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GEM PROPOSAL SUMMARY PAGE

(To be filled in by proposer)

Project Title:	Long-Term Monitoring of the Alaska Coastal Current
Project Period:	October 1st 2003 to September 30th 2004
Proposer(s):	Thomas Weingartner, Institute of Marine Science Room 115 O'Neill Bldg., University of Alaska Fairbanks, AK 99775-7220 Voice: (907) 474-7993; Fax: (907) 474-7204 Email: weingart@ims.alaska.edu
Study Location:	Gulf of Alaska shelf offshore of Resurrection Bay

Abstract: This proposal is for monitoring temperatures, salinities, and spring bloom characteristics of the Alaska Coastal Current (ACC) from a mooring and monthly sampling at station GAK 1 near Seward. The project builds upon the 33-year record at this station. These data can predict ACC (baroclinic) transport anomalies so this variable is obtained indirectly. The results will be examined with respect to variations in terrestrial runoff and atmospheric heat fluxes. We will provide daily maps of satellite scatterometer-derived winds, make theses available to the public via a website, and archive them for future analyses. All variables affect biological production at higher trophic levels. The results have value for: interpreting continuous plankton recorder data to be obtained from ferries under GEM sponsorship, evaluating performance of numerical ocean circulation models, and conducting retrospective analyses of biological productivity. Logistics costs are shared with the NSF-NOAA funded GLOBEC program.

Funding:	EVOS Funding Requested:	FY 04	$ 69,249	
		FY 05	$	
		FY 06	$	TOTAL: 75,481
	Non-EVOS Funds to be Used:	FY 04	$	
		FY 05	$	
		FY 06	$	TOTAL:

Date:	June 2003

I. NEED FOR THE PROJECT

A. Statement of Problem

This is a continuation proposal to maintain the 33-year time series at hydrographic station GAK 1 in the Alaska Coastal Current (ACC). The GEM Science Plan has identified the ACC as an important component of its research effort for good reason. The ACC is a narrow (~40 km), swift, year-round flow maintained by the integrated forcing of winds and terrestrial freshwater discharge. It is fed by a massive runoff (~24000 $m^3 s^{-1}$; or 20% > than the Mississippi River discharge) that affects shelf dynamics, stratification, and nutrient loads. Approximately ~2/3 of the along-shelf (baroclinic) transport is carried within the ACC making it the most prominent circulation feature of the Gulf of Alaska shelf. The ACC originates on the British Columbian shelf (*Royer*, 1998), flows northward through the passages of Southeast Alaska, thence westward along Alaska's south coast, before entering the Bering Sea through Unimak Pass in the western Gulf of Alaska (*Schumacher et al., 1980; Stabeno et al.,* 1999) (**Figure 1**). It thus spans an alongshore distance of ~2500 km making it one of the longest coastal currents in the global ocean. Its attributes suggest that the ACC is an important ocean pathway by which climate signals, dissolved and suspended materials, contaminants, and organisms are advected around the gulf and into the Bering Sea. The ACC flows through Prince William Sound (*Niebauer et al.,* 1994), and regulates exchange between the outer shelf and the fjords and bays along the coast, including Cook Inlet. Hence, the current affects environmental conditions in numerous nearshore Gulf of Alaska habitats. The current is also an important habitat and migratory corridor for many marine organisms, and in particular, for juvenile salmon leaving natal streams for the basin (*Boldt*, 2001).

Variability in the marine environment must be quantified and its causes understood in order to comprehend and predict the response of the Gulf of Alaska marine ecosystem to natural or human related causes. Ocean temperatures, salinities, and phytoplankton blooms are easily monitored and fundamental properties of the ecosystem that might affect upper trophic level productivity. We propose to: 1) maintain the 33-year time series of temperature and salinity measurements at hydrographic station GAK 1 and 2) initiate monitoring of phytoplankton bloom characteristics. GAK 1 lies within the Alaska Coastal Current (ACC) on the northern Gulf of Alaska shelf between Prince William Sound and Cook Inlet (**Figure 3**). Opportunistic sampling commenced at this station in 1970 and since November 1997, the EVOSTC has supported systematic sampling of temperature and salinity at GAK 1. The sampling includes monthly conductivity-temperature versus depth (CTD) measurements (begun in 1970) and hourly temperature and conductivity measurements from a mooring consisting of six instruments distributed throughout the water column at GAK1. This station is the only station in the Gulf of Alaska that measures salinity and it is the *only* station measuring temperature and salinity throughout the water column. Weingartner (2000, 2001, and 2002), Weingartner et al. (*submitted*), and Royer (*submitted*) give a more complete description and analysis of the data collected thus far. Salient findings are:

1. The anomalous summer 1997 warming (~1-2^{o}C above normal) was due to anomalously low summer cloud cover and wind speeds and was confined to the upper 40 m of the ocean.

2. The El Niño-induced warming (~2°C above normal) in winter 1998 occurred over the entire 250 m depth of the shelf, and was accompanied by unusually fresh shelf waters and above normal ACC transport. Stratification occurred early and might have induced an earlier than normal spring bloom. These anomalies provide a glimpse of what may be the norm if future climate change entails warmer and wetter winters in the Gulf of Alaska. Earlier stratification might induce an earlier spring bloom in the sound and the ACC. This could induce a timing mismatch between the spring bloom and early zooplankton feeding.

