

Brookian Foreland Basin Response: From Sediment-Starved During Thrusting To Filled During Extensional Exhumation

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Although reformed by Cenozoic contractional deformation, the framework elements of Early Cretaceous north-directed arc-continent collision are easily discerned in the Brooks Range. Key elements include a metamorphic hinterland in the southern Brooks Range, an imbricated foreland consisting of a stacked series of thin-skinned allochthons in the northern Brooks Range, and the adjacent Colville foreland basin underlying the North Slope to the north. Associated sedimentary deposits include lower Neocomian syntectonic thin-bedded turbidites and olistostromes capping the allochthons, post-deformational Hauterivian-Albian wedgetop units consisting of northward-thinning locally conglomeratic fan-delta deposits, and a thick Albian and younger eastward prograding slope and deltaic foredeep wedge that fills the Colville Basin.

Sedimentary facies, sandstone petrography, and detrital zircon U-Pb data indicate that the syntectonic units are thin and were shed locally from the uppermost allochthons (including ophiolite) and longitudinally from sources of Uralian sediment to the west. The wedgetop deposits consist of sand-rich deposits composed of Uralian detritus, suggesting derivation from reworked syntectonic deposits. Early foredeep deposits were derived from Uralian sources to the west but after 107 Ma changed to dominantly metamorphic sources from the Brookian hinterland. Together these indicate the Brooks Range was a sediment-starved submarine orogen during thrusting but became emergent in the Aptian and Albian as thrusting gave way to extensional exhumation in hinterland areas.