”. The regional boundary is modified from [1] along the hydrological drainage basin.

2.2 National investigation

To understand the regional scale geological evolution history, it is required to understand the geological history of the Korean peninsula. The geological map is the most basic information around the Yuseong area. The pre-studied information on the Yuseong area will give a direction to develop the evolution model.

2.3 International investigation

Japan Atomic Energy Agency (JAEA) has studied the reconstruction and estimation of long-term geological evolution around URL sites [2]. The Finnish organization for final disposal of nuclear waste (POSIVA) and other European countries already have their own technology to construct a structural model for the target area. The preliminary survey of examples and methods of preceding international research will contribute to developing specific evolution model for the Korean environment.

3. Field works and sample preparations

3.1 Field works

To reconstruct the geological evolution history, it is necessary to have field works on the study area. Lithological boundaries marked in the geological map of Yuseong area were investigated to increase the accuracy of the evolution history and to construct fracture networks of the area. Host rock (granite) and dyke rock samples were gathered for age dating.

3.2 Deep borehole- core sampling

The borehole geophysical surveys have been performed for several drillholes adjacent to the KURT to collect geological information of the deep underground. Drilling core samples were taken from

host rock interval, dykes and fracture zones at 300-1000m depth.

4. Sample analysis

4.1 Structural analysis

Brittle and ductile deformation histories will be evaluated using structural analysis data from the field works, geophysical surveys and drilling core investigations. The quantitative analysis of structural characteristics around KURT area will contribute to evaluating hydrogeological processes.

4.2 Age-dating

K-Ar and Zircon age dating will be carried out to decide the age of rocks and fractures consisting of the Yuseong area. Through the SHRIMP zircon age dating, the intruded ages of granite body will be confirmed. The K-Ar age dating will indicate the estimated uplift ages and the intruded ages of dykes.

5. Conclusion

The study on long-term history of geological evolution will be applied to understand hydro-geological and geochemical characteristics, and to predict future processes of geological evolution. The reconstruction of the paleo-geological evolution model is fundamental to estimate long-term history. To construct the paleo-tectonics in next step, it is necessary to do more field works and age dating for confirming and improving the history and for understanding more detail on the relationships between the history and fracture system in the study area.

REFERENCES

[1] Park, K.W.; Kim, K.S.; Koh, Y.K.; Kim, G.Y. (2009) “Site characterizations around KURT area-Geologic model (version 1)”, KAERI/TR-3870/2009.

[2] Kosaka, H; Saegusa, H; Yasue, K; Kusano, Y; Onoe, H. (2011) “Development of a Methodology for the Characterisztion of the Long-term Geosphere Evolution (2) Estimation of the long-term evolution of goundwater flow conditions in a Tono area case study”, Proceeding of ICONE19, ICONE19-43567, 2011, Japan.