# Coupled discharge and temperature controls on $CO_2$ consumption fluxes and carbon dynamics for the Xijiang River, Southwest China

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The feedbacks of climate variability on $CO_2$ consumption fluxes and carbon dynamics are hypothesized to act as an important agent in moderating the global carbon cycle. High-frequency sampling campaigns were conducted in this study to investigate the temporal variations of river water chemistry and the impacts of climate variability on $CO_2$ consumption fluxes and carbon dynamics for the Xijiang River. Physical processes always alter underlying biogeochemical processes, so major ions display different behaviors responding to the increasing discharge. High temperature would increase the primary production in the catchment, and high discharge would accelerate the material transport rates, both of which can be responsible for the carbon dynamics in the high-flow season. Large amounts of $\delta^{13}C$-depleted carbon are flushed into the river, which can change $\delta^{13}C_{DIC}$ during high discharge conditions. The transport of mineral weathering materials, influx of $^{13}C$-depleted soil $CO_2$ and degradation of organic matter in rivers are the main factors controlling the carbon dynamics. Overall, these findings highlight the sensitivity of $CO_2$ consumption fluxes and carbon dynamics in response to climate variability in the riverine system.