

## **Temporal and spatial variability of groundwater quality in Pyosun Watershed, Jeju Island, South Korea**

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Well understanding of the landuse control of groundwater pollution is needed to better manage groundwater quality. In this study, we assessed the spatio-temporal variations of groundwater quality in a basaltic aquifer as an unique source of drinking water supply in the Pyosun watershed, Jeju volcanic island, Korea. A total of 368 groundwater samples were collected from 32 groundwater wells on a monthly basis for one year between November 2010 and November 2011. Basis parameters such as pH, Eh and EC, and the concentrations of major ions of water were assessed using the principal component analysis (PCA) to examine the processes controlling the water chemistry. PCA results showed that two factors explain 70.69% of the total variance of dataset: 1) the first factor (F1) had the positive loadings with EC, Ca<sup>2+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup>, Cl<sup>-</sup>, and NO<sub>3</sub><sup>-</sup>, indicating the impact of agricultural pollution, and 2) the second factor (F2) had the positive loadings with pH, HCO<sub>3</sub><sup>-</sup>, and K<sup>+</sup>, which was explained by natural process (i.e., water-rock interaction). Based on the factor scores, we classified the wells (and waters) in the study area into four types (pristine, polluted, recharge water, and transitional). The results of classification showed a good spatial control of water quality in relation to the topography and land use within the watershed. In addition, a small number of groundwater wells representing the pristine versus polluted waters were chosen to be proposed for an optimized monitoring network with cost efficiency.