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The study of water-rock interaction in Choshui River watershed, Taiwan.

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The hydrogeology of mountain area is now a significant issue in the protection of groundwater resources. Complex stratigraphy and structure, including lithology, fold and fault, can be a very real hindrance to groundwater researches. According to many successful cases, geochemical investigation demonstrates its advantage in flexibility and efficiency.

Generally speaking, geochemical method is based on the concept of water-rock interaction. In this study, water samples in the watershed of Choshui River, the biggest watershed in Taiwan, were collected in non-monsoon season for representing groundwaters recharging the river. The geochemical compositions of waters were determined with ICP-MS for major, minor and trace metal elements and with IC for anions. The results show that the waters are characterized by high sulfate (>140 ppm). According to the distribution of sulfate, there are two major groups of waters along the main channel. The group in the upstream area has sulfate concentration of about 160 ppm. Eocene to Miocene shale is the most common sedimentary rocks in this area. The weathering of pyrite in shale is the possible mechanism for the high-sulfate waters. On the other hand, the group of waters with lower sulfate (about 140 ppm) widely distribute in mid and down stream area. This area is mainly covered by Miocene greywacke, which is low in pyrite. The waters collected from tributaries in this area also show low sulfate content (20 ppm). For this group of waters, the trace elements of V, Zn and Cu and anions of Cl and NO3 are relatively enriched. These elements are generally considered as the pollutants of agricultural activities.

Three shale samples from upstream area were collected for sequential extraction procedure to evaluate the effect of water-rock interaction. The chemistry of exchangeable phases of Eocene shale and Miocene shale confirms that the sulfate and some trace metal elements in stream waters are the result of leaching rocks in a shale-dominant watershed.

It is worth to notice that the geochemical transition between two groups of waters is sharp but the effect of dilution should make a gradual transition along the channel. Therefore, the Chi-Chi Weir located in between two groups may play an important role on the hydrochemical evolution. However, the effect of Chi-Chi Weir need to be further studied.