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**Project Number:** 25120114-I

**Project Title:** Oceanographic station GAK-1 long term monitoring of the Alaska Coastal Current

**Principal Investigator(s):** Seth L. Danielson, College of Fisheries and Ocean Sciences, University of Alaska Fairbanks

**Reporting Period:** February 1, 2025 – January 31, 2026

**Submission Date:** March 16, 2026

**Project Website:**

- <https://gulfwatchalaska.org/>
- <https://research.cfos.uaf.edu/gak1/>
- [https://portal.aos.org/#search?type\\_group=all&query=gak1&page=1](https://portal.aos.org/#search?type_group=all&query=gak1&page=1)
- <https://portal.aos.org/#metadata/103522/station/data>

**Project progress is on schedule.**

**Project progress is delayed.**

**Budget reallocation request.**

**Personnel changes.**

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**1. Summary of Work Performed:**

Project activities in 2025 extended the GAK1 coastal monitoring (Fig. 1) measurement time series through its 56<sup>th</sup> consecutive year with nominally monthly surface-to-seafloor hydrographic profiles. A year-round high-resolution mooring with hourly sampling at up to seven depth levels was first deployed in 1998 and now spans 28 years. The field work was accomplished through monthly visits to the GAK1 site on project-chartered day trips aboard R/V *Nanuq* from the University of Alaska Fairbanks' (UAF's) Seward Marine Center, as well as leveraged cruises of opportunity aboard R/V *Sikuliaq* and R/V *Tiglax* in association with the Seward Line project. Continuing the project initiative begun in 2024, we made additional improvements in our data handling procedures, further decreasing the amount of time between data collection and when the



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data is available to other Gulf Watch Alaska researchers and the public. Sensor data from the monthly hydrographic profiles on R/V *Nanuq* are downloaded from the conductivity and temperature at depth (CTD) right after the cruise (same day) and now subjected to initial data extraction and processing procedures. Both Level 0 raw and Level 1 processed data are then uploaded to the Axiom's Research Workspace project for GAK1 under the Gulf Watch Alaska data repository, where it is immediately available to all Gulf Watch Alaska partners (now reliably within one day of the cast!) and is also staged for Level 2 final processing. Pending staff availability, final processed data is now normally available within a week of the data collection.

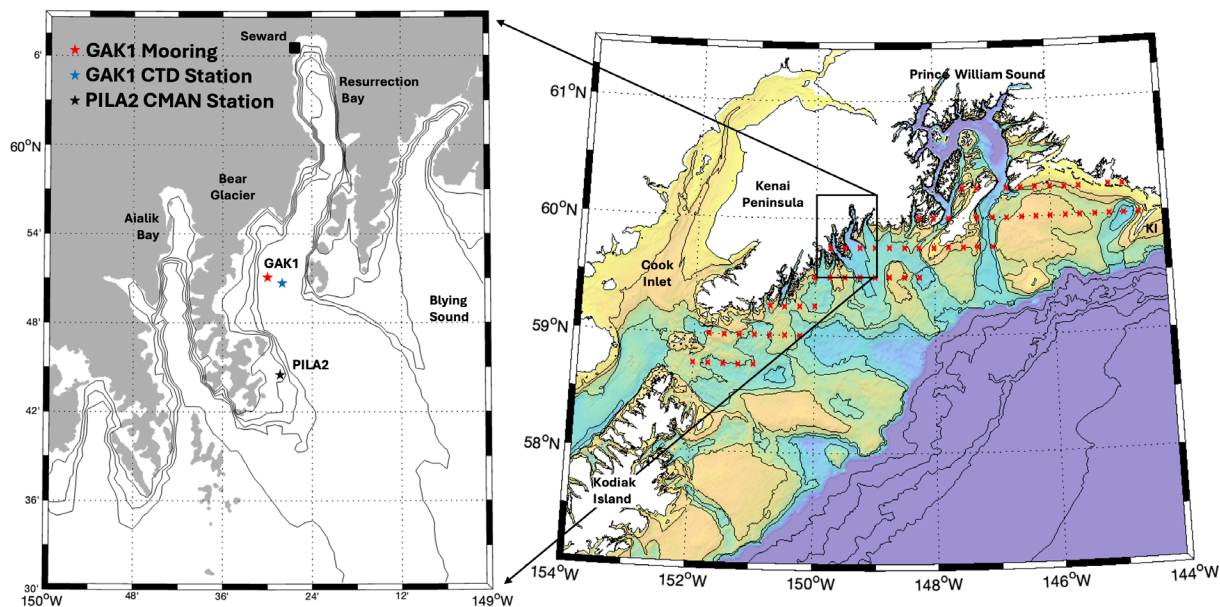


Figure 1. Map of the study region (left) showing place names and locations of the GAK1 mooring (red star), GAK1 conductivity and temperature at depth (CTD) station (blue star) and the PILA2 CMAN weather station (black star). Bathymetric color shading (right panel) spans the 0 to 400 m depth range. Black contours are shown at 50, 100, 150, 200, 1000, 2000, 3000, and 4000 m depth levels. Red x's denote the ERA5 coastal grid cells used to assess the integrating the coastal wind field and other reanalysis parameters. KI = Kayak Island.

We also put significant effort into an ongoing GAK1 retrospective analysis, updating our understanding of coastal Alaska environmental trends and atmosphere-ocean linkages; some of these new analyses are included in the present report. The full analysis will be submitted as a



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peer-reviewed manuscript in 2026. Beyond our own science, the value of the GAK1 dataset is perhaps more evident through the scores of citations that have relied on this record for environmental context, for providing environmental covariates used in statistical models, and for in application to fisheries stock assessment models. Over 120 references can be found on our GAK1 webpage. In just the last year, GAK1 data have been applied to studies that are as wide-ranging as kelp production (Lees et al. 2025), beluga whale bacterial pathogens (Rouse et al. 2025), and red king crab genetics (St. John 2025).

To summarize our analyses of monthly to interannual anomalies, we find that while the coastal Gulf of Alaska warmed over the period of record, the freshwater content of the whole water column remained steady because surface freshening has been balanced by seafloor salinization. The temperature and salinity trends are seasonally non-uniform (Danielson 2024) such that stratification is increasing more rapidly in late winter and spring months than at other times of year. The salinity and temperature fields exhibit short (2-3 month) and long (4-16 month) decorrelation time scales, respectively, suggesting contrasting dynamical controls and unequal time scales for ecosystem impacts of the two parameters.

