The potential occurrence of middle Cretaceous source beds beneath a steadily thickening pile of Cenozoic basin-plain and rise-prism deposits can be viewed as increasing the chances that deep-water reservoirs in the Aleutian basin have been charged by migrating hydrocarbons.


Investigation of Source Rock–Crude Oil Relationships in North Slope Hydrocarbon Habitat

Carbon isotopic studies of kerogen assemblages and petroleum assemblages from the North Slope–Colville trough area of Alaska have permitted firmer source-oil correlation assignments. As a section, the Mesozoic contains a suite of potential source beds including the Shublik Formation, Kingak Shale formation, and Lower Cretaceous units and, most notably, a post-Neocomian, highly radioactive zone (HRZ). The maturation and generation history of these sediments has been broadly controlled by the Brookian orogeny.

Using well data, trends in generalized source richness, hydrocarbon proneness, and organofacies have been recognized. In projecting these data into the deeper Colville trough, a considerable variation in hydrocarbon generating potential was noted over the Mesozoic section. Several particularly attractive oil-prone units were recognized.

The generic relationship of a wide range of North Slope petroleum—incising early, normal, and post-mature or biodegraded examples—was established. A majority of the principal accumulations could be assigned to the previously defined Barrow-Prudhoe oil family. This widespread generic series included petroleums from Upper Cretaceous, Kuparuk River, Ivishak, and Lisburne reservoirs. Lesser, but distinct, Simpson/Seabee-type oil groupings were also recognized.

Effective source-to-oil correlation was achieved by a comparison of the carbon isotopic compositions of the kerogen pyrolyates and the crude oils. The possible contributions of the various source units were assessed in terms of isotopic match, source potential, and volumetrics. Assuming continuity of source characteristics into the deeper Colville trough, a Triassic/Jurassic combination constituted the closest source match to the major accumulations.

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Lateral Continuity of the Blarney Creek Thrust, Doonerk Range, Alaska

The contact between Carboniferous and lower Paleozoic rocks, exposed along the northern margin of the Doonerk window in the central Brooks Range, is a major thrust fault called the Blarney Creek thrust (BCT). The BCT has been traced over a distance of 25 km, from Falsoola Mountain to Wien Mountain. The tectonic nature of this contact is demonstrated by: (1) omission of stratigraphic units above and below the BCT; (2) large angular discordance in orientation of first-generation cleavage at the BCT; (3) numerous thrust imbricates developed in the generic series included petroleums from Upper Cretaceous, Kuparuk River, Ivishak, and Lisburne reservoirs. Lesser, but distinct, Simpson/Seabee-type oil groupings were also recognized.

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Phosphatic Glauconitic Sandstone and Oncolite Deposition at the Upper Paleozoic Base of Eitvik Group, North-Central Brooks Range, Alaska

Carboniferous stratigraphy of the Picnic Creek alloc hotspot in the central Brooks Range is dominated by bedded cherts and slates. In the Killik River quadrangle, bedded black cherts of the Lisburne Group are overlain by a thin diagnostic clastic unit composed of sandstone and conglomerate. The sandstone is a thin (0.35-m), laterally extensive, planar, laminated litharenite with an average Q:F:L of 40:17:43 and a Qp:Lv:Ls of 12:8:80. The provenance is interpreted to be a recycled orogen dominated by uplifted sedimentary sequences with minor plutonic, metamorphic, and volcanic sources. The presence of glauconite (7%) and authigenic phosphate (18%) indicates deposition in a shelf environment. This phosphatic sandstone forms part of the matrix in a conglomerate at one locality. The conglomerate is lenticular (2 m x 10 m), crudely graded, and very poorly sorted, and it contains black chert ripups. Clasts are composed of oncoids (70%), chert (22%), shale (5%), and limestone (3%). Barite preferentially replaces all clasts except chert and part of the matrix. The oncoids are SS-type mode C hemispheroids, indicating formation in a continuously agitated shallow to intertidal marine environment.


Water Resources of the North Slope, Alaska

Lakes, streams, springs, snow, and ice are the most obvious source of fresh water on the North Slope. However, permafrost and seasonal climatic effects restrict the availability of these sources for water supply. Shallow lakes, ranging from the 315-m² (815-km²) Teshekpuk Lake to ponds less than an acre, literally blanket large parts of the coastal plain. Ice-cover formation and thickening on these lakes in winter are accompanied by an increase in dissolved-solids concentration in the remaining water, thus limiting its suitability for water supply. Most of the precipitation occurs as snow, which is stored on the land surface until it melts in late spring and summer. Snow and ice are used to construct temporary roads and airfields, and melted snow and ice are often used as potable water. Most of the annual streamflow occurs during...