

# **Seismic Analysis of Sedimentation and Deformation of Ellesmerian Strata, Umiat Basin, Alaska North Slope: Evidence for Carboniferous Oblique Wrench Faulting**

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The Carboniferous Umiat basin of the Alaska North Slope is one of several grabens developed during generally passive-margin sedimentation. Although the basin's stratigraphy and Cretaceous through Tertiary contractional deformation are well known, its pre-Cretaceous history is relatively poorly documented. While the basin's Ellesmerian (Devonian to Permian) structural elements have been identified by previous workers, regional public-domain 2-D seismic data has been reprocessed recently, and these provide an opportunity to describe the evolution of the basin in greater detail.

Reprocessed seismic data display a complex structural system including halfgrabens, negative and positive flower structures, high angle thrusting along reactivated normal faults and growth folds. These structures suggest a system accommodating transpressional/transensional deformation. Due to the improved resolution in seismic data it is possible to assign a relative time to sedimentation, as well as to fault activation and inversion. Through seismic-stratigraphic correlation of the deformed sequences via core samples and wireline logs from the Inigok 1 well, ranges of dates may be assigned to discrete events in the basin's evolution. Evaluation of a grid of seismic lines confirms that the Umiat basin experienced extension during deposition of the lower part of the Endicott Group (Devonian to Mississippian) followed by oblique wrench-faulting during deposition of the upper part of the Endicott Group and lower part of the Lisburne Group (Mississippian to Permian). This entire succession is commonly cited as having been deposited on a passive margin shelf across the Alaska North Slope.