한국지하수토양환경학회 추계학술발표회
2004년 9월 9~10일 전 주 대 학 교

Hydrogeochemical study of a watershed in Pocheon area: controls of water chemistry

Kyoung-Ho Kim, Seong-Taek Yun, Soo-Ho Chae, Jong-wook Jean
Jeong-Ho Lee, Hae-woo Kweon*

Dept. of Earth & Environ. Sci. and Environmental Geosphere Research Lab., Korea Univ.
** Korea Resources Corporation (styun@korea.ac.kr)*

The groundwater in the Pocheon area occurs from both a fractured bedrock aquifer in igneous and metamorphic rocks and an alluvial aquifer with a thickness of <50 m, and forms a major source of domestic and agricultural water supply. In this study, we performed a hydrogeochemical study in order to identify the control of geochemical processes on groundwater quality. For this study, groundwater level and physicochemical parameters (EC, Eh, pH, alkalinity) were monitored once a month from a total of 150 groundwater wells between June 2003 to August 2004. A total of 153 water samples (13 surface water, 66 alluvial groundwater, 74 bedrock groundwater) were also collected and analyzed in February 2004.

Groundwater chemistry in the study area is very complex, depending on a number of major factors such as geology, degree of chemical weathering, and quality of recharge water. Hydrochemical reactions such as the leaching of surficial and near-suface soil salts, dissolution of calcite, cation exchange, and weathering of silicate minerals are proposed to explain the chemistry of natural groundwater. Alluvial groundwaters locally have very high TDS concentrations, which are characterized by their chloride(nitrate)-sulfate-bicabonate facies and low Na/Cl ratio. Their grondwater levels are highly fluctuated according to rainfall event. We suggest that high nitrate content and salinity in such alluvial groundwaters originates from the local recharge of sewage effluents and/or fertilizers. Likewise, high concentrations of nitrate were also locally observed in some bedrock groundwaters, suggesting their effect of anthropogenic contamination. This is possibly due to the bypass flow taking place through macropores. The degree of the weathering of silicate minerals seems to be a major control of the distribution of major cations (sodium, calcium, magnesium, potassium) in bedrock groundwaters, which show a general increase with increasing depth of wells. Thermodynamic interpretation of groundwater chemistry shows that the groundwater in the study area is in chemical equilibrium with kaolinite and Na-montmorillonite, which indicates that weathering of plagioclase to those minerals is a major control of hydrochemistry of bedrock groundwater. The interpretation of the molar ratios among major ions, as well as the mass balance calculation, also indicates the role of both dissolution/precipitation of calcite and Ca-Na cationic exchange as bedrock groundwaters evolves progressively.

Key words: Hydrogeochemistry, Groundwater qaulity, Pocheon area