As in other years, the GAK1 effort attracts other synergistic activities beyond the core data collection objectives associated with this project. The area near the mooring serves as a testing ground and calibration opportunity for autonomous underwater gliders; gliders use the GAK1 site as a staging area prior to and following offshore sampling missions; the GAK1 site is visited by the UAF Subarctic Oceanography Field Course each August; and we provide the GAK1 mooring as a platform of opportunity for other researchers to mount their instrumentation.

*2024-2025 Mooring Data*

Data from the 2024-2025 GAK1 mooring returned data in good shape overall, although the 28 m depth datalogger (blue trace in Fig. 2) had a bracket fail in early September. This sensor slid down the mooring line, coming to rest on the 60-m instrument and subsequently recorded at that depth for the remainder of the deployment.



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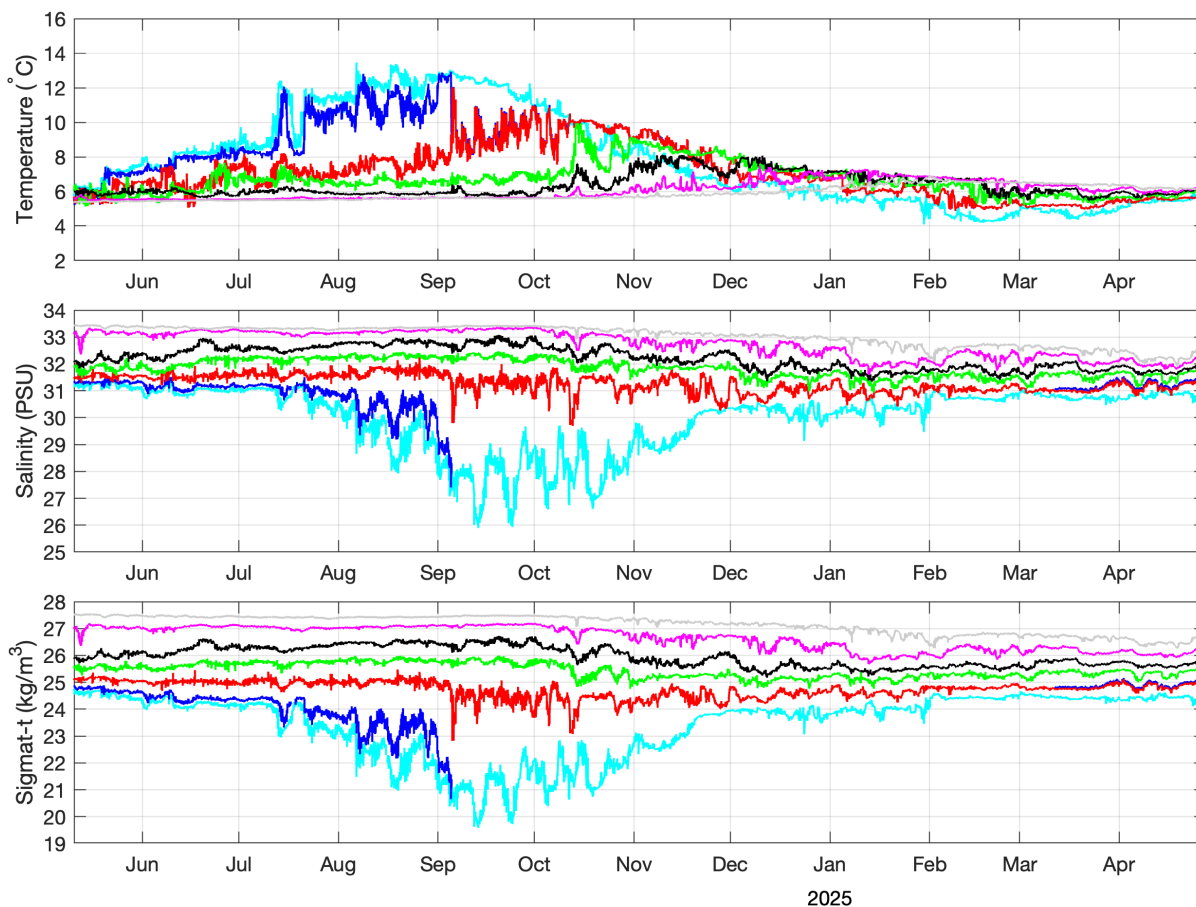


Figure 2. Data records from the 2024-2025 deployment of the GAK1 mooring, with temperature (top), salinity (middle) and density (bottom). Colors denote different instrument depths, with the 2024 sensors winding up near 18 m (cyan), 28 m (blue), 59 m (red), 102 m (green), 140 m (black), 191 m (magenta) and 245 m (gray).



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GAK1 Climatology

Analysis of an aggregated profile and mooring GAK1 dataset reveals the seasonally varying climatology water column structure (Fig. 3), previously described with shorter record lengths (Royer 2005, Weingartner et al. 2005). New to this analysis is the time derivative (third column in Fig. 3), which documents the rate of change in each parameter across the water column and through the year.

