Identification of anthropogenic influences on groundwater quality based on hydrogeochemistry survey in Nanfei watershed, China

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Groundwater is progressively subjected to stress as a result of both anthropogenic activities and natural chemical process. The groundwater recharges contribute main nutrients to most lakes in a watershed, thereby tending to induce serious eutrophication problems. This study has investigated the hydrochemical characteristics and the contamination of groundwater in the Nanfei watershed between Chaohu lake and old town of Hefei, China. An attempt was made to distinguish anthropogenic imputs from the influence of natural chemical weathering on the chemical composition of groundwater at Nanfei watershed. Groundwater samples were collected at 45 locations in the Nanfei area. Multivariate statistical techniques were applied to identify characteristics of the groundwater quality in the studied area. Results showed that: (1) there were very variable chemical composition of groundwater. 44% groundwater was of Na-HCO_3 type, and 40% groundwater was of Ca-HCO_3 type. The types of Ca-SO_4, Ca-Cl, Na-SO_4 and Na-Cl accounted for 4.4%, 4.4%, 4.4% and 2.2%, respectively. Most groundwater was alkalescence and the groundwater chemistry was more influenced by landuse and town development; (2) based on factor analysis of the chemical data, K^+, Cl^-, $PO_4^{3-}$and NO_3^- concentrations have the highest factor loadings on factor 1; Fe and Mn concentrations on factor 4; Ca^{2+}, Mg^{2+} and HCO_3^- concentrations on factor 3; Na^+, SO_4^{2-} concentrations on factor 3. Factor 4 and 1 represent major contributions from natural processes and human activities, respectively. The levels of Ca^{2+}, Mg^{2+}, HCO_3^-, $Na^+$and SO_4^{2-} derive from both pollution sources and natural weathering reactions.

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A-type gneissic metagranites from Donghai in the SW Sulu terrane, eastern China: Geochemical constraints on the nature of protoliths and tectonic significance

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The Sulu terrane is geotectonically belongs to the northeastern margin of Yangtze block. Six gneissic metagranite plutons bearing alkaline mafic minerals from Donghai in the SW Sulu terrane were selected for a detailed geochronological and geochemical study to identify the nature of protolith and to discuss its tectonic significance. These gneissic metagranites are light-colored, and consist mainly of K-feldspar + oligoclase-albite + quartz. Mafic alkaline minerals, such as aegirine or aegirine-augite and arfvedsonite, have been observed in most samples. Zircon LA-ICP-MS U-Pb dating for these rocks yields a protolith age of about 770 Ma. They experienced UHP metamorphism at about 250 Ma and retrograde metamorphism at about 210 Ma. Chemically, these metagranites are characterized by high SiO_2 and K_2O+Na_2O contents, high FeO*/(FeO*+MgO) ratios (= 0.83~0.94), low CaO and MgO abundances, enrichment of Ga, Y, Zr and Hf, and depletion of Sr, P and Ti, and high 10^4×Ga/Al ratios (=2.76~5.15). The mineralogical and geochemical features, believed to have been well preserved during metamorphism, suggest that the protoliths belong to A-type granites. Furthermore, these metagranites show relatively high Y/Nb (1.85~9.72) and Y/Ta (4.71~30.14) ratios, which is quite different from that of the A-type granites generated under an intra-plate rifting setting. They are rather similar to that of the Late Cretaceous A-type granites in the coastal areas of SE China, implying that the protoliths were likely formed in a back-arc extensional setting. The formation of the Donghai A-type gneissic metagranites suggests that the northeastern margin of the Yangtze block during the Neoproterozoic might have been under an active continental margin setting rather than an intra-plate rifting setting.

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