3. Several factors were responsible for these anomalies: 1) coastal Alaska discharge [computed following *Royer* (1982)] was above average in fall 1997 and winter 1998, 2) Pacific Northwest river discharges were above average during summer and fall 1997, and 3) coastal downwelling around the Northeast Pacific was stronger than normal from summer through winter. In aggregate these factors decreased nearshore salinities and strengthened ACC alongshore transport. The simultaneous occurrence of all of these anomalies is unusual; 1997-98 was the only year since 1970 (the start of the GAK 1 record) in which all of these anomalies coincided.

4. Most of the discharge appears to be transported within the upper 75 m of the water column and within ~30 km of the coast and exchange with the middle shelf appears to be limited by prevailing downwelling winds. The results have implications for the shelf's nutrient budget and possibly for the freshwater budgets of the Bering and Chukchi seas.

5. There are statistically significant relationships between monthly anomalies of GAK 1 salinity and/or dynamic height and anomalies of ACC mass and freshwater transport. These results could be applied to resource management issues, for evaluating numerical model performance, and for retrospective ecosystem studies. For example, *Coyle and Pinchuk* (submitted) suggests that variations in ACC alongshore transport in late winter/spring affects zooplankton dispersal and recruitment processes.

6. Coastal discharge can hindcast ACC transports along the Cape Fairfield Line (**Figure 3**) back to 1930. Based upon correlations between anomalies of runoff and atmospheric sea level pressure difference between Seward and Ketchikan (ΔSLP_{KS}), we extended Royer's runoff time series from 1930 to 1900. Using this extended time series we find, that winter ΔSLP_{KS} anomalies are correlated with the winter Pacific Decadal Oscillation (PDO) anomalies. Minimum discharge occurred from 1900-1910 and maximum discharge in the 1930s. The discharge record and GAK 1 salinities indicate decreased freshwater discharge in the Gulf of Alaska from the late 1950s through the mid-1970s, with an increase from the mid-70s through the early-80s. The transition coincided with the regime shift of the 1970s and with a change from the cold phase to the warm phase of the PDO (*Mantua et al.,* 1997; *Overland et al*., 1999). This freshening might be part of a broader-scale freshening over the North Pacific basin since the 1970s (*Wong et al.,* 1999).

7. The mooring has provided a platform for other scientists, for example in 2001-02 we placed prototype halibut tags, developed by USGS-BRD scientists, onto the GAK 1 mooring for testing. These tags are now being used to study halibut migrations.

8. The GAK1 monthly time series has helped quantify the large interannual and interdecadal variability of the northern Gulf of Alaska. With the inception of the moored time series, shorter period

variations that reflect important dynamical transitions are being detected and quantified. These shorter period transitions could be important to phytoplankton production processes that would otherwise be missed by the monthly sampling. We also find that the in-month variances (computed from the moored data) are generally less than monthly variances computed from the historical, monthly CTD sampling and that the integral time scales for temperature and salinity are longer than 1 month. Hence the moored data indicate that the historical (monthly) CTD record did not result in serious aliasing of seasonal variability.

GAK 1 data supported efforts to assess the recovery of marine species and services affected by the oil spill and underscored the need to incorporate natural climate variability and its influence on the recovery of species injured by the oil spill (*Purcell et al.,* 1999; *Piatt and Irons*, 1999; *Duffy,* 1999; *Anderson et al.,* 1999). Many of our results were obtained in conjunction with data collected under the auspices of the NSF-NOAA funded Northeast Pacific Coastal Gulf of Alaska GLOBEC (Global Ocean Ecosystem Dynamics) program, which seeks to understand how climate variability affects marine ecosystems. GLOBEC field sampling will continue through summer 2004, providing additional data from the shelf that will be combined with the GAK 1 data for joint analyses. Many of the biological data sets being collected in the GLOBEC program represent the first systematic and year-round biological sampling for nutrients, phytoplankton, and zooplankton conducted on this shelf. As interpretation of these data sets matures, we anticipate that GAK 1 record will be used in retrospective studies to address biological variability in this ecosystem.

B. Relevance to GEM Program Goals and Scientific Priorities

The ACC is an important focus habitat of GEM and it links nearshore and terrestrial habitats to one another and the outer shelf. Terrestrial runoff from around the Gulf of Alaska affects ACC dynamics and its nutrient and sediment load. Oceanic processes within the ACC modify this contribution, with the resulting mixture then advected into many of the nearshore habitats bordering the gulf. We propose to monitor temperature, salinity, and phytoplankton (chlorophyll fluorescence) bloom properties at GAK 1 in the ACC. These variables are inexpensively monitored and useful indices of ecosystem variability. Salinity primarily controls density gradients, which affects circulation and vertical mixing. Temperature influences stratification and affects the metabolic rates of marine organisms. *Eslinger et al*. (2001) documented large interannual variability in bloom properties due to changes in the physical properties of the ecosystem. Interannual variations in any of these parameters could promote changes in biological production at higher trophic levels. The data and results proposed herein provide a contextual basis for GEM studies that focus on higher trophic levels on both the shelf and in the nearshore.

II. PROJECT DESIGN

A. Objectives

This proposal has three objectives:

1. Continue the temperature and salinity time series at GAK1 so that interannual and longer period variability can be quantified and its causes understood,
2. Begin monitoring phytoplankton bloom characteristics in the ACC, so that the effects of physical variability on phytoplankton production can be understood,
3. Provide real-time winds from satellite borne scatterometers to resource managers, scientists, and mariners and archive these winds for future analyses.

