Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.10318

The Sediment Residence Times of Changjiang (Yangtze River) Catchment Response to Climate Change during last 14 kyrs

CHAO LI[1], JUNFEI CHEN[2] AND SHOUYE YANG[1]

[1]State Key Laboratory of Marine Geology, Tongji University, Shanghai, China

[2]State Key Laboratory of Marine Geology, Tongji University

Presenting Author: cli@tongji.edu.cn

Uranium (U) isotopes are widely uesed to constrain the timescales of earth surface processes. The ($^{234}U/^{238}U$) activity ratio of fine-grained detrital minerals is proposed to document the time elapsed since rock fractured to small size, i.e. the Comminution Age. Comminution ages of river sediments represent the sum of hillslope storage and alluvial transport/storage in a catchment, defined as the sediment residence time.

The sediment core CM97 in the Changjiang estuary is employed to study the residence time of Changjiang sediment during the last 14 kyrs. The sediment residence time from CM97 varies from 200 to 500 kyrs, and shows a quickly shift corresponding to the main climatic events since 14 ka. In the cold period such as Younger Dryas, characterized by aridity and less precipitation, sediments show a longer residence time because the weathered detritus from the regolith are prone to be stored nearby and hard to be transferred to a distant region. In this case, the sediments in the Changjiang estuary undergone a long-time residence in the regolith or in the lowland region due to the poor connectivity in the entire catchment. Conversely, during warm periods such as Bølling–Allerød interstadial period (B/A) and Holocene Climatic Optimum (HCO) with relatively more precipitation, more deeper materials are eroded and be washed out rapidly. In this scenario, these sediments were more mobilizable and easy to be transported to the distant estuary with a shorter residence time. Our study overall indicates that, in the millennial scale, the sediment residence time derived from ($^{234}U/^{238}U$) of fine detrital fraction shows a sensitive and quick response to climate change, and theirfore provides new insights into quantifing the time scale of sediment source to sink processes and infering the paleoenvironment accurately.