Cl^-/SO_4^{2-} molar ratios show a mixing of more than two water sources. The dramatic increase of pH in early mixing zone reflects the low buffer capacity of the river water despite the high concentrations of humic C-POC: -15‰). The mid-saline (salinity between 2 and 14) region characterized by high turbidity, which suggests that mineralization is probably associated with coagulation of dissolved organic compounds. The calculated pCO_2 value from the pH and ALK measurement is high in non-saline area and is oversaturated relative to atmospheric CO_2.The isotopic compositions ^{13}C-POC) of organic carbon (OC) and total nitrogen (TN) of suspended sediments have been analyzed. The combined results of C/N ratios and carbon isotopic compositions were used to assess the sources and transport of organic matter. Our results indicated that the isotopic compositions of particulate organic (^{13}C-DIC) carbon have high values and dissolved inorganic matter is an indicator of high productivity. Statistical analysis suggests that phosphorus is the limiting nutrient.

Key words Yangtze (Changjiang) estuary; carbon; mineralization; nutrient; organic matter

Rare-earth element geochemistry as a tracer for clarifying the provenance of the stream sediments in Namhan River, Korea

Seunggu LEE[1], Jinkwan KIM[2], Dongyoon YANG[2], Juyong KIM[2]
[1] *Groundwater and Geothermal Resources Division, Korea Institute of Geoscience and Mineral Resources, Daejeon, Korea*
[2] *Geological and Environmental Hazard Resources Division, Korea Institute of Geoscience and Mineral Resources, Daejeon, Korea*

In the last forty years, the rare-earth elements (REEs) have been used as a powerful tool for solving various geological and geochemical problems due to their unique and chemically coherent behavior. The river sediments are produced by weathering, transportation and deposition. Nesbitt suggested that the rare-earth elements had been mobilized and fractionated during supracrustal alteration of the Torrongo granite, southeastern Australia. Nevertheless, recently, our replicate estimation for REE patterns in sediments revealed that there is nearly no variation in REE patterns. This suggests that invariability of REE patterns in weathering and solidification can be used as a tracer for constraining the provenance of stream sediments. In order to trace the pathway of the river sediments geochemically, based on the REE geochemistry from the river sediments and rocks, we have monitored the REE abundance of stream sediments at branch rivers of the Namhan River in South Korea for three years. The branches studied are Bokhacheon, Shinduncheon and Yanghwacheon. The sediments were divided into coarse (>300 μm) and fine fractions (<300 μm). As a result, we could observe that major element compositions were similar to each other regardless of particle size and sampling date. This suggests that it is difficult to deduce a geochemical difference between river sediments based on major element composition and particle size. The geochemical characteristics of surrounding soils were similar to those of fine river sediments. And the chondrite-normalized REE patterns of most of the fine and coarse sediments in combination with grain sizes and drainage area showed very close relationship with the surrounding rocks. However, some sites showed that there were large variations in REE patterns including total REE abundance and Eu anomaly due to feldspars. This variation trend of REE patterns suggests that changes might have happened in sediment supply for the drainage system in the study area due to floods or large-scale construction. Particularly, we can confirm that fine sediments are more useful than coarse sediments in verifying the provenance of river sediments based on their major, trace and REE geochemistry. In conclusion, our results suggest that the REEs can be used as a powerful tool in verifying the provenance of river sediments compared to major element composition.

Key words rare-earth element; tracer; provenance; stream sediment

Sulfuric acid as a weathering agent of carbonate weathering constrained by $\delta^{13}C$: Examples from Southwest China

Siliang LI[1], Jérôme Gaillardet[2], Guilin HAN[1], Damien Calmels[2], Congqiang LIU[1]
[1] *The State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550002, China*
[2] *Laboratoire de Geochimie et Cosmochimie, Institut de Physique du Globe de Paris, Université Paris 7, UMR 7579, 4 Place Jussieu, 75252 Paris Cedex 05, France*

