The internal dynamics of sediment transport system controls on short-term silicate weathering in the Changjiang (Yangtze River) basin

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Knowledge of sediment routing system provides important constraints on the continent weathering and earth surface processes. In this study, we investigated major constraints of the silicate chemical weathering, especially the importance of sediments residence time in the transfer zone, in Changjiang (Yangtze River) river system based on the multi-proxy records of Core CM97 drilled on the Changjiang River Delta and Core MD06-3040 on inner continental shelf of East China Sea since ~14 ka.

During the last deglacial period, the positive response of sediment chemical alteration to East Asian summer monsoon precipitation indicates the monsoon climate variation controlled the silicate weathering intensity in the Changjiang catchment on glacial-interglacial scale. However, sediment transient storage in the vast Changjiang alluvial plain likely buffers rapid climate change signal (e.g., the Bølling warm period and cold Younger Dryas event) in silicate weathering records.

Influenced by postglacial transgression, enlarged basin accommodation space caused abundant sediments trapped in the mid-lower Changjiang reaches and thus undergo an increased residence time after ~10 ka. Meanwhile, accompany with more favorable monsoon climate, the weathering detritus had always maintained in a high degree of chemical alteration from ~10 to 4 ka. After the end of the Holocene optimum, the Changjiang sediments were subject to stronger chemical weathering due to increased sediment residence time caused by decreased sediment transport capacity until the late Holocene. This indicated the internal dynamics of the sedimentary system has overwhelmed the natural climatic controls on the silicate weathering process in the Changjiang river during the early-middle Holocene.

With the intensive human activity in the catchment, more sediments sourced from the upper reaches with slightly chemical alteration induced the abruptly reduced silicate chemical intensity observed in the Changjiang Estuary and inner continental shelf of ECS during the late Holocene. Which does not necessarily characterize the real state of chemical weathering in Changjiang basin over the past ~2 kyr.