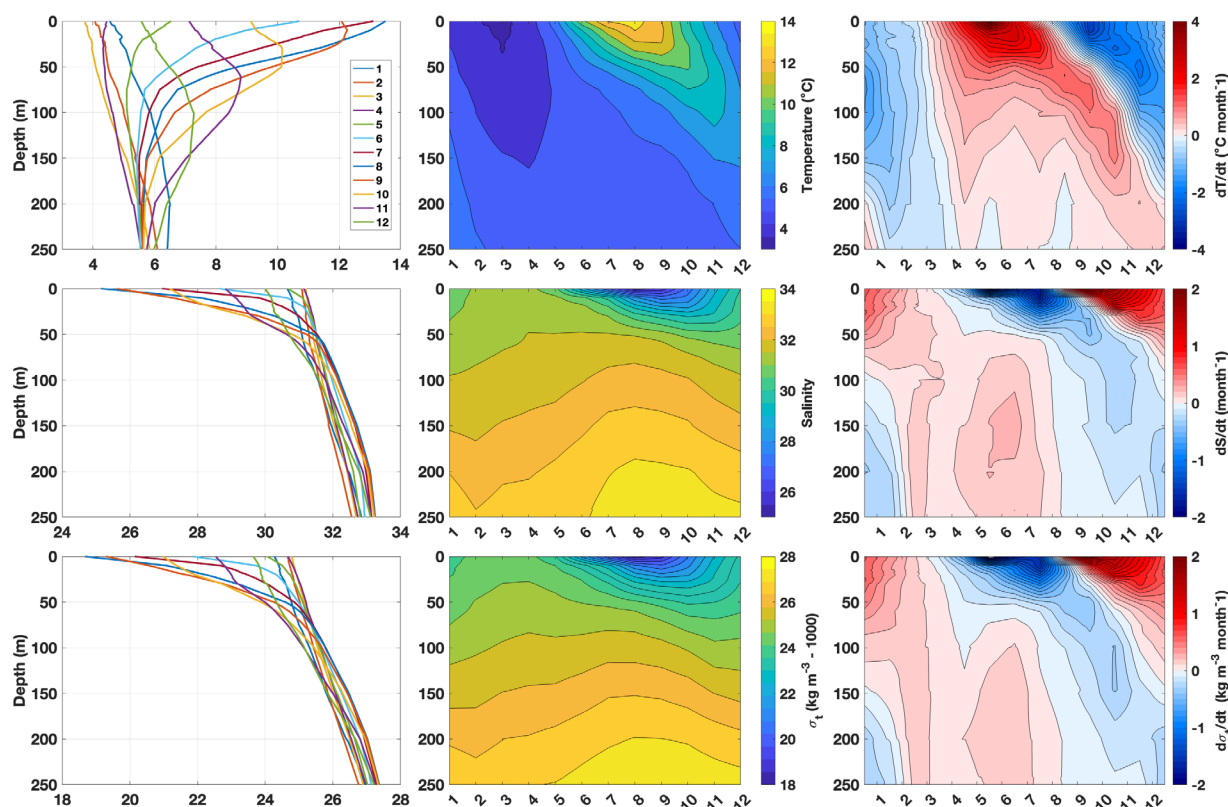


Figure 3. Temperature (top), salinity (middle) and density (bottom) profiles (left), contours (middle), and monthly rate of change (right) of the GAK1 hydrographic monthly climatology. Monthly profiles are colored as noted in the upper left legend (January = 1, December = 12). Middle column contour intervals are 1.0 for temperature and 0.5 for salinity and density. Right column rate of change contour intervals are 0.2 for temperature and 0.1 for salinity and density.



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Key aspects of the GAK1 thermohaline kinematics include the following. Surface warming and coastal runoff stratifies the upper water column in mid and late summer. Surface heat loss and vertical mixing after the fall equinox drive a pronounced subsurface temperature maximum that deepens and spreads vertically, warming the deepest waters into January. Strong downwelling and wind mixing continues through the winter, leading to the annual minimum near-bottom salinity in February and the near-bottom minimum temperature in March. The upper ocean begins to warm first in March, followed by warming at greater depths, although the strongest warming is confined to the upper 50 m of the water column. The surface pycnocline shoals toward the surface under the influence of seasonally increasing coastal runoff, so the solar heating penetrates below the surface mixed layer depth either by direct warming or by downward mixing of heat absorbed closer to the surface (e.g., in shallower waters).

Freshening at the surface continues into August (Fig. 3), after which low-salinity waters at the surface are mixed downwards into the water column through fall. By the end of the year and into February near-bottom waters freshen, after which near-bottom waters begin to salinize as stratification begins to isolate subsurface waters from the sea surface and dense bottom waters from the shelf break advect onshore. Maximum bottom salinity and density occur in late summer at about the same time that surface waters are freshest and least dense.

The hydrographic data (Fig. 3) suggest that the most direct communication between the surface and the seafloor occurs early in the year, February or March, when the surface-to-seafloor density difference is at its annual minimum and when the winds force strong downwelling circulation. Interannual changes of downwelling, wind mixing energy, surface heat loss, freshwater inputs and water column temperature or salinity stratification at or leading up to late winter may impact the depth to which surface signals are transmitted to depth (Janout et al. 2010).

*Monthly, Seasonal and Interannual Anomalies*

The annual cycle of surface heat and wind stress forcings impose strong control over annual cycles of the thermohaline fields, but we are also interested in the amplitude and duration of anomalies that manifest at interannual and sub-seasonal time scales (Fig. 4). Monthly anomalies are computed at all depths relative to the full 1970-2024 period of record. The amplitude of near-surface anomalies, greatest in late summer and fall months, propagates downwards into the water column through autumn and winter (Fig. 3). Following mixing and downwelling of the prior



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year's surface heat and freshwater accumulations, near-bottom anomalies for both temperature and salinity tend to be greatest in the first half of the year.

Estimates of the decorrelation time scale (Thompson and Emery 2004) for the monthly anomaly records show that the temperature decorrelation time scale is close to 6 months in the upper water column, increasing to 1.5 years near the seafloor (Fig. 5). In contrast, salinity exhibits a decorrelation time scale of 2-3 months throughout the water column. These estimates suggest the effective degrees of freedom for the time series ranges between 36 (bottom) to 108 (surface) months for temperature, and at least 200 months for salinity. Using the zero-crossing method of determining the decorrelation time scale (Emery and Thompson 2004) slightly increases the time scale for both parameters, but their relative changes through the water column and to each other remain the same. In aggregate, this analysis provides justification for linearly interpolating in time through 1–2-month data gaps for salinity and 3–4-month data gaps for applications of the GAK1 dataset that require a monthly mean record with minimal data gaps.