Rock weathering by carbonic acid is one of the important atmosphere CO_2 sequestration. Actually, it depends on whether carbonic acid or other acids as weathering agents, which is important to understand the model of global carbon cycle. For example, sulfuric

acid derived from oxidation of pyrite takes part in the rock weathering, which might counteract one part of CO_2 drawdown by silicate weathering. In this study, chemicals and carbon isotopic composition of waters were determined in the Beipan River, Guizhou. The $\delta^{13}C$ values of dissolved inorganic carbon in the province, Southwest China. The values of the samples range from -13.1‰ to -2.4‰, which show a good negative correlation with the equivalent ratio of $[HCO_3^-]/([Ca^{2+}+Mg^{2+}])$ and a good positive correlation with the equivalent ratio of $[SO_4^{2-}]/([Ca^{2+}+Mg^{2+}])$ and $[SO_4^{2-}]/[HCO_3^-]$. The relationships suggest that sulfuric acid took part in carbonate weathering. Acid rain is thus a significant source of sulfuric acid to the karstic rivers of Guizhou Province. Based on the mean Ca+Mg/Cl of Guiyang rain waters, there is about 2% and 5% of divalent cations in the waters are due to rain water input. This shows that the chemical weathering of carbonate dust by sulfuric acid in the atmosphere is not significantly compared to the weathering rates of bedrocks. The calculation of weathering budget and chemical mass balance shows that sulfuric acid derived from oxidation of pyrite might contribute about 1/5 to 1/3 of $[HCO_3^-]$ to the Beipan River and some main tributaries after correction of atmospheric sulfuric acid inputs. The result indicated that sulfuric acid derived from oxidation of sulfide minerals should be an important agent for weathering and should be considered to elaborate the global and regional carbon cycle model.

Key words carbonate weathering; sulfate; carbon isotope; pyrite; carbon cycle

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Water geochemistry and boron isotope in the Xijiang River, SW China

Zhiqi ZHAO[1], Congqiang LIU[1], Zhifang XU[2]

[1] *State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang 550002, China*

[2] *Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing 100081, China*

During the last decade boron isotopic compositions have been successfully used as a geochemical tracer in oceanic paleo-pH reconstruction and paleo-climatologic studies. All the pH-proxy investigations were based on the assumption that the boron concentrations and $\delta^{11}B$ values of seawater keep unaltered over geological periods. But recent results obtained by some scientists have proved that the B isotopic composition of the ocean water was controlled the riverine discharge. Hence, it is necessary to investigate in detail the behavior of boron isotopes during erosion processes. Before this study, only one river catchment basin had been systematically documented. Using a method adapted for the isotopic analysis of low-boron-content samples, we measured the $\delta^{11}B$ values of river water samples from the Xijiang River Basin. The boron contents of the Xijiang River water vary from 0.7 to 22.7 μg/L, with an average value of 9.1±4.3 μg/L. The $\delta^{11}B$ values of the Xijiang River water vary from -11.2‰ to +17‰ with an average value of 4.4‰±5.0‰. The results revealed that the influence of anthropogenic contamination to the Xijiang River can not be neglected. About 10 percent of the total dissolved boron in river water was derived from the polluted sites located in the upper reaches of the Nanpanjiang River. *In-situ* riverine processes like adsorption on clay minerals and precipitation of $CaCO_3$ have no influence on the boron isotopic composition of Xijiang River water and the variation of $\delta^{11}B$ values of the Xijiang River water mainly reflects the change of the boron source. The variation of $\delta^{11}B$ values of the Xijiang River water is controlled by the boron isotopic composition of rain water and that of carbonates. The results are potential to indicate that the dissolution of carbonate rocks and the atmospheric inputs are the two major sources of dissolved boron in river water. Boron from these two sources accounts for 83% of that of the Xijiang River water. This is very different from the conclusions of Rose et al. (2000) and Lemarchand et al. (2002). This discrepancy can presumably be explained by the difference in bed rock composition between the Xijiang River and the other river basins. Carbonate is the dominant rock of the Xijiang River Basin. Therefore, the river water is characterized by high alkalinity, Ca^{2+} and Mg^{2+}, which is controlled by rock weathering, precipitation and acid deposition.

Key words boron isotope; river erosion; Xijiang River; China

Carbon and nitrogen isotope records in sediments of Lake Taihu, China, and their paleoenvironmental significance

Zhihua ZHOU[1,2], Congqiang LIU[1], Huayun XIAO[1], Jun LI[1], Zhaozhou ZHU[1]

[1] *State Key Laboratory of Environmental Geochemistry, Institute of Geochemistry, Chinese Academy of Sciences, Guiyang550002, China*

[2] *Graduate School of the Chinese Academy of Sciences, Beijing 100039, China*

Lake sediments can provide important historical information on records of paleoenvironments and paleoclimates and their changes.