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Hydrogeochemistry of a Coastal Thermal Aquifer, Magumsan area, Southern Korea

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Hydrogeochemical study was performed in the Magumsan hot spring area, in order to explain the origin and evolution of the geothermal water with high TDS. We also examined the effect of the flushing of saline groundwater by fresh water owing to the seawater regression. The groundwater in the Magumsan area is classified into three groups based on the temperature and chemical composition (Fig. 1). Thermal water (TW) shows the characteristics of Na-Cl type which is high in temperature and concentrations of Na, K, SiO_2, Cl and SO_4. The oxygen and hydrogen isotope data, together with tritium data, show that TW recharged from high lands and flowed for a long time toward the ancient coastline where fresh water recharge flushed the seawater in deep aquifer. On the other hand, shallow groundwater (SGW) recharged in recent years and flowed to the shallow aquifer.

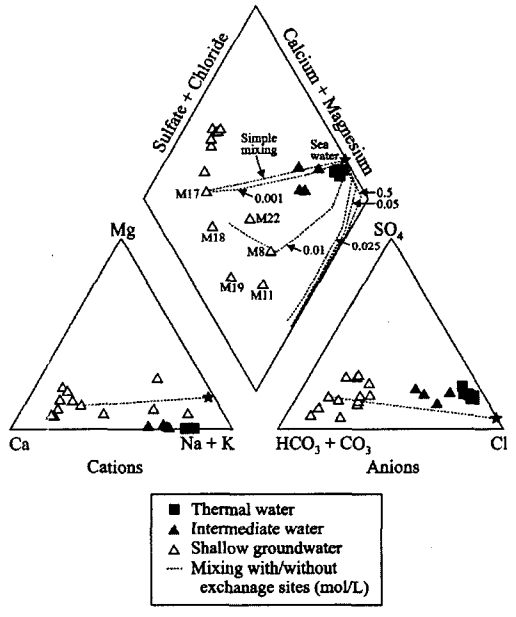

Fig. 1. Piper's diagram showing the chemical compositions various kinds of waters from Magumsan area. The result of modeling which simulate the changes of chemical composition of water after mixing and cation exchange also shown.

They are Ca-(SO_4)-HCO_3 type. The other samples are classified as intermediate waters (IW) that occur in the peripheral site of TW and have the intermediate hydrochemistry between TW and SGW.

Geochemical modeling on the hydrochemistry of TW and IW shows that silicate mineral weathering is predominant. However, the observed hydrochemistry does not match with the modeled cation exchange line on the Piper's diagram, indicating that cation exchange is not significant in TW and IW. On the other hand, calcite dissolution is prevailing in SGW. Both the sulfur isotope composition and the relationship between Ca and SO_4 indicate that Ca ion in TW and IW was originated from dissolution of gypsum and/or anhydrite in sedimentary rocks. In this paper, we examined the hydrogeochemical change in a coastal saline aquifer due to the flushing by fresh water during the seawater regression.