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Hydrological controls on Chemical weathering in the Jinsha River draining the southeastern Qinghai-Tibet Plateau

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The geochemistry of the riverine waters could provide an insight in understanding the surface processes, such as chemical weathering and carbon cycle. As the headwater of Chanjiang (Yangtze) River, Jinsha River flows on the southestern Qinhai-Tibet Plateau at high altitute (from 1000m to 4600m) above the major areas of human impact and carries important information on this erosive region. In spite of being impacted by monsoonal climate and with significant variations of discharge, the temporal variations of compositions of main ions and chemical weathering of Jinsha River are rarely documented. In this study, a systematic investigation on the seasonal and episodic water geochemistry (major ions and $\delta^{13}C_{DIC}$) of the outlet of Jinsha River basin were carried out with the purpose of 1) characterizing temporal variations of aqueous geochemistry and its controlling factors, 2) quantifying rock weathering and associated CO_2 consumption rates, and 3) exploring the impact of hydrological controls on chemical weathering of the Jinsha River Basin.

The results show that the concentrations of Ca, Mg, HCO_3 and NO_3 are generally decreased during monsoon season, while that of Cl, Na, SO_4, K are relative higher in monsoon season than in dry season, which may be mainly caused by hydrological condition, i.e., with increased runoff, more surficial evaporate dissolved water and salt lake water of the Basin flow into the river. Moreover, due to increased contribution of soil $CO_2$and fast decomposition of organic matters, $\delta^{13}C_{DIC}$ in the high-flow period has more negative values than in low-flow period, and shows a negative relation with the concentration of DOC. An increasing of Ca concentrations was found with shift of the $\delta^{13}C_{DIC}$ values, positively, indicating the precipitation might be occured. Meanwhile, the dissolution of gypsum and anhydrite might enhance the calcium precipition. The forward model results show that the weathering rates of silicate and carbonate as well as that of related CO_2 consumption have a positive relation with water discharge, highlighting the hydrological controls on chemical weathering and CO_2 consumption rates, which should be considered in the future study in river basins impacted by monsoon climate.

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