Testing Sediment Buffering Model Using Detrital Zircon U–Pb Dating in the Lower Mississippi River

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ABSTRACT

Detrital zircon geochronology is a common approach to constraining provenance in sedimentary systems, and modern rivers are often used as fingerprints to be compared with older deposits in order to understand the evolution of drainage systems over a variety of time scales. In this study we repeatedly measured the lower reaches of the Mississippi River just north of New Orleans to understand how variable the detrital zircon U–Pb age spectra are on a seasonal basis. We furthermore sampled a meandering river point bar dating back around 1500 years in order to see how the composition of the Mississippi may have evolved as a result of climate change related to the Medieval Warm Period and the Little Ice Age. Source-to-sink models that emphasize the importance of sediment storage and reworking in floodplains would imply that the composition of a long alluviated river like the Mississippi should be relatively constant on seasonal and even centennial scales. Our initial results suggest that this is not entirely correct. Although the river composition appears to be relatively stable over parts of the point bar system, we see significant variations within this, as well as on a seasonal basis in the modern stream, implying that pulses of different sediment composition are moving through the Mississippi, resulting in a non-stable provenance signature in the lower reaches at any one time. Our study implies that in order to establish a fingerprint for a given river, multiple samples spanning several seasons would be preferable than a single grab sample.

Neubeck, N., P. Clift, A. Herrmann, and A. Carter, 2021, Testing sediment buffering model using detrital zircon U–Pb dating in the Lower Mississippi River: GeoGulf Transactions, v. 71, p. 465.

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