



Yellow River sediment dynamics and the provenance of Chinese Loess Plateau dust – an unexpected relationship

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The Yellow River is one of the world's major sediment bearing rivers but little is known about its sediment sources, sinks and evolutionary history. In particular, it is unclear whether the vast dust deposits of the Chinese Loess Plateau are a source or sink for the Yellow River sediments. Furthermore, the relationship of the generation of this aeolian dust to mountain uplift, drainage and/or aridification is also unclear. Resolving this is crucial to understanding past dust dynamics, terrestrial sediment routing and the interpretation of one of the most important global climate archives: Chinese loess. Here we present the first detailed and multi-technique modern and terrace Yellow River sedimentary provenance data using detrital zircon U-Pb, heavy mineral and sediment petrographic methods. We compare this to provenance data from the Loess Plateau and other potential source regions. The results indicate that the Yellow River sediment load upstream of the Loess Plateau and northern Chinese deserts exhibits similar provenance signals to the river's sediment load as it flows through the Loess Plateau itself. In addition, the sediment load at the boundary between the Tibetan and Loess plateaus shows unchanging provenance signals since at least ~1.5 Ma, and these characteristics are similar to the Loess Plateau/northern Chinese deserts. In contrast, the sediment load flowing past the eastern Loess Plateau has similar signals to the North China Craton and contrasts strongly with Loess Plateau and upper reaches signals. Here we suggest that this unexpected and distinct provenance signal shift demonstrates that the Loess Plateau and parts of the northern Chinese deserts are acting as sediment sinks for NE Tibetan plateau derived upper reaches Yellow River material, implying that the Loess Plateau deposits are heavily influenced by the Yellow River. This is in contrast to previous theories that see the Loess Plateau as the key source of the Yellow River's sediment load. This also demonstrates that lower and middle reaches river sediments may not be representative of the river's upper reaches source areas.