

*Stratigraphic Correlation and Signal Propagation Across Sedimentary System Segments Using U-Pb Detrital Zircon Geochronology: Insights from the Late Pleistocene Mississippi River and Deep-sea Fan*

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The Modern Mississippi River at ~37° north latitude is composed of three large tributaries – the Missouri River, the Upper Mississippi River, and the Ohio River. The courses of these rivers have changed dramatically during the last several 10s thousands of years. One such significant change in the Mississippi River's course occurred about 24 ky ago, when the river avulsed from its position in the Western Lowlands of the Mississippi Valley to the Eastern Lowlands. This chronology is well established, yet what is unclear is whether the Mississippi's course through the Western and later through the Eastern Lowlands represents a combined Missouri-Mississippi-Ohio River system, or if these rivers flowed apart through the Mississippi Valley en route to the Gulf of Mexico. In order to understand the spatial history of the major tributaries to the Mississippi River, we used sedimentary provenance to improve existing constraints on their boundaries. Then in our study location (Eastern Arkansas and western Mississippi) we performed vibracore sediment coring and power auguring to retrieve ancient buried sand from the Western and Eastern Lowlands of the Mississippi River Valley, which contain small minerals called detrital zircons. Detrital zircons were separated from each sediment sample, and the U-Pb age of each of hundreds of detrital zircons were measured using laser ablation geochronology at the University of Texas, Austin. The populations of U-Pb ages in a sediment sample relate to the sediment source area, or tributary to the Mississippi River, the Missouri, Upper Mississippi, and Ohio Rivers. Based on the U-Pb age spectra from samples in the Western Lowlands, we found that our samples were most similar to the Missouri and Upper Mississippi Rivers. The U-Pb age spectra from a sample from the Eastern Lowlands suggests that sediment sources were a combination of the Missouri-Upper Mississippi River-and Ohio Rivers. However, the Missouri River was still the main source of sediment to each of the locations thousands of years ago.

We interpret our findings to mean that when our samples were deposited (~25 ka and ~15 ka), that the major tributaries for the Mississippi were the Missouri and lower Mississippi River tributaries. This discovery is significant in mapping the paleo Mississippi river and its behavior which could influence modern day decisions such as land development. If given the opportunity, further work would be deeper sediment samples and more wide spread sample areas spanning sights of interest or complex possible avulsions that do not yet have an established paleo tributary.