Hydrogeochemcal investiagtion of the deep subsurface environment in two representative lithologies in South Korea

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Deep bedrock groundwater was investigated in the two study areas (AH and BH) in Korea to understand the control of different lithologies (granite and gneiss, respectively) on hydrochemical conditions. In the two areas, a total of 5 boreholes were drilled up to 500 m below ground surface, and hydrological tests and groundwater sampling for chemical constituents and stable isotopes of oxygen ($\delta^{18}O$), hydrogen (δD), carbon ($\delta^{13}C$) and sulfur ($\delta^{34}S$) were performed at about 50 m intervals. AH and BH showed the hydraulic conductivity from 1.83×10^{-11} to 4.73×10^{-7} m/sec and from 1.15×10^{-10} to 1.27×10^{-6} m/sec, respectively. Most of the groundwater samples showed the pH higher than 7 while the hydrochemical properties did not show any relation with depth. Groundwater from BH showed the higher TDS (210 ± 18 mg/L) than AH (144 ± 26 mg/L). In particular, Na, Mg, SO_4 and HCO_3 were higher in BH. The Na-HCO_3 water type was more distinct in BH. Meanwhile the minor elements such as Fe, Al, Be, Cd and Cs were more frequently detected in AH where the high concentrations of Li, Zn, Ba and U were also observed. δD and $\delta^{18}O$ were plotted along the global meteoric water line in both areas, but AH showed higher δD and $\delta^{18}O$. $\delta^{34}S$ was also higher in AH groundwater with lower SO_4 concentrations. $\delta^{13}C_{DIC}$ values were similar in both areas, although AH showed a wider range. As fracture-filling minerals, illite was frequently observed in AH while chlorite in BH. Rocks from BH showed higher CaO, MgO, P_2O_5, TiO_2, Cr, Sc, Ni, Cu and Eu while rocks from AH showed the higher Be, Rb, Mo, Pb and U. The relation between hydrological, hydrochemical and geochemical results will be further discussed in this presentation.

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