

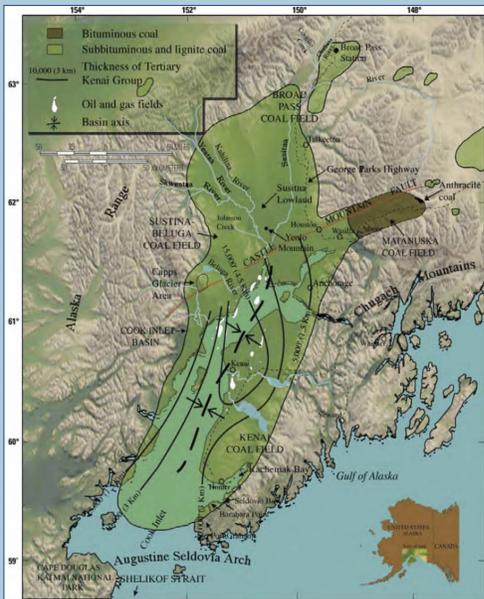
Integrated Cook Inlet Environmental Monitoring and Assessment Program (ICIEMAP): Hydrocarbon Fingerprinting

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This poster is one of a series from the Integrated Cook Inlet Environmental Monitoring and Assessment Program (ICIEMAP) and provides a brief summary of hydrocarbon fingerprinting results.

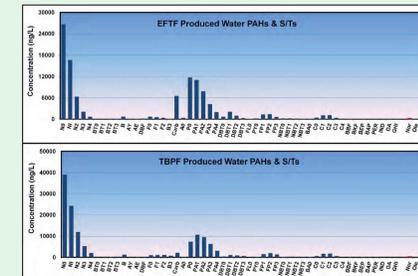
- PAH concentrations and geographic distributions provide information for determining whether contaminants are accumulating in the environment. These data are presented here as total summed PAH.
- In concert with the PAH concentration data, the relative ratios of each individual PAH analyte with every other PAH can provide clues to the potential source of those PAHs.
- Hydrocarbons comprise a diverse variety of potential inputs from both natural and anthropogenic origins that complicate the assessment of sources and the primary task of this component of ICIEMAP interpret from hydrocarbon data whether samples show evidence of oil releases due to oil industry exploration or production activities.
- Hydrocarbon fingerprinting used PAHs, as well as hopane biomarkers, to compare sample signatures with known sources of hydrocarbons to the environment.
- For ICIEMAP, each sediment and water column sample collected for PAH analyses was graphed to provide visual clues to the samples PAH signature and a selection representing groups of signatures are presented here.



