Inversion Tectonics in the Brooks Range Orogen and Subsequent Controls on Sedimentation: A view from the craton

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ABSTRACT

Proterozoic and Lower Paleozoic basement (Franklinian) of the Brooks Range Orogen was extended in Late Devonian to Early Mississippian times along northwest-trending faults, leading to deposition of thick sequences of Upper Devonian coarse clastics of the Kekituk and Kanayut formations, and local volcanism. These extension faults impacted the distribution of units and facies in the Ellesmerian megasequence (Mississippian to Jurassic). Crustal shortening initiated with the Middle Jurassic obduction of the oceanic Angayucham terrane over Arctic North America. Inversion of Kekituk depocentres beneath the Colville Foreland Basin affected the section up to the Jurassic Kingak Formation, suggesting a possible link between terrane accretion and inversion. These, and similar inversion structures beneath the Brooks Range Foothills, provide an analog for inversion of the Upper Devonian Kanayut conglomerate depocentres exposed near the Brooks Range front. Shortening culminated in a pulse of foreland basin development recorded by deposition of the Berriasian to Hauterivian Okpikruak and Barremian to Albian Fortress Mountain formations in the Colville Basin.

Neocomian shortening was followed by Late Albian to Cenomanian and younger extension in the central and southern Brooks Range. Rocks of this age in the Colville Basin include the sandstones of the Nanushuk Formation. The Nanushuk is distributed in SW-NE trending depocentres, with overall thinning northward away from the Neocomian deformation front. Seismic data suggest that thicks of Nanushuk were deposited in asymmetric subbasins controlled by faults that sole in the underlying Torok shales (Albian), an important detachment horizon for Tertiary shortening in the Brooks Range Foothills.