Alaskan North Slope Petroleum Systems

Seven onshore North Slope petroleum systems are identified and mapped using oil-to-oil and oil-to-source rock correlations, pods of active source rock, and overburden rock packages. To map these systems, we assumed that:

a) petroleum source rocks contain >=2 wt. % organic carbon (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.

Three 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 thrusting;

b) a western package of Early Cretaceous rocks that filled the western part of the foreland basin; and

c) an eastern package of Late Cretaceous and Paleogene rocks that filled the eastern part of the foreland basin.

The seven 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) three western systems involving source rock in the Shublik-Otuk, Kingak-Blankenship, and pebble-GRZ-Torok source rock units that were active during the Albian; and

c) three eastern systems involving the Shublik-Otuk, Kingak-Blankenship, and Hue Shale source rock units that were active during the Paleogene.