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Numerical analysis of groundwater flow system under the seabed accompanying sea level fluctuations

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Coastal area is one of the promising places for geological disposal due to scientific and social aspects. Developments of investigation and evaluation method to interpret coastal environment are needed because there are a lot of uncertainties remaining to understand the hydrogeological environment in there. Long-term geological variations such as climate variation and sea level fluctuations will lead to great changes of groundwater flow environment under the seabed especially in shallow sea area. It is believed that the prediction of future groundwater flow process is necessary for evaluation of geological environment stability.

There is a report that fresh paleo-water under the seabed was discovered on the continental shelf away from a present coastline in many parts of the world (ex. Horonobe coastal area), because recently investigation technology has been improving. That is the proof that a complex mixing and diffusion among seawater and groundwater and meteoric water was happened. Prediction of future groundwater flow environment can be better interpreted by constructing the groundwater flow model of long-term behavior like a natural analog.

The purpose of this study is to find out the long-term groundwater flow processes at Horonobe coastal area and Iwaki coastal area through the sensitivity and scoping analysis using site-scaled numerical modeling. Transient boundary condition is better than static boundary condition for evaluation of the distribution of the groundwater flow under the seabed. Many cases indicated that remnants of fresh groundwater which was infiltrated and became trapped in shelf sediments may be occurred. Groundwater under the seabed may be washed out due to sea level fluctuations with each cycle, so that it is NOT safe for the radioactive waste repository. This method to evaluate groundwater flow system under the seabed contributes effectively research plan such as offshore boring, electromagnetic investigation.

Keywords: under the seabed, groundwater flow, sea level fluctuation, numerical simulation, density flow, groundwater age