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Occurrence and Geochemistry of Arsenic in Groundwater of Korea

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ABSTRACT

Naturally occurring As in groundwater has emerged as a global problem. Particularly, in Bangladesh and West Bengal, India, As is released into groundwater by natural processes, which become major environmental health concern. In this study, occurrence and geochemistry of As in groundwater of Korea was investigated based on a few previous studies and a groundwater quality survey in Nonsan and Geumsan areas conducted by authors. From the national groundwater quality monitoring network operated by Ministry of Environment, about 1 % of grounwaters have concentrations greater than WHO guideline, 10 μg/L, and relatively high values appear to be more frequently observed in Busan, Ulsan, Gyeongnam, and Jeonnam areas. However, more serious results have been reported from other case studies. It was revealed that 19.3 % of bottled mineral waters contained As above the value, and during detailed groundwater quality surveys in Jeonnam and Ulsan areas, the percentages exceeding 10 μg/L were 36% and 22 %, respectively, indicating As enrichment possibly by geological factors and local mineralization.

From both Nonsan and Geumsan areas, around 7 % of tube well waters showed As concentrations > 10 μg/L (Fig. 1). High concentrations were found at metasediments-based areas than at gneiss and granite-based areas whilst presumably surface induced components, such as Na, Cl, and NO_3 were high at granite areas (Fig. 2). Metasediments of the study areas including black shale are well known to have high contents of sulfides to become the source of As release. However, high As groundwaters had higher pH values and did not seem to be directly related with SO_4 (Fig. 2). It can be postulated that As is released through desorption under alkaline conditions and/or reductive dissolution of iron oxides.

Further systematic researches need to proceed in areas potential to As contamination such as mineralized, metasediments-based, alluvial, and acid sulfate soil areas. Prior to that, it is required to understand various geochemical and microbial processes, and groundwater flow characteristics affecting the behavior of As.

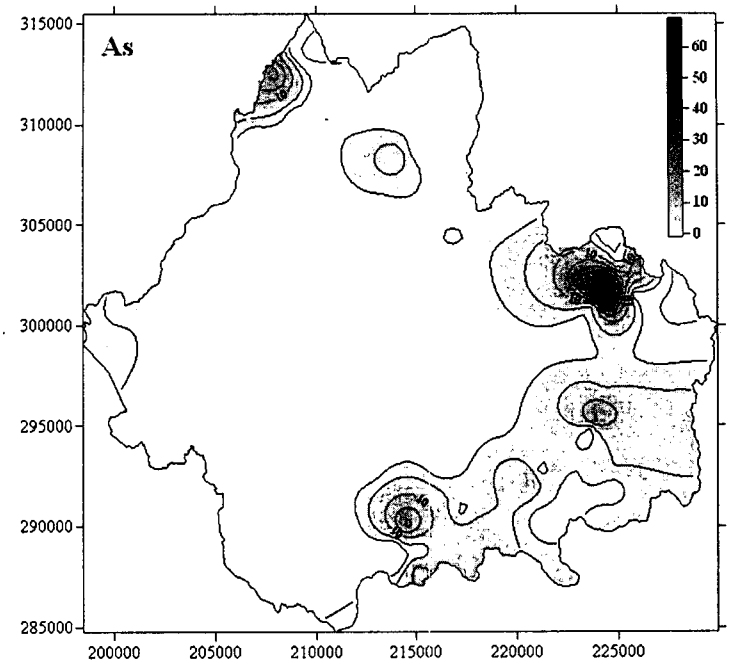

Figure 1. Distribution of arsenic in groundwater of the Nonsan area (unit in μg/L).

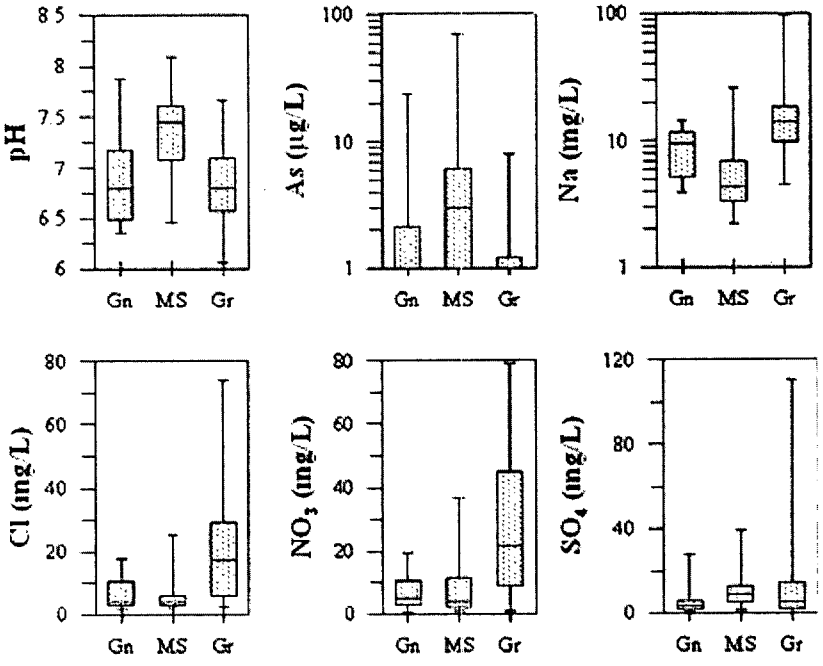

Figure 2. Box-whisker diagrams for some chemical parameters in groundwater of the Nonsan area (Gn: gneiss, MS: metasediments, Gr: granite).