ABSTRACT

Six North Slope petroleum systems are identified, described, and mapped using oil-to-gas and oil-to-source rock correlations, pools of active source rock, and overburden rock packages. To map these systems, we
assumed that: (1) petroleum source rocks contain >2 wt. % organic
matter (TOC); b) immature oil-prone source rocks have hydrogen indices
(HI) >300 (mg HC/gm TOC); c) the top and bottom of the petroleum
(oil plus gas) window occur at vitrinite reflectance values of 0.6 and 1.0% Ro,
respectively; and d) most hydrocarbons are expelled within the petroleum
window.

The six petroleum systems we have identified and mapped are: a) a
southern system involving the Kuna-Lisburne source rock unit that was
active during the Late Jurassic and Early Cretaceous; b) two western
systems involving source rock in the Kingak-Alpine (West) and GTZ-
lower Tonsle source rock units that were active during the Albian; and c) three
eastern systems involving the Shublik-Owl, Huie Shale and Carney
source rock units that were active during the Cenozoic. The GTZ-
lower Tonsle in the west is correlative with the Huie Shale to the east.

Four overburden rock packages controlled the time of expulsion and
gross geometry of migration paths: a) a southern package of Early
Cretaceous and older rocks structurally thickened by early Brooks Range
fracturing; b) a western package of Early Cretaceous rocks that filled
the western part of the foreland basin; c) an eastern package of Late
Cretaceous and Paleogene rocks that filled the eastern part of the
foreland basin; and d) an offshore deltaic package of Neogene rocks
deposited by the Chukchi, Canning, and Mackenzie rivers.

This petroleum system poster is part of a series of Northern Alaska
posters on modeling. The poster in this season by Bird and Bird present
grided maps for the greater Northern Alaskan onshore and
offshore that are used in the 3D modeling poster by Lampe and others.
Posters on source rock units are by Keller and Bird as well as Peters and
others. Sandstone and shale composition properties used in sedimentary
basin modeling are covered in a poster by Rowan and others. The
results of this modeling exercise will be used in our next Northern Alaska
oil and gas resource assessment.

Figure showing National Petroleum Reserve in Alaska (NPRA) and Arctic National Wildlife Refuge (ANWR) in North Slope of Alaska. The polygon relates to poster by Lampe and others. Numbers are the oil and gas pools listed alphabetically above and numerically in the table to the left. The table and map shown here are the base for the location and volume of each pool in each of the six petroleum systems.