U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

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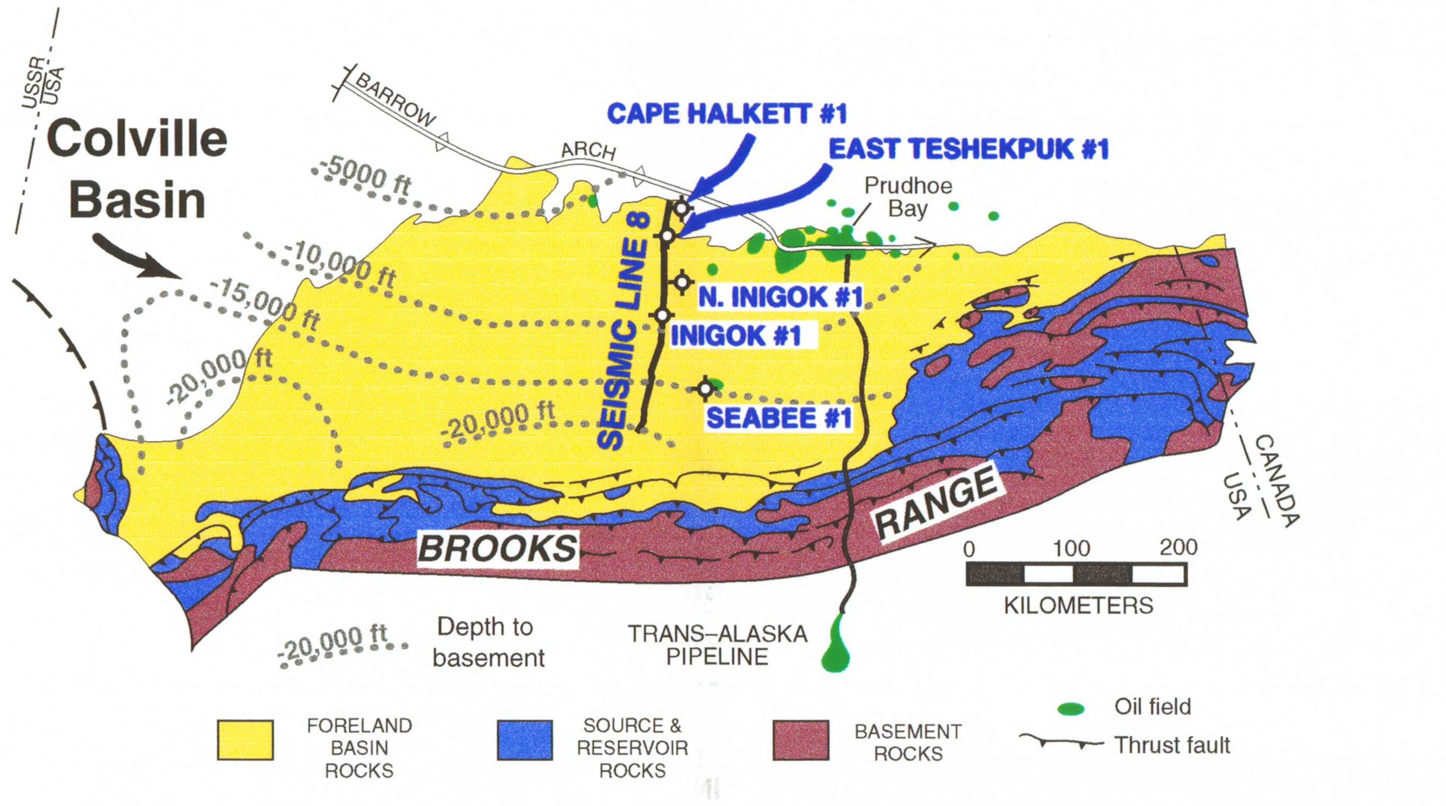
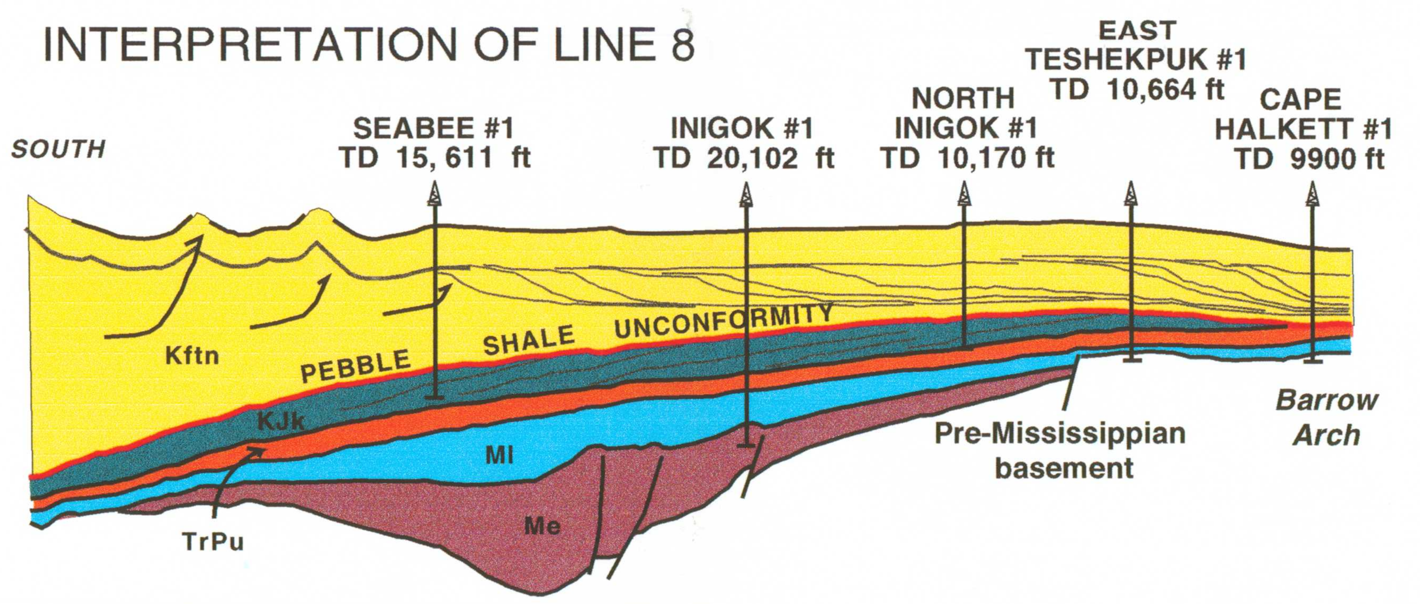
OPEN-FILE REPORT 95-823
SHEET 3 OF 3

