

MMS ENVIRONMENTAL STUDIES PROGRAM: ONGOING STUDIES

Region: Alaska

Planning Area: Cook Inlet

Title: Water and Ice Dynamics of Cook Inlet (AK-93-48-49)

MMS Information Needs to be Addressed: This project will enable MMS to improve its oil-spill risk modeling applied to Alaskan waters. This in turn will enhance the credibility of MMS Cook Inlet EISs and related NEPA analysis and documentation. Public acceptance of OSRA results and analyses will be enhanced if accompanied by supporting drifter data for Alaskan waters.

Total Cost: \$940,000

Period of Performance: FY 2002-2008

Conducting Organization: CMI, UAF

MMS Contact: [Chief, Alaska Environmental Studies Section](#)

Description:

Background The Cook Inlet tidal regime is among the most complex in the United States because of the large tidal range, extensive mud flats, strong currents, severe weather, and seasonal ice cover. Most physical oceanographic data supporting the model is derived from a comprehensive NOAA circulation survey of Cook Inlet carried out from 1973-1975. A few modest Lagrangian surface current studies have been performed in the Cook Inlet/Shelikof Strait. One study involved releasing drifters in and near Kachemak Bay as documented in 1977; another, released drifters from lower Cook Inlet, was documented in 1981; and another involved releasing drifters in the lower Shelikof Strait. The latter study released a small number of oil-spill-simulating drifters for the purpose of testing how well these drifters would follow an actual oil spill, in this case the *Exxon Valdez* spill.

The MMS has used a variety of ocean models to estimate water and oil movement in Cook Inlet. Most recently, MMS has used an in-house version of the Princeton Ocean Model. In 1999 MMS co-sponsored a Cook Inlet oceanography workshop which recommended that Cook Inlet models be improved and validated in parallel with acquisition of improved observational data.

Objectives The objective of this work is to successfully simulate the sea ice and water dynamics in Cook Inlet and validate the simulations with observational data.

Methods A combination of 2-d models and a 3-d model, the Regional Ocean Model System (ROMS) because it has been configured to Cook Inlet, will be used and compared to observational data. An improved Cook Inlet bathymetry needed for the modeling has been obtained from commercial and government sources. Scatterometer satellite observations will provide winds to the models. Drifters are a primary data source. These include oil-following drifters provided by MMS and water following drifters with combined Global Positioning

System (GPS) and Advanced Research and Global Observation Satellite (ARGOS) capabilities. Synthetic Aperture Radar (SAR) imagery is being obtained concurrent with drifter and other field measurements to obtain broad scale information on tide rips.

Current Status:

The Principal Investigator (PI) has submitted project deliverables to MMS. Draft final report chapters have been reviewed by MMS and MMS has requested that report be forwarded to the CMI for editing.

Final Report Due: March 30, 2008

Publications Completed:

- Johnson, M. A. Water and Ice Dynamics in Cook Inlet [Abstract]. University of Alaska Coastal Marine Institute. Annual Report No. 9. 2003. Fairbanks, AK, University of Alaska, Coastal Marine Institute and USDO, MMS, Alaska OCS Region.
- Johnson, M. A., Okkonen, S. R., and Proshutinsky, A. Y. Water and Ice Dynamics in Cook Inlet. University of Alaska Coastal Marine Institute. Annual Report No.10. 2004. Fairbanks, AK, University of Alaska, Coastal Marine Institute and USDO, MMS, Alaska OCS Region.
- Johnson, M. A., Okkonen, S. R., and Proshutinsky, A. Y. Water and Ice Dynamics in Cook Inlet. University of Alaska Coastal Marine Institute. Annual Report No.11. 2005. Fairbanks, AK, University of Alaska, Coastal Marine Institute and USDO, MMS, Alaska OCS Region.
- Johnson, M. A. Water and Ice Dynamics in Cook Inlet [abstract]. Marine Science in Alaska Book of Abstracts 2006 Symposium. unpaginated . 2006. Anchorage, AK, Marine Science in Alaska 2006 Symposium.
- Johnson, M. A. Satellite Drifters/3-Dimensional Cook Inlet Model. Cook Inlet Physical Oceanography Workshop. 2005. Homer, AK, Alaska Ocean Observing System; Cook Inlet Regional Citizens Advisory Council; Kachemak Bay Research Reserve.
- Johnson, M., Proshutinsky, A., and Okkonen, S. Water and Ice Dynamics of Cook Inlet. Proceedings of the Tenth MMS Information Transfer Meeting and Barrow Information Update Meeting. MMS OCS Study 2005-036, pp. 15-16. 2005. Anchorage, AK, Prepared by MBC Applied Environmental Sciences, Costa Mesa, CA for MMS Alaska OCS Region.

Affiliated WWW Sites: <http://halibut.ims.uaf.edu/~johnson/cmi/>
<http://www.ims.uaf.edu/research/johnson/cmi/>
<http://www.mms.gov/alaska/>
<http://www.sfos.uaf.edu/cmi/>

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