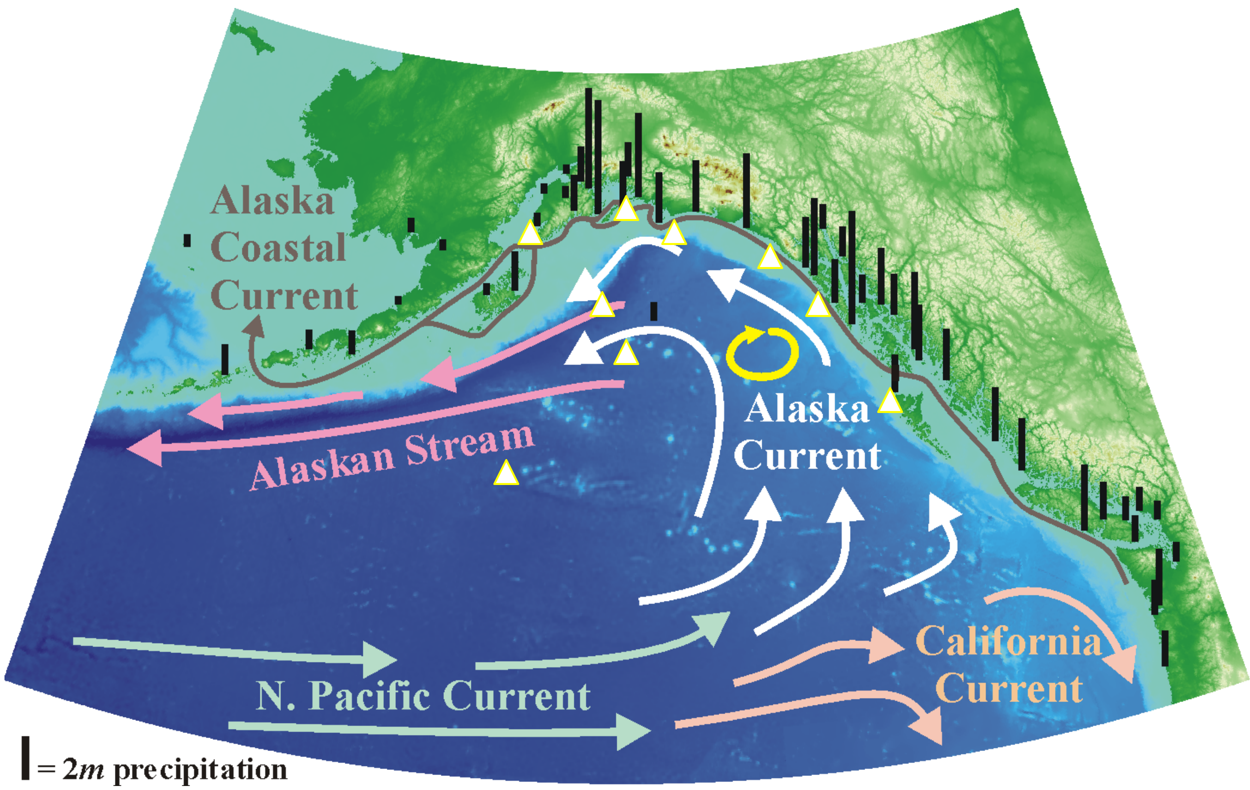

Figure 1. Schematic of the circulation of the Northeast Pacific and Gulf of Alaska. The vertical bars are the mean annual precipitation amounts at selected National Weather Service coastal sites and in the interior of the Gulf of Alaska. The latter is from *Baumgartner and Reichel* (1975). The yellow triangles locate positions of weather buoys.

B. Procedural and Scientific Methods

The first two objectives will be met, as in the past, by monthly CTD measurements and yearlong measurements from a subsurface mooring with temperature and conductivity (T/C) recorders placed at nominal depths of 20, 30, 60, 100, 150, 200, and 250 m. A (Wetlabs, Inc.) fluorometer and transmissometer will be included at 20 m, to determine timing and duration of the spring and summer blooms and changes in suspended load. GLOBEC measurements show that the spring bloom extends from the surface to at least 20 m depth, but by summer, the chlorophyll maximum is at ~20 m depth. The sampling schemes are complementary; one provides high vertical resolution at monthly time scales and the other provides high temporal resolution, but at coarser vertical spacing. The monthly CTDs provide redundancy in the event an instrument fails on the mooring. GAK 1 temperature and salinity are statistically significant predictors of monthly anomalies of the alongshelf baroclinic transport in the ACC along the Cape Fairfield Line (**Figure 3**) from November – August; *Weingartner et al.* [submitted] so transport anomalies are monitored indirectly.

The moored T/C recorders are MicroCats and SeaCats manufactured by Seabird, Inc. Seabird performs pre- and post-calibrations from which we establish sensor drift. This is typically ~0.01°C -yr^{-1} for temperature and 0.03 yr^{-1} for salinity. Prior to deployment, we run all the T/C recorders together in a well-mixed seawater bath in our facility in Seward as a preliminary instrument check out procedure. This procedure is <u>not</u> a calibration effort but simply a method to insure that instrument clocks are accurate, that the data is stored correctly, and that differences, in temperature and salinity among the instruments, are within their specified accuracies. We mount the MicroCats and SeaCats on gimbaled vanes that allow the ducted conductivity sensor to be oriented into the flow. Our prior experience (at GAK 1 and elsewhere) indicates that this procedure enhances flow through the conductivity cell, which minimizes sediment accumulation and leads to better conductivity sensor response. The mooring was designed with guidance from a mooring motion program, which indicates that the instruments will dive by ~1m at this location. Diving is monitored with a pressure sensor on the topmost instrument and prior results confirm predictions from the mooring design program.