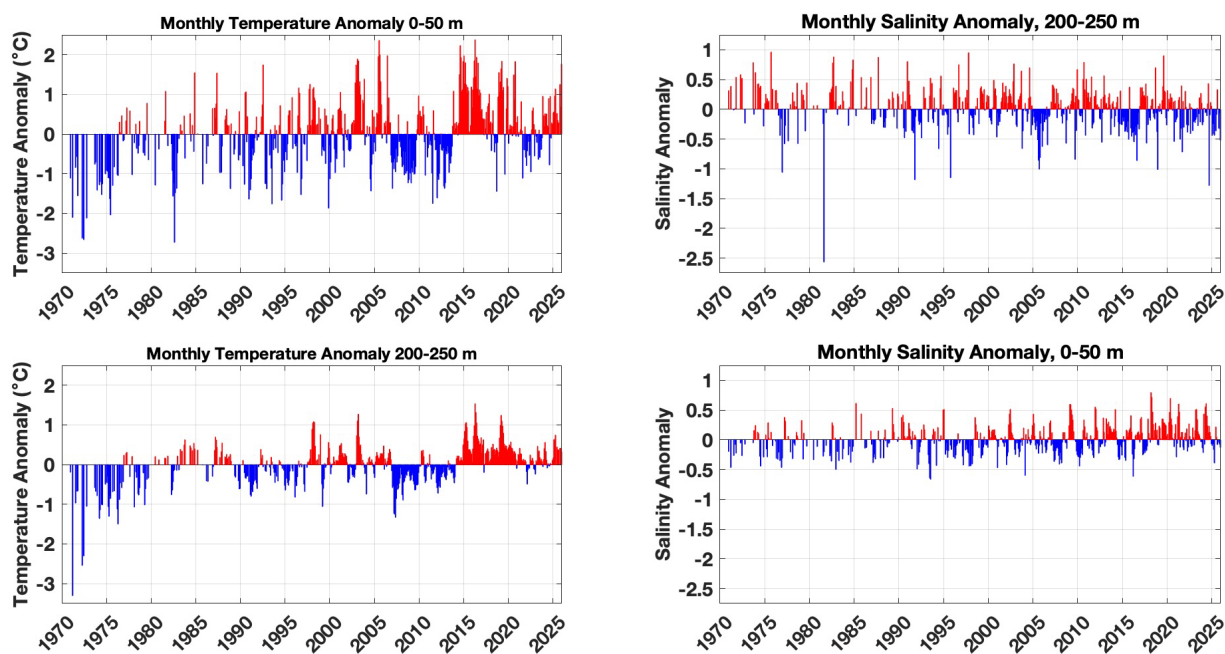


Figure 4. Station GAK1 monthly anomalies over 1970-2024 of the near-surface (20-50 m depth, top) and near-bottom (200-250 m depth, bottom) for temperature (left) and salinity (right).



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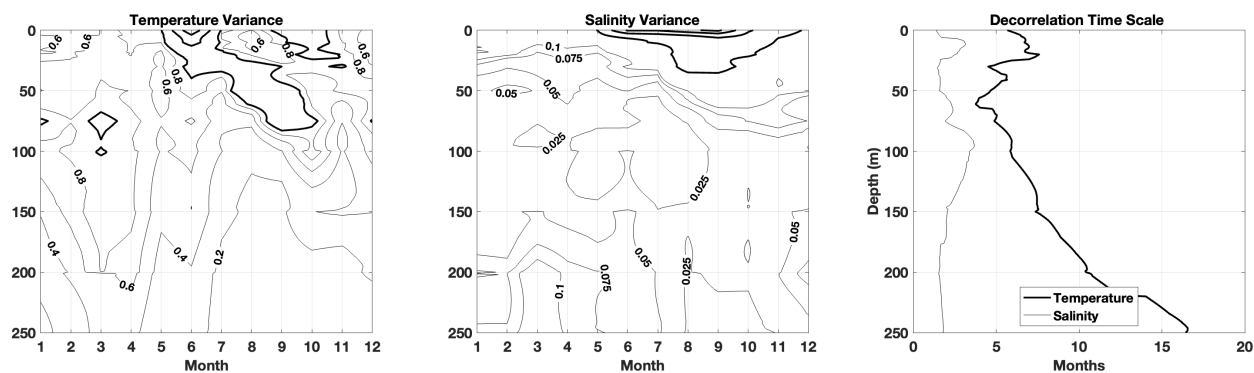


Figure 5. Seasonality of the variance in (left) temperature and (middle) salinity and (right) depth profiles of the decorrelation time scales for monthly temperature (thick line) and salinity (thin line) anomalies. Temperature variance contour levels are spaced by 0.2 from 0 to 0.8 with thin lines and 1.0 to 3.0 by 1.0 with thick lines. Salinity variance contour lines are spaced every 0.025 up to 0.1 with thin lines and then by 1.0 from 0.5 to 3.5 with thick lines. Maximum variance near the seafloor for both parameters is found in mid to late winter but near the surface in June for temperature and in September for salinity.

With a near-bottom temperature decorrelation timescale exceeding one year, the coastal Gulf of Alaska is potentially primed for re-emergence of temperature anomalies should the following year's winter mixing reach sufficiently deep (Alexander et al. 1999). The contrasting integral time scales for the temperature and salinity fields point to differences in the two fields' drivers. Salinity, exerting dominant control over the density field (Fig. 3), responds to coastal freshwater runoff, which imposes strong lateral and vertical gradients near the coast. Accumulation of freshwater in the riverine coastal domain (Carmack et al. 2016) increases the cross-shelf density gradient, feeding greater cross-shelf eddy fluxes (Weingartner et al. 2005). The time scale for development of baroclinic eddies is on the order of a few inertial periods, so coastal freshwater anomalies can be fluxed offshore in relatively short order, consistent with the salinity's relatively short decorrelation time scale. Correlation analysis of the cross-shelf salinity field relative to salinity fluctuations at GAK1 (Danielson et al. 2024) reveals coincident anomalies over the mid and outer shelf, suggesting that freshwater anomalies at GAK1 are advected offshore with high efficiency and little time lag. Freshwater discharge responds to seasonal anomalies of air temperature at high elevations and seasonal precipitation anomalies associated with North Pacific cyclone activity (Royer 1982, Hill et al. 2015). Temperature responds primarily to surface heating and cooling that is much more uniformly distributed across the shelf.



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Annual averages of the GAK1 monthly anomalies show the 5-decade trends in hydrographic properties (Figs. 6 and 7) that have been previously documented with shorter records (Royer 2005, Kelley 2015, Danielson et al. 2022). Least-squares linear fits to these records show warming across the water column (larger at the surface than at the seafloor), freshening near the surface and salinization near the seafloor. The upper 100 m of the water column is warming at a rate of about 0.2 °C per decade and the trend accounts for about 10% of the total variance over the record. Below 100 m depth, the rate of warming linearly decreases to about 0.13 °C per decade near the seafloor.

The 100 m depth level emerges as a transition level for the salinity trend (Fig. 7), which reverses sign near here. Surface waters freshened at a rate of almost -0.09 per decade, while near-bottom waters salinized at a rate of about +0.04 per decade. Relative to a salinity of 33.8, which represents the base of the permanent halocline in the Gulf of Alaska basin, we find that the freshwater content integrated over the entire water column has not changed over the length of the GAK1 record ( $p = 0.43$ ) and the upper water column freshwater gains balance lower water column freshwater losses (Fig. 7). Record-length linear trends of freshwater content for the 0-50 and 150-200 m depth layers are significant at the 95% confidence level, with  $p = 0.01$  and  $p = 0.001$ , respectively. The trend for the 50-150m layer is not significant ( $p \sim 0.3$ ).

