Variation of water chemistry and dissolved carbon to hydrological conditions in a large river, SW China

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The feedback between the hydraulic conditions and chemical weathering, dissolved carbon dynamics is hypothesized to play a crucial role in moderating CO_2 concentrations for the riverine carbonate system. Time series observations are critical to better constrain the chemical fluxes, chemical weathering rates and the processes controlling the fate of chemical species in rivers. In this study, we investigated hydrochemistry and carbon isotopic compositions of dissolved inorganic carbon (DIC) based on high-frequency sampling in the Wujiang River draining the carbonate area in southwestern China. The concentrations of major elements show significant temporal variations in the Wujiang River. Concentrations of major dissolved solute do not strictly follow the dilution process with increasing discharge, and biogeochemical processes lead to variability in the concentration-discharge relationships. The concentrations of dissolved carbon and the carbon isotopic compositions decreased with discharge increasing, suggesting that hydrological conditions and biogeochemical processes influenced on dissolved carbon dynamics in the riverine system. The concentration of DICbio (DIC from biological sources) derived from a mixing model increases with increasing discharge, indicating that DICbio influx is the main driver of the chemostatic behaviors of riverine DIC in this typical karst river. The study highlights the sensitivity of chemical weathering and carbon dynamics to hydrological conditions in the riverine system.

Reference:

Zhong et al., 2017. Scientific Reports 7:42944, DOI: 10.1038/srep42944.