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The Birthday of the Mississippi River: Evidence from the Cretaceous McNairy Sand

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ABSTRACT

The McNairy sand is a member of the Ripley Formation (~67 Ma), exposed intermittently around the margins of the Mississippi Embayment (MSE). The MSE is a southwest plunging syncline which began developing during the rifting period during the breakup of Rodinia in the Neoproterozoic creating the northeast trending Reelfoot Rift. Through time the area subsided and the drainage patterns of the ancestral Mississippi River were rerouted to drain southward into the MSE. The McNairy is thought to have been deposited intermittently following transgressive cycles through the Late Cretaceous into the Paleogene with heaviest deposition occurring in the Maastrichtian period (72.1–66.0 Ma) with the significant source areas from the Appalachian Mountains associated with Grenville and Taconic-Acadian aged sediments. Through eustatic sea level changes and tectonic activity the deposition of the McNairy has alternated between shallow marine sediments and fluvial dominated depositional environments. As subsidence occurred and drainage networks adapted, the McNairy was deposited along the eastern and western lengths of the embayment. Current theories suggest the orientation of the Mississippi River adjusted from an east-west orientation to a north-south orientation during this reorganization.

Detrital zircon U-Pb analysis of the McNairy sand provide us with information to address the ages and sources of the sediment. The zircons used for this study are anhedral, colorless, translucent, sub-rounded, and have low sphericity. The detrital zircon age range was similar for our McNairy Sand samples. Zircons from the associated Grenville province are the most common, composing 76% of the dataset. Taconic-Acadian and Midcontinent Granite-Rhyolite province grains each compose ~9% of the total grains. This data suggests the McNairy Sand's primary source area was in the Appalachian region. Additional sediment may have been carried to the area by longshore current from the northern portion of the Mississippi Embayment, sampling the Archean core of Laurentia.

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