

Chemical and strontium isotopic compositions of dissolved loads in the upper reaches of the Pearl River, South China

PIN LV, GUILIN HAN* AND AIGUO DONG

School of Water Resources and Environment, China
University of Geosciences (Beijing), Beijing 100083,
China (*correspondence: hanguilin@cugb.edu.cn)

The Pearl River as the second largest river in terms of discharge in China, its headwater tributaries (the Nanpan River and Beipan River) are characterized by similar climates and apparently lithological differences, being ideal settings to study the weathering process in the drainage basin. Generally, the Beipan River basin is dominated by carbonate rocks and coal-bearing formations. In contrast, the upper Nanpan River basin is covered by clastic rocks and magmatic rocks, and the lower reaches flow through carbonate formations. In order to identify chemical and physical weathering processes in the upper reaches of the Pearl River, the chemical (HCO_3^- , Cl^- , NO_3^- , SO_4^{2-} , K^+ , Na^+ , Ca^{2+} , Mg^{2+} , NH_4^+ , and Sr^{2+}) and strontium isotopic compositions ($^{87}\text{Sr}/^{86}\text{Sr}$) in dissolved loads were measured.

The waters of the Nanpan River were characterized by low Sr^{2+} concentrations ($0.06\text{--}0.37\text{ mg}\cdot\text{L}^{-1}$) and higher $^{87}\text{Sr}/^{86}\text{Sr}$ ratios ($0.7080\text{--}0.7137$), whereas those of Beipan River had high Sr^{2+} concentrations ($0.12\text{--}0.64\text{ mg}\cdot\text{L}^{-1}$) and lower $^{87}\text{Sr}/^{86}\text{Sr}$ ratios ($0.7075\text{--}0.7095$). Based on the difference of $^{87}\text{Sr}/^{86}\text{Sr}$ ratios between the detrital sediments (having higher $^{87}\text{Sr}/^{86}\text{Sr}$ ratios greater than 0.715) and the carbonate rocks (having lower $^{87}\text{Sr}/^{86}\text{Sr}$ ratios about 0.706–0.709) [1], it indicated that the dissolved loads in the Beipan River originated from weathering of carbonate rocks while the dissolved loads in the Nanpan River was from weathering of clastic rocks. Weathering rates of basin were determined from major elements mass balance and Sr isotopes. The chemical weathering rate of rocks for the Beipan River basin was estimated to be approximately $92.0\text{ t}\cdot\text{km}^{-2}\cdot\text{yr}^{-1}$, which is higher than that of the Nanpan River basin ($66.8\text{ t}\cdot\text{km}^{-2}\cdot\text{yr}^{-1}$). This feature suggested that the intense carbonate weathering in karst area exerted a significant contribution to the river basin.

Acknowledgements

This work was supported by the National Natural Science Foundation of China (Grant No.41325010)

[1] Gaillardet *et al.* (1995) *GCA* **59**, 3469–3485.