

Distribution and implication of the Rare Earth Elements in the Minjiang River of China

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Minjiang River is the largest river in the southeast coastal region of China. The Minjiang watershed is located in the subtropical monsoon climate zone. The warm, humid climate and strong hydrodynamic force due to the steep topographic gradients in E. China facilitates extensive physical and chemical weathering. Paleozoic to Mesozoic granites are widely spread in the area and Minjiang watershed is one of the important rare earth metal mining area in China.

The abundance and spatial-temporal distribution of rare earth elements (REE) and their signatures in the Minjiang River of China were studied from samples of surface water and sediments. Our results show that the average of dissolved \sum REE in Minjiang water sample is ~ 1890.7 ng/L, which is higher than those in most of the major rivers in the world. It is 7.80 times to the average value of the main rivers in China, 16.2 times to the Yangtze River, and 3.45 times to the Amazon River. It shows a strong enrichment of LREE. LREE/HREE increased from land to ocean in the study area with an average value of 9.52. It is 1.07, 3.71 and 1.32 times to the average value of the main rivers in China, the Yellow River, and the Amazon River, respectively. Different from the northern rivers in China, the maximum abundance of total dissolved \sum REE in the Minjiang River does not appear in the wet season, but in the secondary water period. The average value is about 8 times of the dry season. The secondary water period also has the highest LREE/HREE ratio up to 12.72.

Only fine-grained samples are used to study for the REE composition of the sediments in order to eliminate the dilution effect of quartz to the coarse-grained ones. The \sum REE ranges from 230.1~420.2 μ g/g, with an average value of 345.3 μ g/g. It also shows a modest increasing trend from land to sea. The NASC standard normalized REE pattern show enriched in LREE but slightly depleted in HREE which is different from those of the Yangtze River, the Yellow River, the Pearl River and other major rivers in China.

Our study indicates that, the appropriate samples, the time of sample collection, and the frequency of observation are crucial for obtaining the correct and effective data to evaluate the material flux from land to sea in the study of the source to sink. The distribution of REE in Minjiang river indicates strong weathering differentiation. The REE differentiation in water samples are attributed to biogeochemical activities and geochemical exchanges at solid-liquid interface.