

Dissolved rare earth elements in rivers draining karst terrain in Guizhou Province, SW China

G. L. HAN AND C.-Q. LIU

The State Key Laboratory of Environmental Geochemistry,
Institute of Geochemistry, Chinese Academy of Sciences;
hanguilin@yahoo.com.cn; Liucongqiang@vip.skleg.cn

In the process of chemical weathering, the rare earth elements (REEs) are relatively inert with respect to their behavior and tend to be retained in the weathering crust, only a little amount of REEs enters river water in the form of dissolved loads. However, the dissolved REEs in river water are informative for better understanding of geochemical processes such as complexing, water/rock and /particle interactions.

The dissolved REEs in the waters of the Wujiang River, one of the biggest tributaries in the upper reach of the Yangtze River, are extremely low, concentrations of which range from 3.0×10^{-9} to 40×10^{-9} g/L for La and from 0.4×10^{-9} to 3.0×10^{-9} g/L for Lu, lower than those of most of the world large rivers. The pH of river water is the most important factor controlling the concentrations of river water dissolved REE. In addition, the ion strength of water, inorganic complex anions (HCO_3^- , HPO_3^{2-}), metallic oxide colloidal particulates and biological processes would all exert a great influence on the behavior of the REEs. The high pH values and high ion concentrations of the rivers in the Karst regions of Guizhou are main factors leading to the lower concentrations of dissolved REE in the river water.

The shale-normalized REE patterns for the dissolved loads are shaped with from light REE-enriched to heavy REE-enriched features. The rivers in the upper reach of Wujiang River generally show light REE-enriched patterns, while the river waters in the lower reach have heavy REE-enriched patterns. The waters of Wuyang River draining dolomite-dominated terrain have the REE patterns showing heavy REE-enriched signature. A number of river waters show the shale-normalized REE patterns with negative Eu anomaly, especially the waters from Wuyang River. The fractionation between heavy and light REEs can be ascribed to several factors, such as source, water chemistry and water/particle interaction, among which the water/particle interaction might have played an important role.

Suspended substances in the Wujiang and Qingshui Rivers are relatively high in REE content. The REEs of the suspended substances are composed of two phases, crystalline and adsorbed phase. The REE distribution patterns of suspended matters are consistent with those of the source rocks, indicating that the contents of REE in suspended substances are closely related to the lithological character of the source rocks, but have no obvious relationships with water chemistry.

Acknowledgement: The author gratefully acknowledges the support of K. C. Wong Education Foundation, Hong Kong.