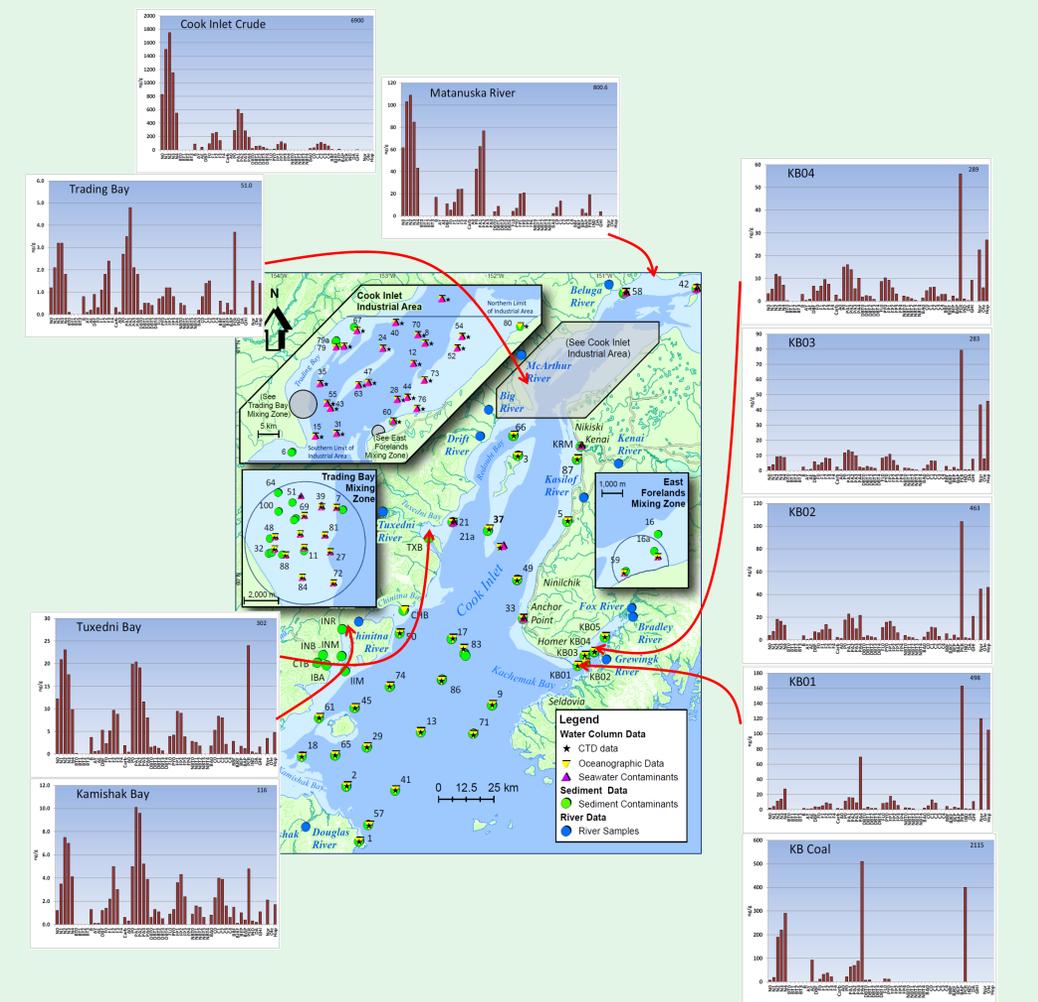
Oil, gas, and coal fields in the Southern Alaska-Cook Inlet provinces (from Flores et al. 2004)

Cook Inlet PAH Signatures

- Presented here are several examples of PAH signatures that confirm results seen in previous Cook Inlet analyses that suggest mixed sources for most areas of the Inlet.
- Kachemak Bay sediments show a slight gradient of coal signatures along the bay. The produced water (right), crude oil, and Matanuska River show 3 potential "sources" of PAHs to sediments in the Inlet.
- There is much variation in PAH signatures, but they show common traits in having large naphthalene and phenanthrene concentrations (first and third groups in histograms) relative to other PAH groups.
- Almost all Cook Inlet samples show classic predominant fresh naphthalene "hump," they are retaining unweathered naphthalene signatures no matter how far they are from a PAH source source (e.g. produced water, crude oil, river sediments, etc...), suggesting that petrogenic compounds are locked within the matrix and are not bio-available as free oil would be.