Monthly CTD casts are collected from either The University of Alaska's 25-foot *Little Dipper* using a portable CTD (Seabird SBE-25) or opportunistically from the *R/V Alpha Helix* using an SBE-911 CTD. The SBE 25 has an accuracy ~0.01 or better for salinity and .005°C for temperature. The SBE-911 has an accuracy better than ~0.002 for salinity and 0.001°C for temperature. Both CTDs are calibrated annually at Seabird and the 911 is routinely compared to bottle salinities. Fluorometry and transmissivity are *relative* measures of chlorophyll (fluorescence) and suspended matter properties of the water column. (These sensors could provide absolute measures of chlorophyll and suspended matter, but doing so requires frequent *in situ* water sampling and laboratory analyses.) Bio-fouling will gradually degrade signal quality of the optical sensors. We deploy the mooring in March in order to minimize fouling prior to the spring bloom in April or May.

The third objective entails constructing a website of daily maps of the scatterometer-derived wind field over the Gulf of Alaska shelf and archiving these winds for future analysis. The daily maps would enhance marine safety by providing a supplementary source of wind information to the public and management agencies. (In a future effort we will propose to quantify the poorly understood wind field over the Gulf of Alaska's shelf using wind estimates derived from buoys and coastal stations, forecast fields [prepared by NOAA's National Center for Environmental Prediction], and satellite scatterometers.) Wind data for mariners is available from National Weather Service forecasts and by the recently expanded buoy network operated by NOAA's National Data Buoy Center (NDBC) in the

Gulf of Alaska. The approximate location of buoys in the northern Gulf of Alaska is shown in **Figure 1**. (This figure does not shown buoys in Prince William Sound, Cook Inlet, and Southeast Alaska.) Nevertheless, the buoy record can be gappy because the sensors are frequently damaged in fall and winter, with repairs not made until the following summer. The forecast fields do not capture ageostrophic barrier jets and/or gap winds (*Overland and Bond,* 1995; *Stabeno et al.* in press) that may be prominent features of the winter wind field. Large cross-shelf gradients in wind velocity may be associated with these events, which are missed in the absence of direct measurements. Case studies (*Overland and Bond,* 1995) suggest that these wind features have a cross-shore length scale of ~50 – 150 km and wind speeds that can be several times greater than those offshore (say at Middleton Island). Thus wind estimates over critical areas of the Gulf of Alaska might not be available, particularly in winter when high winds and sub-freezing temperatures pose vessel icing risks. The scatterometer maps provide an additional/alternate source of wind information for mariners.

Scatterometers fly aboard NASA's Quick Scatterometer (QuikSCAT) satellite and Japan's ADEOS II satellite. The ADEOS II data is scheduled to be available in October 2003. Scatterometers radiate microwave pulses over an ~1800 km wide swath of the ocean and use the backscattered signal to estimate wind velocity. The spatial resolution is ~50 km for SeaWINDS and ~25 km for QuikSCAT. (These resolutions mean few data are obtained in Prince William Sound, Cook Inlet, Shelikof Strait, and Southeast Alaska and within 25 km of the coast.). **Figure 2** is an example of mapped winds from QuikSCAT. Wind measurements are accurate to within 2 $m\text{-}s^{-1}$ and 20^{o} over the wind speed range of 3 - 20 $m\text{-}s^{-1}$ (6 – 40 kts). We have performed a similar mapping exercise for the Bering Sea, an example of which can be found on our website http://www.ims.uaf.edu/NPRBdrifters/.

C. Data Analysis and Statistical Methods

The temperature and salinity data analyses are straightforward. The thrust of this effort is to quantify interannual variability so we will compute standard statistical estimates for each month and depth and compare these with historical data. We will also incorporate Royer's discharge time series and air-sea heat fluxes derived from Middleton Island data (which begins in 1948) to explain variability in temperature and salinity. The historical heat flux calculations are now underway (supported by GLOBEC) and will be reported in *Danielson et al.* [in prep.]. We are finding that these fluxes are strictly valid only over the outer shelf because Middleton Island air temperatures and winds are generally more moderate in winter than those nearshore. Nevertheless, we believe that the Middleton Island record provides a useful measure of interannual variability in heat flux over the shelf.

We will also begin to quantify spring and summer blooms in relation to changes in stratification, runoff, and winds. Stratification estimates will be made from the 3 uppermost instruments along with the monthly CTD surveys. To determine the number of blooms and bloom duration we will determine the duration of a peak and the number and duration of peaks observed in spring and summer. Bloom events will be defined with reference to a base line (which might drift over time because of fouling) determined from the fluorometer. Although subjective, this approach should be useful for the qualitative descriptions proposed here and quite reliable for evaluating variability in the spring bloom.

D. Description of Study Area

The fieldwork will be conducted at Station GAK1 at the mouth of Resurrection Bay (**Figure 3**). The station is at ~59.85°N, 149.47°W, and is located on the inner edge of the ACC midway between Prince William Sound and Cook Inlet. Much of the ACC flows through the sound (*Niebauer et al.*, 1994) and the transit time between the western passes of the sound and GAK 1 is only a few days. Consequently, GAK 1 characterizes salinity and temperature properties of Prince William Sound waters. GAK 1 is also within 30 km of the NOAA meteorological station on Pilot Rocks.