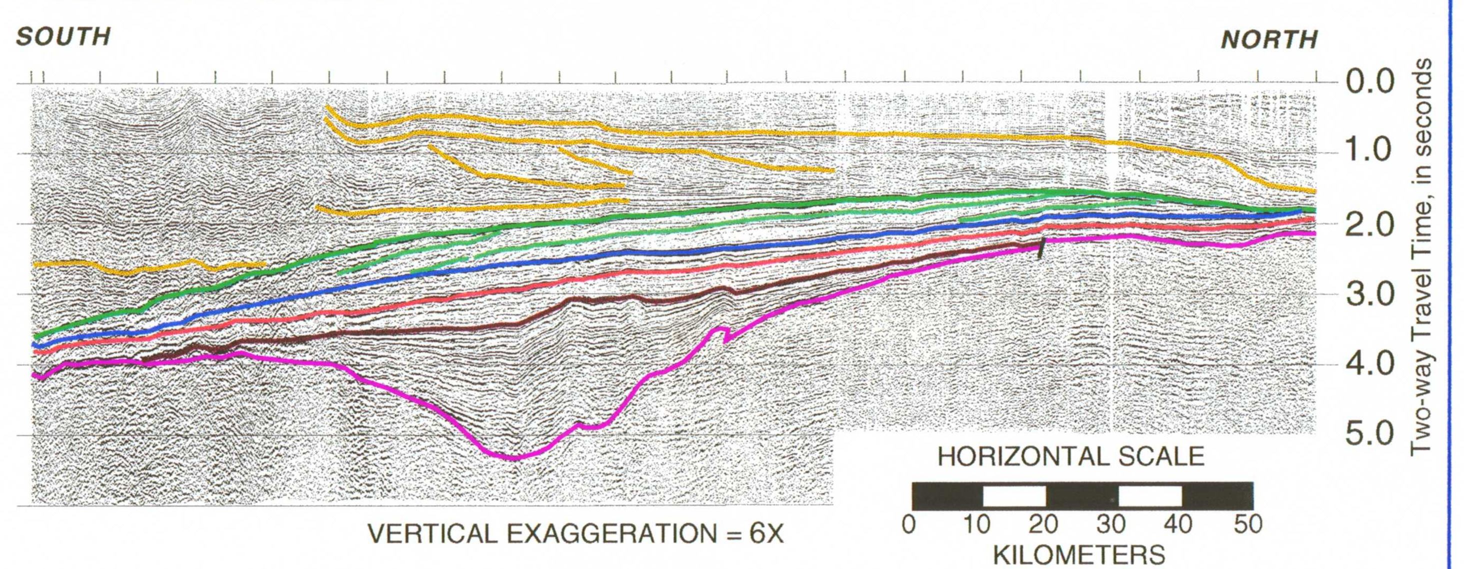
III. TECTONIC SUBSIDENCE MODELING



INTERPRETATION OF LINE 8



SEISMIC LINE 8

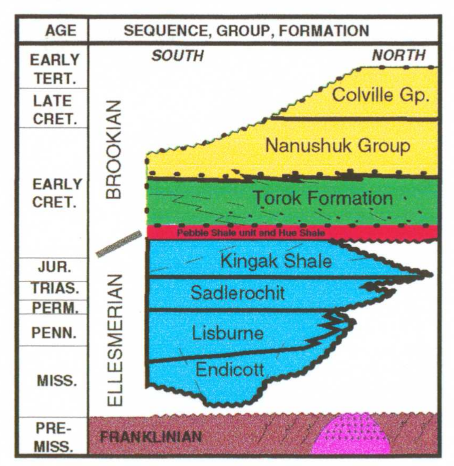


To constrain the timing of deformation in the fold- and thrust-belt, we analyzed the subsidence history in the adjacent foreland basin (Colville Basin). The map on the left shows 5 government-drilled wells (Seabee #1, Inigok #1, North Inigok #1, East Teshekpuk #1, and Cape Halkett #1) and the seismic line (NPRA Seismic Line 8) used in this analysis. The map and the seismic interpretation (middle and lower left) also show the positions of the tectonic features that flank the Colville Basin-- the Barrow Arch to the north, and the Brooks Range Orogen to the south.

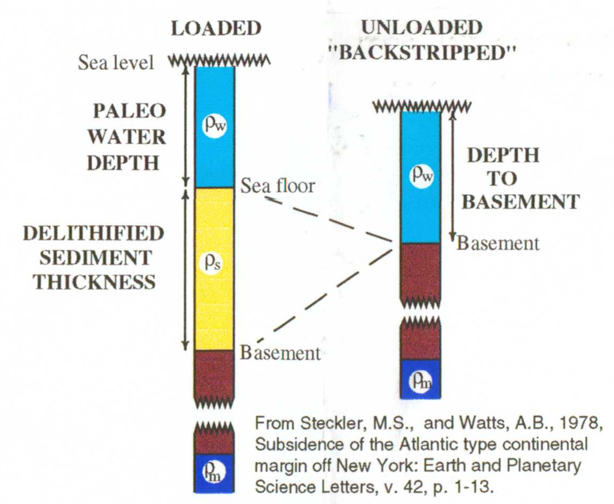
By analyzing changes in sedimentary thickness and paleobathymetry as the Colville basin evolved through time, we can see the flexural effects of overthrusting in the Brooks Range, as well as the thermal effects of rifting along Barrow Arch. Decompacted sedimentary thicknesses and paleo-water depths are adjusted according the the backstripping method (below) to view the tectonic subsidence of the basin through time-- or the basin subsidence that is not accounted for by simple sedimentary loading.