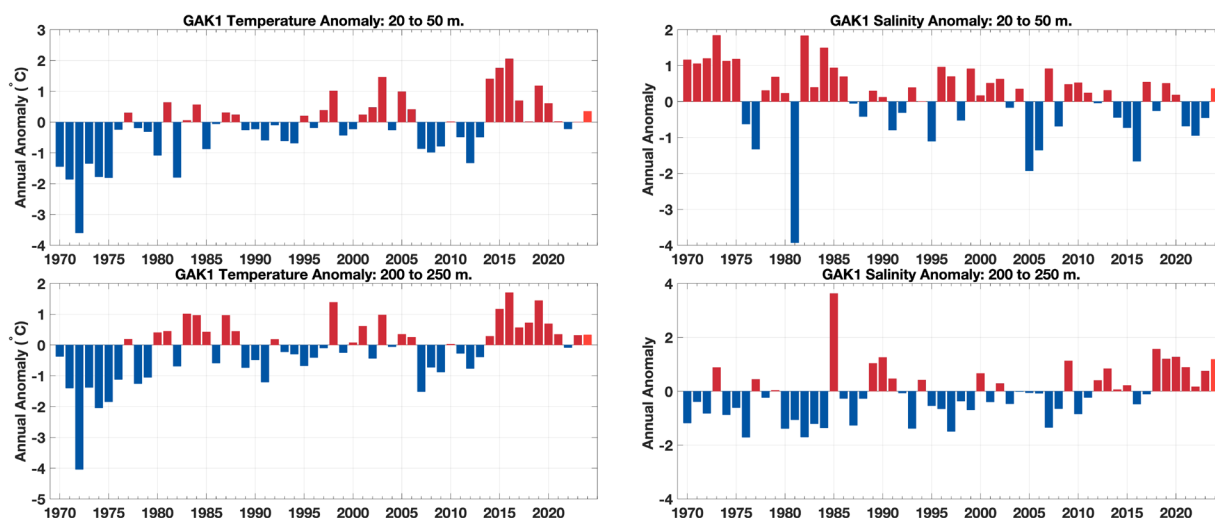


Figure 6. Annual averages of the monthly GAK1 anomalies. Note that 1981 and 1985 each have only two months sampled within the year.



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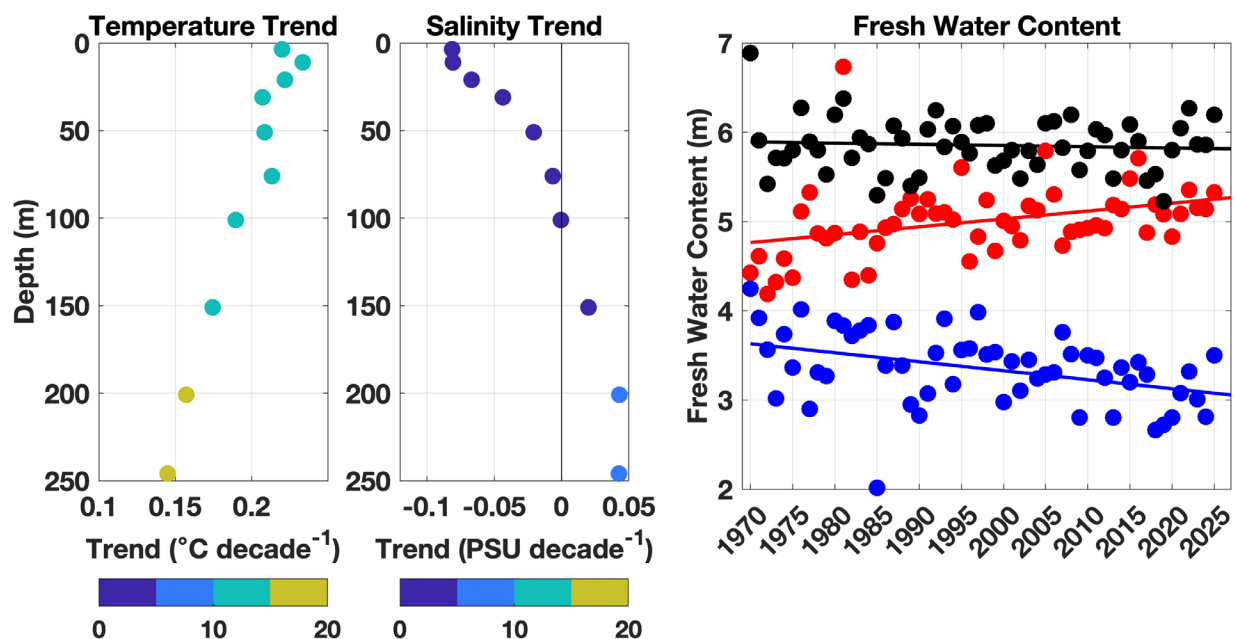


Figure 7. Record-length trends of temperature (left) and salinity (middle). Circle colors denote the proportion of the total variance (%) that is represented by the trend. GAK1 freshwater content (right) integrated over depth layers of 0-50 m (red), 50-150 m (black), and 150-250 m (blue) relative to reference salinity  $S_r = 33.8$ . Freshwater content linear trends for only the surface and bottom are significant ( $p < 0.05$ ).

We next leverage the longevity of the GAK1 dataset to assess thermohaline patterns that recur in years classified as warm vs. cool, and fresh vs. salty, both near the surface and near the seafloor (Fig. 8). Annual means of temperature and salinity over 0-50 m and 200-250 m depths guide analyses that are based on aggregations of years that exhibit similarly anomalous conditions. For each of the four computed annual means, we then select all months from years exhibiting the seven most positive anomalies and the seven most negative anomalies of each parameter to form monthly composites of each. To avoid years with sparse GAK1 data coverage, we here confine our analysis to the more-complete second half of the data record that overlaps with the mooring deployments (1998 to 2024). Thus, the analysis is a comparison of the most extreme conditions that comprise approximately the top 25% and bottom 25% of observations within this time window.