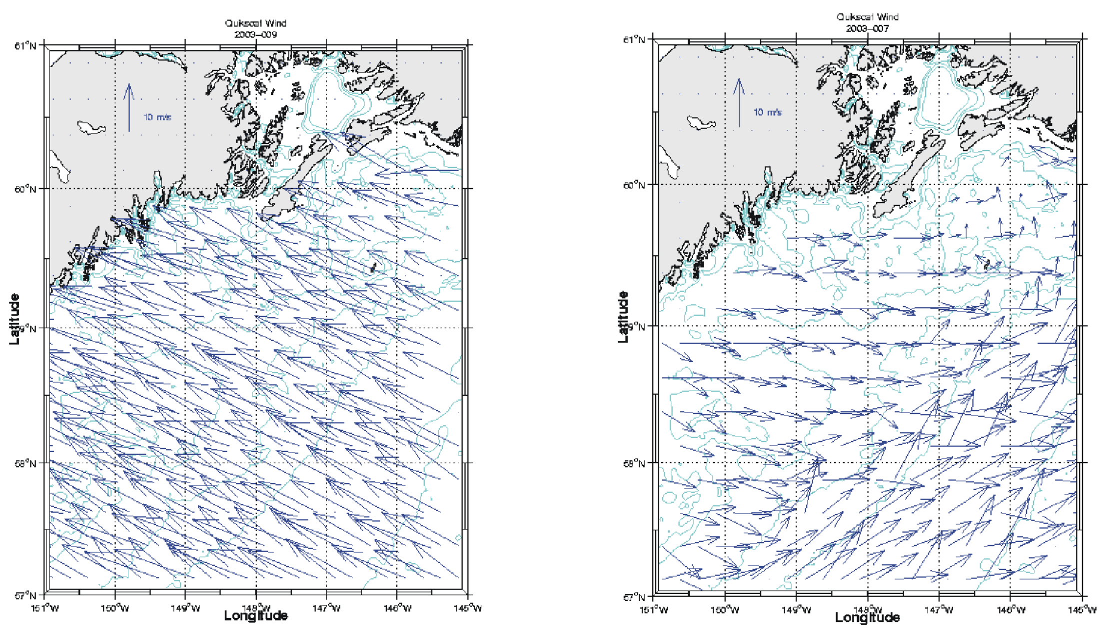

Figure 2. QuikSCAT derived winds from January 7 and 9, 2003 for the northern Gulf of Alaska (courtesy H. Batchelder, Oregon State University).

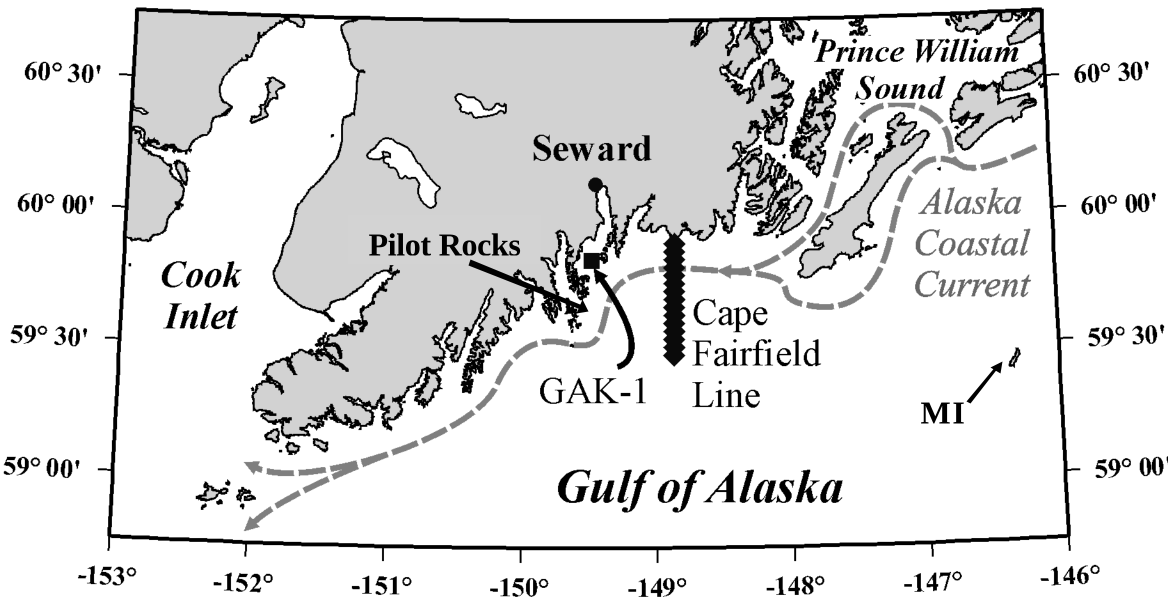

Figure 3. Map showing locations of hydrographic station GAK1, the Cape Fairfield GLOBEC transect, and the weather stations at Pilot Rocks and Middleton Island (MI) in relation to the ACC, Prince William Sound, Cook Inlet and Seward.

