

A quantitative approach for evaluating the extent of quartz dilution and tracing the recycled sediment provenance

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In order to better decode the weathering intensity signals registered in the terrigenous sediment archives, the effects of sedimentary recycling and quartz dilution should be evaluated properly. Based on a compiled data set of major element geochemistry of river sediments and their parent rocks collected from East Asia, we developed a quantitative index for evaluating the extent of quartz dilution and discriminating the recycled sediment source. Taking advantage of the present-cycle weathering products trend in the CIA-WIP diagram, we proposed the index of $\Delta\text{WIP}/\text{WIP}$ can faithfully mirror the extent of quartz dilution (expressed as the amount of SiO_2 addition) with respect to the present-cycle weathering products. Given that the index of CIA/WIP is determined by both the extent of quartz dilution and the chemical weathering degree, the $\Delta\text{WIP}/\text{WIP}$ versus CIA/WIP diagram can clearly eliminate the interferences of hydrodynamic sorting and sedimentary recycling effects and then, quantify the degree of present-cycle weathering processes. It also provides a useful clue to the provenance tracing for the recycled sediment, since the weathering and recycling signatures of these sediments are largely inherited from the source terranes. This study provides a convenient and fast approach for examining whether or to what extent the siliciclastic sediments can represent the present-cycle weathering products, and thus sheds new light on decoding the weathering intensity signals from the terrestrial clastic sediments.