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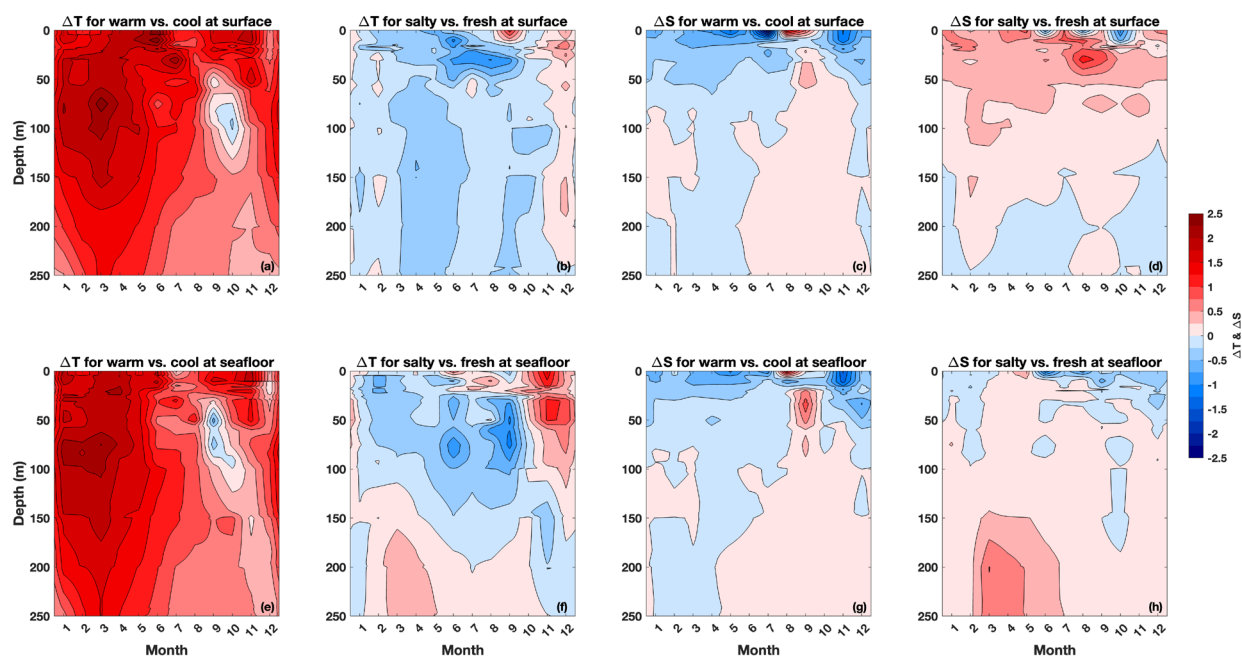


Figure 8. Temperature and salinity differences, by month and depth, between years classified as particularly warm vs. cool and salty vs. fresh near the surface and near the seafloor for the 1998–2024-time span. Panels show the mean monthly difference in temperature ( $\Delta T$ ; a, b, e, f) and salinity ( $\Delta S$ ; c, d, g, h) for the seven warmest vs. seven coolest years (a, c, e, g) and the seven most saline vs. seven freshest years (b, d, f, h). For each case, the seven selected years were identified based on annual averages of the 0-50 m surface layer (a-d) or the 200-250 m seafloor later (e-h). Differences are computed as warmer minus cooler and saline minus fresh conditions.

Difference of the high-low temperature and salinity pairs (Fig. 8) reveal the contrasting nature of such years. When the water column is particularly warm, positive temperature anomalies tend to extend across all depth level and all months. In contrast, near-surface and near-bottom salinity fields tend to fluctuate out of phase with one another (Fig. 8d,h). The difference between the warmest seven and coolest seven years (Fig. 8a) exhibits seasonality in the depth-time structure; the largest subsurface temperature difference occurs at about 75 m depth in the first three months of the year. At the seafloor, the difference is largest in March, again suggesting that this late winter month is important for setting near-bottom temperature anomalies that persist in time.



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This interpretation is consistent with the near-bottom salinity difference plot (Fig. 8h), which shows the difference between years that are particularly fresh and salty at the seafloor is greatest in March and that the difference tends to persist into late the summer although the difference magnitude diminishes in time.

Because temperature anomalies generally manifest through the water column at GAK1, the warmest seven years near the surface mostly coincide with the seven warmest at the seafloor and the differences between panels Fig. 8a/e and Fig. 8c/g are slight. Years that exhibit particularly salty conditions at the seafloor or the surface are mostly associated with cooler conditions. For years with high bottom salinities, a strong warm anomaly develops in late autumn over the upper water column and as a near-bottom warm anomaly in late winter (Fig. 8f). Warm years are associated with fresh anomalies in the upper 50 m of the water column (Fig. 8c,g), possibly reflecting the importance of ocean heat inducing melt within high altitude snow and ice fields. Near the surface, particularly salty years exhibit elevated salt content in August and September near the base of the halocline (Fig. 8d), suggesting a shallower pycnocline for these years. Excess salt in the upper water column and reduced salt near the seafloor is consistent with a reduced coastal downwelling signal.

The data here reinforce the other analyses above that showing near-bottom temperature and salinity anomalies tend to be set in mid- to late-winter and that they then persist for some months (Fig. 3 right hand panels). This interpretation is consistent with the analyses of Janout et al. (2010) who point to the importance of late autumn and winter wind and salinity anomalies in setting the depth of deep winter mixing

*Predicted Ocean Temperatures in Northern Gulf of Alaska*

The analysis below is extracted from the GAK1 contribution to the National Oceanic and Atmospheric Administration's (NOAA's) Ecosystem Status Report (ESR) for 2025 in the Gulf of Alaska (Hennon and Danielson 2026). Air temperatures in Sitka, Alaska are dominated by the marine climate. Danielson et al. (2022) found Sitka air temperatures had a weak but significant predictive power for integral coastal water column temperatures in the following year at the nearshore station (GAK1) of the Seward Line Transect, in northern Gulf of Alaska ( $r^2 = 0.37$ ,  $p < 0.05$ ). This predictive power can be explained by Sitka's 'upstream' location of GAK1 along the Alaska Coastal Current. Records of Sitka air temperatures exist since 1850 and GAK1 has recorded ocean temperatures since 1970. The anomalies for both GAK1 oceanic temperature and



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Sitka air temperature are seasonally adjusted, and relative to the long-term average (1970-present for GAK1).

The 2026 integrated water column temperatures for the nearshore GAK1 station of the Seward Line transect are predicted to be warmer than average based on 2025 Sitka air temperatures. The average Sitka air temperature through August 12, 2025, was  $\sim 1.1$  °C warmer than the long-term average (Fig. 9). If the anomalies observed through 2025 persist (i.e., Sitka air temperatures in September to December remain  $\sim 1.1$  °C above seasonal averages), we could expect whole water column GAK1 temperatures in 2026 to be  $\sim 0.7 \pm 0.5$  °C above average (Fig. 10). The GAK1 full water column depth-averaged temperature is 6.24 °C for the period of record. Based on the anomalies observed thus far through 2025, GAK1 integrated ocean temperatures ( $\pm 1$ SD) are predicted to range from 6.5 to 7.5°C (centered on 7.0 °C).

