A method for the analyses of carbon stable isotope and content of particulate inorganic carbon in inland waters

Yajun Li, Fanyong Meng, and Baoli Wang
Institute of Surface-Earth System Science, School of Earth System Science, Tianjin University

Studies on particulate inorganic carbon (PIC) in inland waters are relatively scarce due to the low concentration of PIC which makes it difficult to be measured accurately. In other studies, a characteristic ratio of PIC in total suspended solids in the water column has been proposed to estimate the river PIC flux to the sea, and a titration method to measure the PIC fluxes in karst rivers has been reported. Therefore, we used the Gas Bench II-IRMS coupled technique method to analyze the $\delta^{13}$C_{PIC} and PIC concentration in inland waters. The method has the advantage of being suitable for the accurate determination of the isotopic composition of trace PIC samples.

The purging time and carbon content of samples are the important factors affecting experimental accuracy. This study proposed the optimal purge time and the lowest carbon content of the inland water sample. The samples in the experiment included laboratory calcium carbonate standard (99.95 % purity) and PIC samples from the Wujiang River. The PIC samples from Wujiang River were collected on glass fiber filters. Datasets from the experiment demonstrated that the ideal purge time is 500-700 s, and at least 25 μg C should be included in the sample. The instrument signal value is low and the isotopic value fluctuates widely when the purge time is less than 500 s. The phosphoric acid cannot be injected into the sample bottle due to the high pressure in it when the purge time is more than 700 s. Therefore, a purging time of 600 s was used for the field sample analyses. The peak area displayed by the device is correlated with the carbon content in the sample, and the datasets show a good linear relationship between the peak area and carbon content in the sample when the sample be analyzed contained more than 25 μg of inorganic carbon. The carbon content of the sample can be calculated from the peak area of the same batch of calcium carbonate standard. While the peak signal is too low to detect the sample accurately when the C content is less than 25 μg. Therefore, the sample should contain more than 25 μg for the field sample analyses. This study will help to provide a reference for the method of determining the PIC content and isotopic composition in inland water.