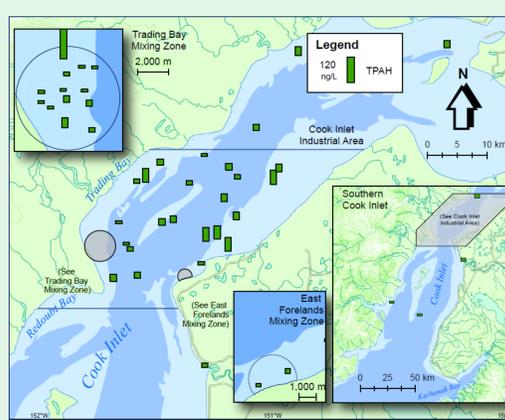
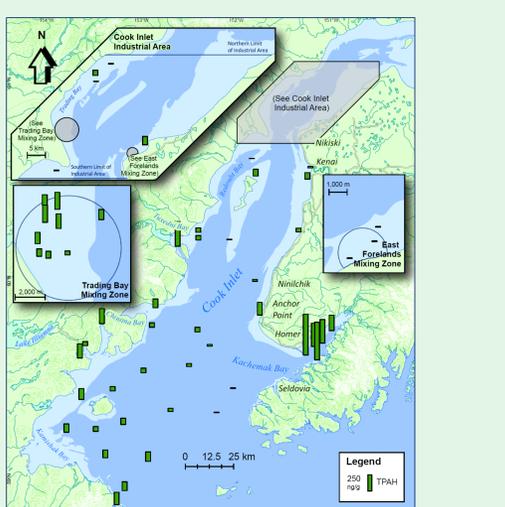
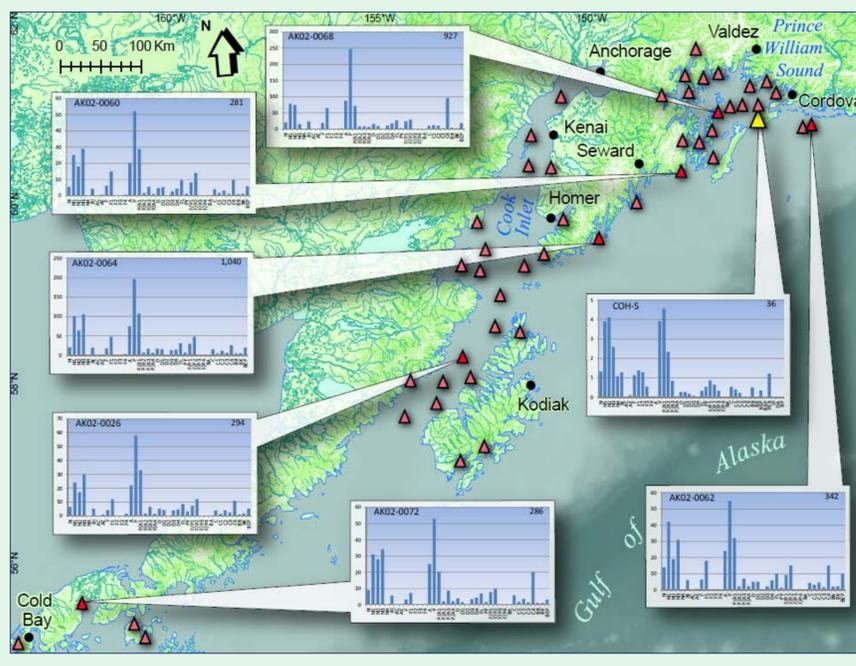
PAHs from East Forelands and Trading Bay treatment facilities' produced water. Note the predominance of naphthalenes, dominated by the parent compound (N0), with decreasing contributions by the alkyl-homologues, altered by the presence of water-dissolved naphthalenes suggested by the descending stair-step pattern of naphthalenes (N0-N4) rather than the "hump" seen in fresh oil (below).



Gulf of Alaska PAH Signatures

A 2002 coastal assessment in southcentral Alaska shows that PAHs in benthic sediments showed a persistent, non-weathering (non-bioavailable) coastal background signal that was ubiquitous across the study area.

This background PAH signature was observed from the Alaska Peninsula in the southwest to the Copper River delta area in the northeast. It is within the context of this background signature that other PAH data must be interpreted in order to detect potential anthropogenic or other natural sources of PAHs to the coastal environment.



Distribution map for sediment PAH concentrations (ng/g) measured during ICIEMAP (top). Note the highest concentrations occur at the deep stations in Kachemak Bay. These sediments are particularly fine-grained and have high organic carbon content, both known to positively correlate with hydrocarbon adsorption onto sediments.

The lower map shows distributions for depth-averaged water column PAHs (ng/L) measured during ICIEMAP.

PAH data from ICIEMAP (stations on map) show mixed sources, with three regionally dominant patterns. As with historical studies, no evidence of PAH accumulations from produced water discharges or recent crude oil or distillate product releases were observed. All samples did contain oil-like signatures from potential peat/coal/source-rock (kerogen) inputs into Cook Inlet that has been attributed by other scientists as a PAH-bearing, ubiquitous, source-rock signal across the western Gulf of Alaska, and that now seems to also have Cook Inlet contributions.