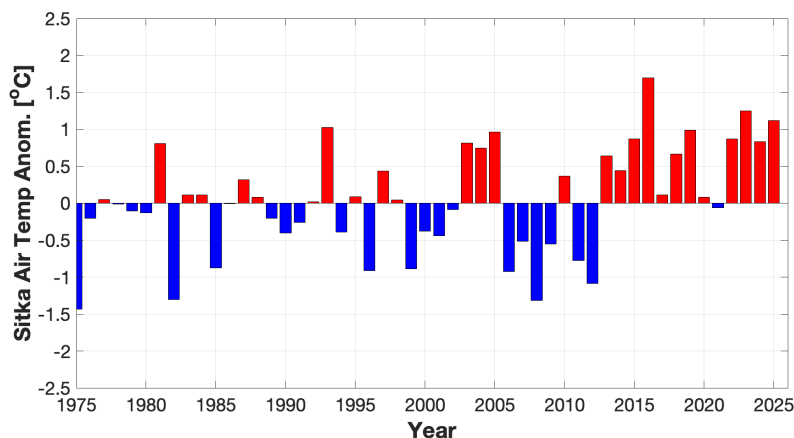


Figure 9. Annual averages of monthly air temperature anomalies (seasonal climatology removed) at Sitka, Alaska (entire record is 1828 – 2024; figure shows 1975 to present). Records are shown relative to a 50-year baseline computed over 1970 – 2024, updated from Danielson et al. (2022).



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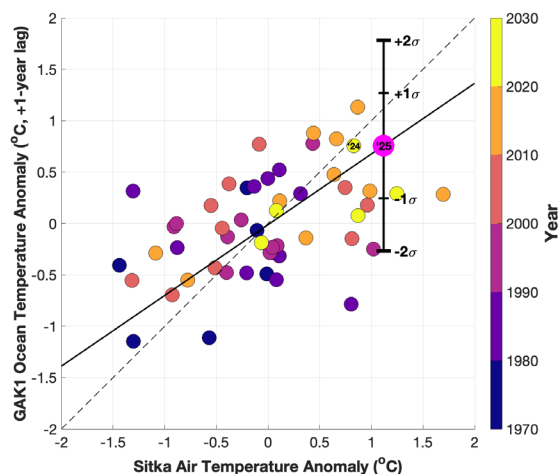


Figure 10. Relationship between the detrended annual Sitka air temperature anomaly (x-axis) and the following-year whole water column ocean average temperature anomaly measured at station GAK1 (y-axis), with a +1-year lag compared to Sitka. Dashed black line shows a 1:1 slope and the solid black line is the least squares best fit line between the two records. Both anomalies are referenced to the average temperature from the early 1970s to present. The colored dots show each yearly comparison between Sitka air anomaly and the next year's GAK1 anomaly. The pink dot shows the 2025 air temperature anomaly (through August 12th, 2025). The error bars show one and two standard deviations of variability from the trend line (solid black line, the dashed line is 1:1), for bounds on the expected water temperature at GAK1 in 2026.

Both Sitka air temperature and GAK1 water temperature are impacted, in part, by large scale climate systems. Detrended (decadal trend removed) Sitka air temperature anomalies are positively correlated (Fig. 11) with the Multivariate El Niño Southern Oscillation Index (MEI) and Pacific Decadal Oscillation (PDO) ( $p < 0.001$  for both). While there is a tighter correlation between detrended Sitka air temperature anomalies and PDO, there is a marked departure within the last several years, where an extended negative state of PDO has also coincided with relatively warm air temperatures.

Warm surface waters in the Gulf of Alaska are generally associated with earlier peak spring phytoplankton blooms, earlier Pacific cod hatch timing (Laurel et al. 2023), and a change in the zooplankton community. The duration and intensity of warming can have cascading effects across the trophic levels of the marine food web.



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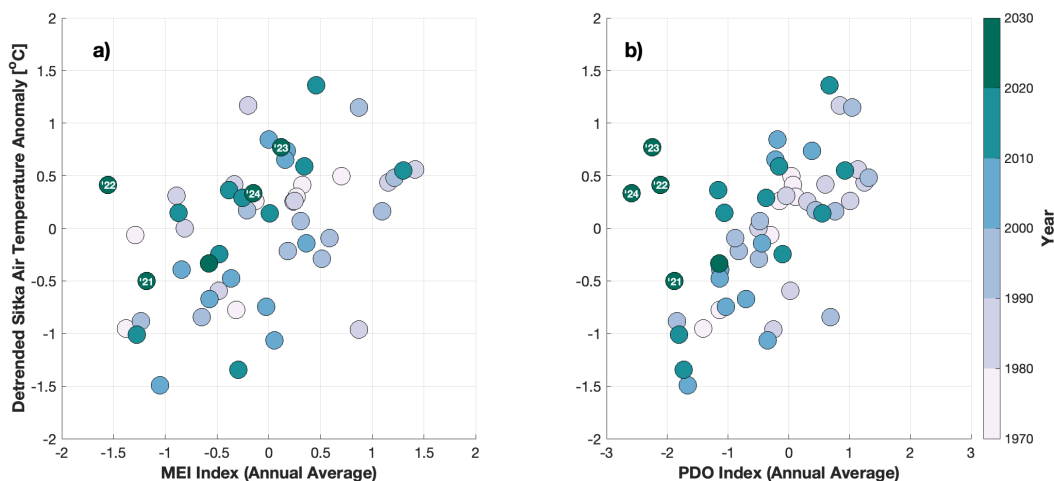


Figure 11. a) The relationship between the annually averaged Multivariate El Niño Southern Oscillation Index (MEI) index and the detrended (decadal trend removed) annual anomalies of Sitka air temperature. Color shows the decade of comparison, with recent years labelled. b) Same as (a) but using Pacific Decadal Oscillation (PDO) for the climate index.

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**2. Products:**

Peer-reviewed publications:

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St. John, C. A., L. E. Timm, K. M. Gruenthal, and W. A. Larson. 2025. Whole genome sequencing reveals substantial genetic structure and evidence of local adaptation in Alaskan red king crab. *Evolutionary Applications* 18(1):e70049.