The 5 graphs on the right show the total subsidence (green curve), the estimated paleobathymetry (blue curve), and the tectonic subsidence (red curve) at each well-site through time.Tectonic subsidence prior to early Cretaceous time is dominated by slow, decelerating subsidence typical of a passive margin. Beginning in early Cretaceous time we see tectonic uplift followed by rapid subsidence, signalling thermal uplift along the Barrow Arch and tectonic loading in the Brooks Range orogen, respectively. The Neocomian through Albian tectonic subsidence history is shown in more detail by a blow-up of the tectonic subsidence curves (upper far right) and a diagrammatic cartoon (lower far right).

NORTH SLOPE STRATIGRAPHY

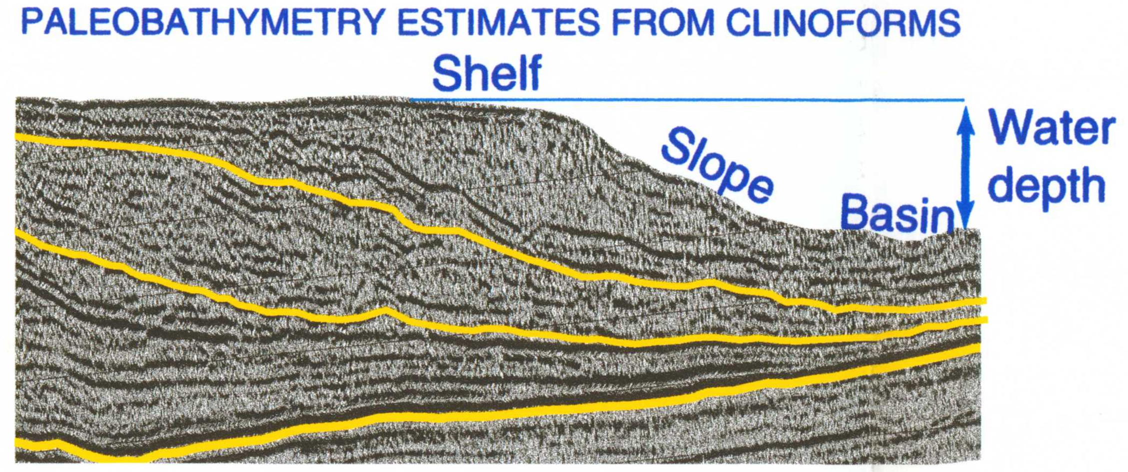


BACKSTRIPPING METHOD



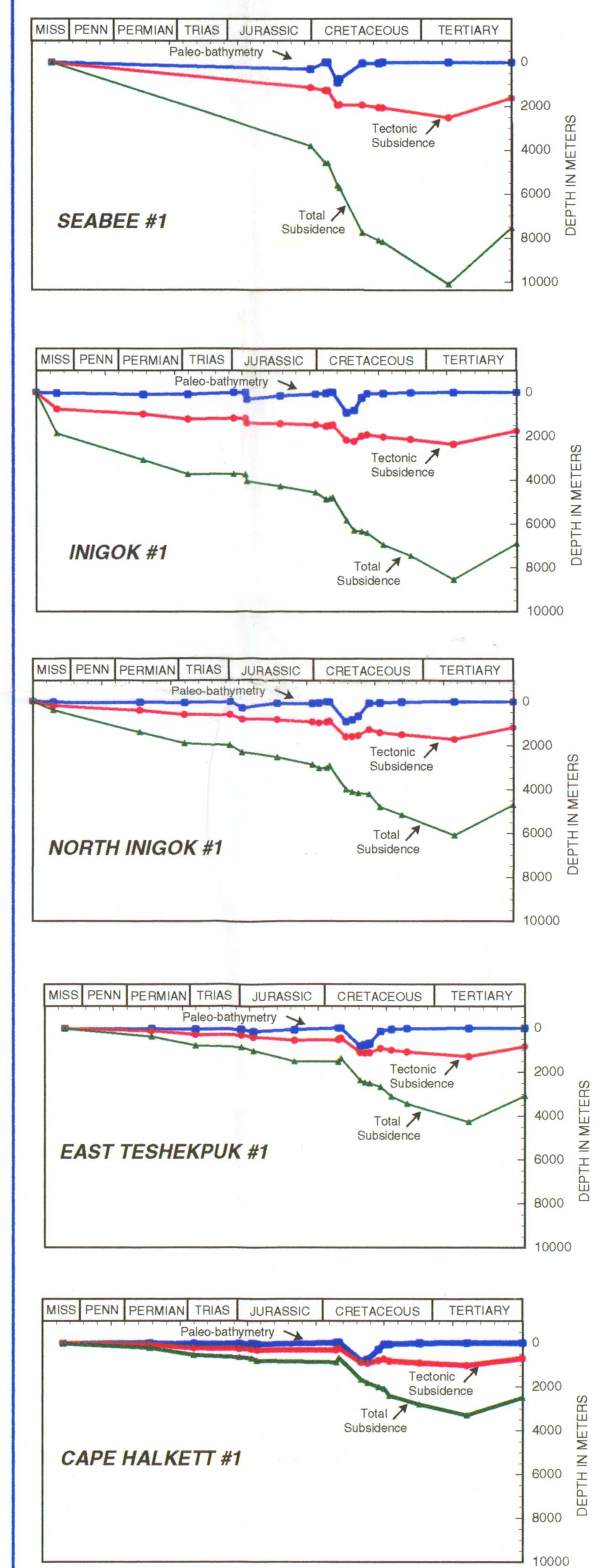
From Steckler, M.S., and Watts, A.B., 1978, Subsidence of the Atlantic type continental margin off New York: Earth and Planetary Science Letters, v. 42, p. 1-13.