E. Coordination And Collaboration With Other Efforts

All data collected in this project along with the historical GAK 1 record are, and will be available on the GAK 1 website: http://www.ims.uaf.edu/gak1/. The GAK 1 data will be particularly valuable to GEM-supported scientists involved with the continuous plankton recorder (CPR) and sea surface temperature/salinity sampling efforts to be made from the Alaska Marine Highway ferries. Other collaborations will occur between the PI and participants in the GLOBEC program (in which the PI is an investigator). GAK 1 sampling costs are shared with GLOBEC, as seven of the monthly cruises to GAK 1 (in FY04) will be from *R/V Alpha Helix* cruises supported by GLOBEC. These cruises, which sample across the shelf to the continental slope and in Prince William Sound, collect information on physics, nutrients, and the production of phytoplankton, zooplankton, and fish. Both the GLOBEC and CPR data will help establish the spatial context of the GAK 1 data and better define its relevance to biological processes. For example, we know that GAK 1 temperature anomalies are coherent across the shelf at most depths and that GAK 1 salinity is representative of ACC salinity variations [*Royer*, 1998, *Weingartner et al*., submitted]. We are not yet certain, however, the extent to which GAK 1 salinity anomalies are correlated with salinity anomalies over the mid- and outer shelf, but this will be assessed at the conclusion of the GLOBEC program. *Coyle and Pinchuk* (submitted) show that there is a unique zooplankton assemblage associated with the ACC and that biomass and community structure varies seasonally and interannually. *Boldt* (2001) and *Helle* (pers. comm.) find that juvenile salmon leaving Prince William Sound and Southeast Alaska tend to remain in the ACC. The GAK 1 time series permits us to place the CPR and GLOBEC cruises in a proper temporal context with respect to synoptic, seasonal, and interannual variability.

The GLOBEC program is also supporting NOAA-PMEL for several current meter moorings deployed over the middle and outer shelf offshore of GAK 1 as well as in the ACC (to the west of GAK 1). When combined with GAK 1 data, the mooring data will provide a better understanding of synoptic and seasonal variability over this shelf. We will also work with P. Stabeno (PMEL), the NOAA PI responsible for the moorings, in an effort to predict the total (barotropic plus baroclinic) ACC alongshore transport using GAK 1 data, Seward sea level, and winds. (This is a future goal and is beyond the scope of this proposal.) If statistically reliable predictions can be made, then ACC transport variability could be easily monitored using only sea level, data from the GAK 1 mooring, and/or appropriate wind data.

III. SCHEDULE

A. Project Milestones

Objective 1. GAK 1 data updated in annual report and on website
To be met by September 1 of each year

Objective 2. GAK 1 data updated in annual report and on website
To be met by September 1 of each year

Objective 3. Wind maps on line.
To be met by January 1, 2004.

B. Measurable Project Tasks for FY 03 and FY04 (October 1, 2002 – August 31, 2004)

FY 04, 1st quarter (October 1, 2003 – December 31, 2003)
Oct., Nov., Dec: Monthly CTD surveys; begin mapping/archiving scatterometer winds.
FY 04, 2nd quarter (January 1, 2004 – March 31, 2004)
January 12 - 16: Attend GEM Workshop
Jan., Feb., Mar.: Monthly CTD surveys, recover and re-deploy GAK 1 mooring. Begin analysis of May 2003 – March 2004 GAK 1 mooring data.
FY 04, 3rd quarter (April 1, 2004 – June 30, 2004)
Apr. May, June: Monthly CTD surveys mapping/archiving wind fields. Complete post-calibration on mooring instruments, process mooring data.
FY 04, 4th quarter (July 1, 2004 – September 30, 2004)
Jul., Aug., Sept.: Monthly CTD surveys mapping/archiving wind fields. Submit final report.

IV. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement And Traditional Ecological Knowledge

There is no traditional ecological knowledge component in this program. Data sharing with the public and scientists is achieved via our website, which provides information on project history and prior results. We will create a separate website for the scatterometer wind maps so that these are readily accessible to mariners. Once the wind map website is completed we will inform harbormasters, the US Coast Guard, the National Weather Service, fishing and community organizations of the web address.

B. Resource Management Applications

This project monitors fundamental parameters that characterize the variable physical conditions of the Gulf of Alaska shelf and especially the ACC. These variables influence biological production and, in the case of the winds, maritime safety. Agency personnel who have expressed interest or used GAK 1 data in the past are NMFS (Paul Anderson, Kodiak, Ann Hallowed, Seattle), USGS-BRD (John Piatt and Jennifer Nielsen), the oil spill response division of the Alaska Department of Environmental Conservation (Larry Dietrick), and the Alaska Department of Fish and Game (Mark Willette).

PUBLICATIONS AND REPORTS

Data and results will be provided via Internet as mentioned and presented at the annual GEM workshop.

PROFESSIONAL CONFERENCES

No funds are requested for conferences other than the annual GEM meeting.

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EDUCATION

Ph.D. Physical Oceanography, 1990, North Carolina State University
M.S. Physical Oceanography, 1980, University of Alaska
B.S. Biology, 1974, Cornell University

MEMBERSHIPS

American Geophysical Union; American Meteorological Society, Oceanography Society

PUBLIC SERVICE

Member, Science and Technology Advisory Committee, Gulf Ecosystem Monitoring Program, 2002 - 2004
Member, GLOBEC Northeast Pacific Executive Committee, 2000 - 2003
Member, Science Steering Committee, NSF - Arctic System Science-Ocean Atmosphere Ice Interaction (OAII) Shelf-Basin Interaction Project (term expired 2/03).
Member, Science Steering Committee, NSF - ARCSS-OAII Shelf-Basin Interactions (1995 -2002)
Past Member, Science Steering Committee, NSF - ARCSS-Human Dimensions of the Arctic component
Past Member, UNOLS - Fleet Improvement Committee
Co-chair, Institute of Marine Science Ship Committee, 1993-present

PROFESSIONAL EXPERIENCE

Associate Professor; Institute of Marine Science, School of Fisheries and Ocean Sciences, U. of Alaska Fairbanks, Alaska; 7/99 - present
Assistant Professor; Institute of Marine Science, School of Fisheries and Ocean Sciences, U. of Alaska Fairbanks, Alaska; 11/93 - present
Research Associate; Institute of Marine Science, School of Fisheries and Ocean Sciences, U. of Alaska Fairbanks, Alaska; 9/91 - 10/93
Postdoctoral Student; Institute of Marine Science, School of Fisheries and Ocean Sciences, U. of Alaska Fairbanks, Alaska; 7/88 - 8/91
Graduate Research Assistant; Department of Marine, Earth and Atmospheric Sciences, North Carolina State U.; Raleigh, North Carolina; and Department of Marine Science, U. of South Florida; St. Petersburg, Florida; 8/84 - 10/88

PROFESSIONAL INTERESTS

Physical oceanography of the Arctic and North Pacific Ocean and the adjacent shelves, biophysical linkages in oceanography; public education.

