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THE USE OF MULTIVARIATE STATISTICAL APPROACHES FOR THE INTERPRETATION OF THE HYDROGEOCHEMICAL EVOLUTION OF GROUNDWATER

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Multivariate statistical analyses are extensively applied to hydrogeochemical studies for the interpretation of data. This study examines the factors of anthropogenic effects obtained from the application of correspondence analysis (CA) and principal component analysis (PCA) to a hydrogeochemical data set. The present study focuses on understanding the hydrogeochemical attributes and the changes of phase when anthropogenic effects are imposed on groundwater. In order to interpret the major factors controlling the chemical variability of the groundwater system, due to anthropogenic effects, principal component analysis adding saturation index (SI) and correspondence analysis is applied to the study area.

The selected case is about the hydrogeochemical evolution of LPG underground storage caverns, which are situated in the southeast of Korea. The geochemistry and hydrogeology of the study area have been studied extensively by earlier researchers. In order to further understand hydrogeochemical characteristics of the groundwater, it is necessary to obtain more information about the hydrogeochemical system of the study area. The highly alkaline groundwaters at this study area are an analogue for those of the radioactive waste disposal system. High pH, high concentration of aluminum and possible precipitation of calcite characterize these groundwaters. Geochemical speciation results induced from WATEQ4F in NETPATH are added in order to synthesize the hydrogeochmical information. Possible calcite precipitation and aluminum speciation can be more quantitatively characterized for the groundwater. Available groundwater quality monitoring data are used to confirm these statistical models.