PALEOBATHYMETRY ESTIMATES FROM CLINOFORMS

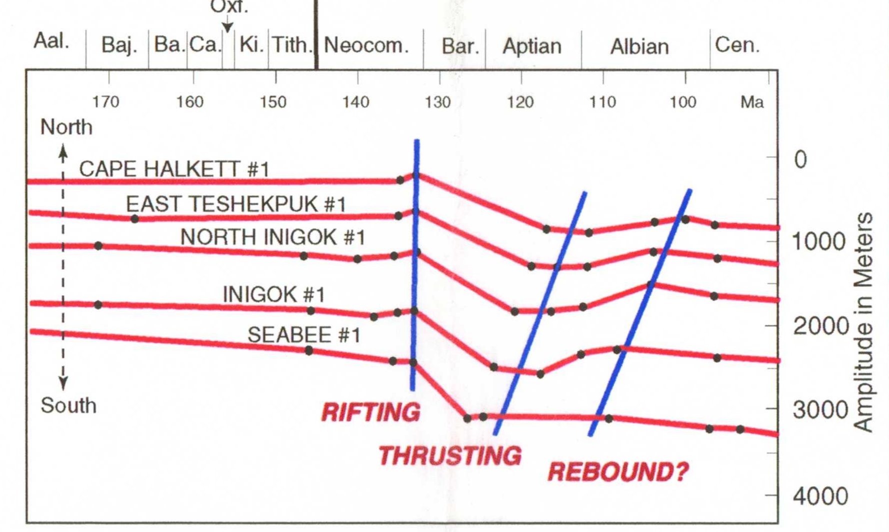


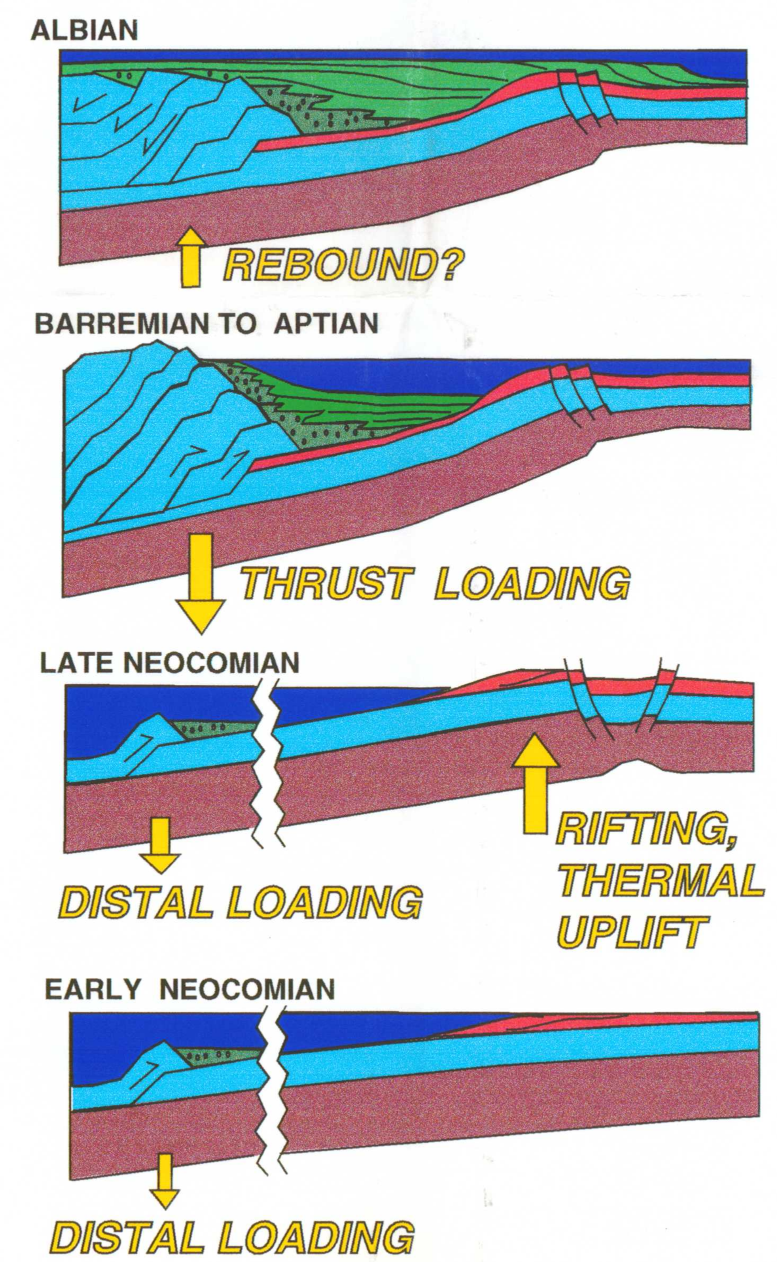
SUBSIDENCE CURVES FOR 5 NORTH SLOPE WELLS

Subsidence curves generated with Decem-Kominz software, courtesy of Michelle Kominz, UT Austin.



Tectonic Subsidence Comparison





KINEMATIC AND SUBSIDENCE MODELING OF THE NORTH-CENTRAL BROOKS RANGE AND NORTH SLOPE OF ALASKA

By
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