FIVE RECENT PUBLICATIONS

Weingartner, T.J., S. Danielson, and T. C. Royer, Freshwater Variability and Predictability in the Alaska Coastal Current (submitted to Deep-Sea Research)

Okkonen, S., **Weingartner, T.J.,** S. Danielson, D. L. Musgrave, and G. M. Schmidt, Satellite and hydrographic observations of eddy-induced shelf-slope exchange in the northwestern Gulf of Alaska *J. Geophys. Res*. 108: 15 –1, 15 –10, 2003.

Weingartner, T.J., K. Coyle, B. Finney, R. Hopcroft, T. Whitledge, R. Brodeur, M. Dagg, E. Farley, D. Haidvogel, L. Haldorson, A. Hermann, S. Hinckley, J. Napp, P. Stabeno, T. Kline C. Lee, E. Lessard, T. Royer, S. Strom, The Northeast Pacific GLOBEC Program: Coastal Gulf of Alaska, *Oceanography*, 15: 48 – 63, 2002.

Weingartner, T. J., S. Danielson, Y. Sasaki, V. Pavlov, and M. Kulakov. The Siberian Coastal Current: a wind and buoyancy-forced arctic coastal current. *J. Geophys. Res., 104:* 29697 – 29713, 1999.

Weingartner, T. J., D. J. Cavalieri, K. Aagaard, and Y. Sasaki. Circulation, dense water formation and outflow on the northeast Chukchi Sea shelf. *J. Geophys. Res*. 103: 7647-7662, 1998.

OTHER RECENT PUBLICATIONS

Münchow, A., **T. J. Weingartner**, and L. Cooper. On the subinertial summer surface circulation of the East Siberian Sea. *J. Phys. Oceanogr*., 29: 2167 – 2182, 1999.

Gawarkiewicz, G., **T. Weingartner**, and D. Chapman. 1998. Sea Ice Processes and Water Mass Modification and Transport over Arctic Shelves. pp. 171-190 *in* K. H. Brink and A. R. Robinson, (eds.), The Sea: Ideas and Observations on Progress in the Study of the Seas, Vol. 10.

Cooper, L.W., J. Grebmeier, T. Whitledge, and **T. Weingartner**, The nutrient, salinity, and stable oxygen isotope composition of Bering and Chukchi Seas waters in and near the Bering Strait. . *J. Geophys. Res*. *102*, 12563 - 12578, 1997.

Roach, A. T., K. Aagaard, C.H. Pease, S.A. Salo, **T. Weingartner**, V. Pavlov, and M. Kulakov. Direct measurements of transport and water properties through Bering Strait. *J. Geophys. Res., 100*, 18443-18458, 1995.

Moore, S.E., J. C. George, K. O. Coyle, and **T. J. Weingartner**, Bowhead whales along the Chukotka coast in autumn, *Arctic*, 48, 155-160, 1995.

Scientists with whom I have had a long-term association, or collaborated with, within the last 48 months:

K. Aagaard (U. Washington), E. Carmack (Institute of Ocean Sciences), D. Chapman (Woods Hole), K. Falkner (Oregon State U.), G. Gawarkiewicz (Woods Hole), A. Hermann (NOAA-PMEL), R. Macdonald (Institute of Ocean Sciences), A. Münchow (U. Delaware), P. Stabeno (NOAA-PMEL), R. Woodgate (U. Washington).

EXXON VALDEZ OILSPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

Budget Category:	Proposed FY 04	Proposed FY 05	Proposed FY 06		TOTAL PROPOSED
Personnel	$26,532.5	$0.0	$0.0		$26,532.5
Travel	$482.0	$0.0	$0.0		$482.0
Contractual	$10,135.0	$0.0	$0.0		$10,135.0
Commodities	$3,850.0	$0.0	$0.0		$3,850.0
Equipment	$18,000.0	$0.0	$0.0		$18,000.0
Subtotal	$58,999.5	$0.0	$0.0		$58,999.5
Indirect (rate will vary by proposer)	$10,250.0				$10,250.0
Project Total	$69,249.5	$0.0	$0.0		$69,249.5
Trustee Agency GA (9% of Project Total)	$6,232.5	$0.0	$0.0		$6,232.5
Total Cost	$75,482.0	$0.0	$0.0		$75,482.0

FY 04-06

Date Prepared:

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Proposer: Thomas Weingartner, Institute of Marine Science

FORM 4A
NON-TRUSTEE
SUMMARY

***EXXON VALDEZ* OILSPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 04 - FY 06

Personnel Costs:			Months	Monthly		Personnel
Name	Description		Budgeted	Costs	Overtime	Sum
Weingartner			0.5	7858.0		3,929.0
Danielson			1.5	7644.0		11,466.0
Leech			1.5	7425.0		11,137.5
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	3.5	22927.0	0.0	
					Personnel Total	$26,532.5

