



Mid-Cretaceous Source-to-Sink Sediment Routing in North America from Detrital Zircons

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Previous work used detrital-zircon (DZ) U-Pb age populations to argue the Aptian McMurray Formation of the Alberta foreland basin of western Canada represents an early to mid-Cretaceous continental-scale river system that drained much of North America and routed sediment to the Boreal Sea. Late Cretaceous and Early Paleocene drainage reorganization then rerouted sediment from the southern half of North America to the south and the Gulf of Mexico. This presentation refines these ideas with new DZ U-Pb data from the McMurray and from the age-equivalent distal tributary network in the US continental interior.

Previous work shows the updip McMurray in the southern part of the Alberta foreland is dominated by DZ U-Pb populations that were ultimately derived from the Appalachian Cordillera of the eastern and southern US, but also contains small Mesozoic populations derived from the US Western Cordillera: some or most of the “Appalachian” population is actually recycled from primary Appalachian-derived populations of the Western US passive margin succession. Farther downdip and to the north, some McMurray samples are represented by this same “Appalachian” DZ U-Pb population, but others fingerprint a large system derived from the east and the Canadian shield: previous work suggests provenance differences record evolution of drainage through time, such that the lower McMurray is characterized by the east-derived shield population, and the middle McMurray and higher parts of the succession are characterized by south-derived “Appalachian” populations.

New data from the northern part of the Alberta foreland show that all McMurray units have some sample locations that produce DZ U-Pb age populations that are strictly south-derived “Appalachian”, others are strictly east-derived, and still others represent a mix of these populations. These relationships indicate the McMurray represents an axial system that enters western Canada from the south, as well as a tributary system from the east, and the combined McMurray drainage area therefore includes much of Canada.

New data from the age-equivalent distal tributary network in the US Rocky Mountains and the US midcontinent show that fluvial deposits of the Rockies represent drainage of the Western Cordillera, and are dominated by a recycled “Appalachian” DZ U-Pb population with additions from the Western Cordilleran magmatic arc, whereas Cretaceous fluvial deposits of the US midcontinent are derived from the east and have primary Appalachian DZ U-Pb populations only. Samples from locations between the Rockies and the midcontinent represent generally northward sediment transport, and DZ U-Pb populations are a mix of the recycled west-derived and primary east-derived Appalachian sources. The combined drainage area for the McMurray and the Boreal Sea was similar to that of the largest river systems of the modern world, and the McMurray represented the Mississippi or Amazon of its time.