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
RT Fairbanks -Anchorage	250.0	1	2	116.0	482.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$482.0

FY 04

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Proposer: Thomas Weingartner, Institute of Marine Science

FORM 4B
Personnel
& Travel
DETAIL

EXXON VALDEZ OILSPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

Contractual Costs:	Contract
Description	Sum
Little Dipper (2003: Nov. 2003, Jan. 04, Feb. 04, Jun. 04, Sept. 04) 5 full days @ $416/day	2,080.0
Chartered fishing vessel (1 day for mooring)	4,000.0
MicroCat calibrations (6@$300; 1@$475)	2,275.0
SeaCat Calibration (1@$615)	615.0
SBE-25 Calibration (1@$565)	565.0
Shipping (RT Seward –Seattle microcats)	600.0
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$10,135.0

Commodities Costs:	Commodity
Description	Sum
Mooring anchor and lashing chain	400.0
Shackles, sling links, thimbles, pins, misc. mooring hardware	1,000.0
Batteries, O-rings, vane assembly parts	2,450.0
Commodities Total	$3,850.0

FY 04

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Name: Thomas Weingartner, Institute of Marine Science

FORM 4B
Contractual & Commodities
DETAIL

New Equipment Purchases:	Number	Unit	Equipment
Description	of Units	Price	Sum
Seabird SEACAT with Fluorometer,	1	18000.0	18,000.0
0 -100 psia strain gauge			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$18,000.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency

FY 04

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Proposer: Thomas Weingartner, Institute of Marine Science

FORM 4B
Equipment
DETAIL

EXXON VALDEZ OILSPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

Personnel Costs:			Months	Monthly		Personnel
Name	Description		Budgeted	Costs	Overtime	Sum
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	0.0	0.0	0.0	
					Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY 05

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Proposer: Thomas Weingartner, Institute of Marine Science

FORM 4B
Personnel
& Travel
DETAIL

***EXXON VALDEZ* OILSPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 04 - FY 06

Contractual Costs:	Contract
Description	Sum
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$0.0

Commodities Costs:	Commodity
Description	Sum
Commodities Total	$0.0

FY 05

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Proposer: Thomas Weingartner, Institute of Marine Science

FORM 4B
Contractual &
Commodities
DETAIL

EXXON VALDEZ OILSPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

New Equipment Purchases:	Number	Unit	Equipment
Description	of Units	Price	Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency

FY 05

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Proposer: Thomas Weingartner, Institute of Marine Science

FORM 4B
Equipment
DETAIL

EXXON VALDEZ OILSPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

Personnel Costs:			Months	Monthly		Personnel
Name	Description		Budgeted	Costs	Overtime	Sum
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
		Subtotal	0.0	0.0	0.0	
					Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$0.0

FY 06

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Proposer: Thomas Weingartner, Institute of Marine Science

FORM 4B
Personnel
& Travel
DETAIL

EXXON VALDEZ OILSPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

Contractual Costs:	Contract
Description	Sum
Contractual Total	$0.0

Commodities Costs:	Commodity
Description	Sum
Commodities Total	$0.0

FY 06

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Proposer: Thomas Weingartner, Institute of Marine Science

FORM 4B
Contractual & Commodities
DETAIL

EXXON VALDEZ OILSPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

New Equipment Purchases:	Number	Unit	Equipment
Description	of Units	Price	Sum
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$0.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency

FY 06

Project Number:
Project Title: Long-Term Monitoring of the Alaska Coastal Current
Proposer: Thomas Weingartner, Institute of Marine Science

FORM 4B
Equipment
DETAIL

Budget Justification

Salary support ($26532)
Dr. Thomas Weingartner is the project PI and is responsible for project management. He will devote 0.5months of his time to the project. Mr. Seth Danielson is a physical oceanographer who has worked on both the GLOBEC and EVOSTC GAK 1 projects for several years. He is responsible for data processing, analyses, and maintenance of the project web page including the scatterometer map webpage. We are requesting support for 1.5 months of his time. Mr. David Leech is the Seward based mooring and marine technician responsible for the design, fabrication, deployment and recovery of the mooring and maintenance of all of the instruments. He also conducts the monthly CTD sampling. He will spend 1.5 months on the project with 44 hours of this support covering university mandated overtime pay while he is at sea for the CTD and mooring work. All members of this research team are affiliated with the University of Alaska.

Travel ($482)
Funds for one person to travel (round-trip Fairbanks – Anchorage) with two days per diem for attending the annual GEM meeting are requested.

Services ($10135)
The service request includes funds for instrument calibrations ($3455) and the shipping ($600) of these to and from Seabird in Seattle. Additional funds are needed to cover the costs for five days ($2080) on the *Little Dipper* for five of the monthly CTD sampling periods. (The remaining seven monthly CTD casts will be conducted from the *R/V Alpha Helix* during GLOBEC cruises funded by NSF and NOAA.) The mooring recovery/deployment must be done from a vessel larger than the *Little Dipper* and we are requesting funds ($4000) to charter a Seward-based fishing vessel to accomplish this task.

Supplies ($3850)
Funds are requested for expendable mooring supplies (instrument batteries, hardware, vane components, anchors, etc.).

Equipment ($18000)
We request funds to purchase one SeaCat with a fluorometer, transmissometer, and strain gauge pressure sensor. This instrument will be added to the other T/C recorders, which were previously purchased by the EVOSTC and dedicated to this project.