Reports:

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Conferences and workshops:

Cushing, D., M. Arimitsu, S. Danielson, S. Hatch, R. Kaler, E. Labunski, S. Whelan, and R. Suryan. 2026. Seabird distributions and diets reflect ecosystem integration of climate forcing. Oral presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.

Danielson, S. L. 2025. Seward Line and Oceanographic Station GAK1 updates. NOAA Preview of Ecosystem and Economic Conditions. Online presentation, May.

Danielson, S. 2025. NGA LTER lightning talk. Oral presentation, Northern Gulf of Alaska LTER All-Hands Meeting, Fairbanks, Alaska, March.

Danielson, S. 2025. Northern Gulf of Alaska LTER data nuggets Presentation. Online presentation, February.

Hennon, T., S. L. Danielson, T. Klenz, and C. Murdoch. 2025. Assessing drivers of thermohaline variability in Glacier Bay with over three decades of hydrography. Oral presentation, National Park Service Technical Workshop, Juneau, Alaska, December.

Hennon, T., S. L. Danielson, T. Klenz, and C. Murdoch. 2026. Assessing drivers of thermohaline Variability in Glacier Bay with over three decades of hydrography. Oral presentation, Alaska Marine Science Symposium, Anchorage, Alaska, January.



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Public presentations:

Danielson, S. 2025. Links between changing climate and Alaska's marine ecosystems. Oral presentation, UAF Earth System Science seminar series, Fairbanks, Alaska, September.

Danielson, S. 2025. A photo tour of Alaska's ocean. Oral presentation, Stroudwater Lodge, Westbrook, Maine, December.

Data and/or information products developed during the reporting period:

Danielson, S. L. 2025. CTD profile time series data from the GAK1 site in the Northern Gulf of Alaska, 1970-2025. <https://research.cfos.uaf.edu/gak1/data/TimeSeries/>

Danielson, S. L. 2025. Oceanographic mooring time series data from the GAK1 site in the Northern Gulf of Alaska, 1998-2025. <https://research.cfos.uaf.edu/gak1/data/Mooring/>

The GAK-1 timeseries is served as a "Signature Data Set" on the NGA LTER program's website. This can be accessed at: <https://nga.lternet.edu/data-overview/signature-datasets/>

Data sets and associated metadata:

Danielson, S. L. 2025. CTD profile time series data from the GAK1 site in the Northern Gulf of Alaska, 1970-2025.

[https://researchworkspace.com/project/23194/folder/45516095/level\\_3](https://researchworkspace.com/project/23194/folder/45516095/level_3)

Danielson, S.L., 2025. Oceanographic mooring time series data from the GAK1 site in the Northern Gulf of Alaska, 1998-2025.

<https://researchworkspace.com/project/23194/folder/44883729/mooring-data>

Additional Products not listed above:

Updates to the UAF GAK1 home page are maintained at <http://research.cfos.uaf.edu/gak1/>.

Hennon, T. D., S. L. Danielson, A. Aguilar Islas, I. Reister, and R. A. Potter. Salinity Structure, Drivers, and Time Variability in the Northern Gulf of Alaska. *Peer-review manuscript in preparation.*

Danielson, S. L, T. D. Hennon, T. Klenz, K. McMonigal, and T. J. Weingartner. Wind and climate-mediated variability in a 50-year coastal hydrographic time series. *Peer-review manuscript in preparation.*



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**3. Coordination and Collaboration:**

*The Alaska SeaLife Center or Prince William Sound Science Center*

Principal Investigator (PI) Danielson engaged in scientific discussions with Alaska SeaLife Center (ASLC) researcher Dr. Tuula Hollmen and served on her UAF graduate student's (Brendan Higgens) thesis committee.

The GAK-1 project has mounted acoustic receiver dataloggers on the mooring that can detect fish tags. These have been deployed in the past for Dr. Mary Anne Bishop of the Prince William Sound Science Center, in support of herring studies. More recently these recorders have been deployed for studies of Pacific sleeper sharks carried out by Drs. Markus Horning and Amy Bishop, formerly of ASLC.

*EVOSTC Long-Term Research and Monitoring Projects*

We coordinate closely with the Gulf Watch Alaska Long-Term Research and Monitoring (GWA-LTRM) program Seward Line project (25120114-L, PIs Hopcroft and Danielson), which is also jointly supported by the National Science Foundation (NSF) Northern Gulf of Alaska Long Term Ecological Research (NGA LTER) program. The GAK1 project benefits from the Seward Line project because CTD casts taken by the Seward Line project can be directly incorporated into the GAK1 CTD time series. In turn, the monthly GAK1 cruises on R/V Nanuq for CTD sampling also collect plankton net tows and water for nutrient and chlorophyll a collections that are supported by the Seward Line project. The Seward Line consortium supports the GAK1 mooring turnarounds by providing vessel support for the mooring recovery and deployments during their May cruises.

In addition, the GAK1 project complements sampling carried out by all GWA-LTRM projects by providing more than half-century context of ocean environmental conditions.

*EVOSTC Mariculture Projects*

Nothing to report.



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*EVOSTC Education and Outreach Projects*

Ms. Nicole Webster is a PhD student in PI Danielson's UAF oceanography lab and has been working closely with Katie Gavenus of Center for Alaskan Coastal Studies, joining Coastal Ocean Restoration and Learning (CORaL) Network visits to Prince William Sound communities and leading science exploration especially in the realm of underwater soundscapes. In addition, the GAK1 project has begun mounting a Sound Trap hydrophone to record underwater sounds and the data will be used in N. Webster's Gulf of Alaska soundscape analysis.

*Individual EVOSTC Projects*

The GAK1 project coordinates with the Data Management program to ensure data are reviewed for quality control and assurance and posted to the Gulf of Alaska Data Portal annually within required timeframes.

*Trustee or Management Agencies*

The GAK1 project provides regular updates of bottom temperature that are used in generating NOAA's Pacific cod spawning index. These are generated in the spring for the Preview of Ecosystem and Economic Conditions workshop and in the fall for indicators used in the Ecosystem and Socioeconomic Profile and Ecosystem Status Reports. In late summer, our project provides an analysis of GAK1 temperature variability, and a forward prediction of 2026 ocean temperatures based on established relationships between Sitka air temperature and the GAK1 surface-to-bottom water column temperature.

The GAK1 data record has been used in joint analysis with long-term hydrographic data (over three decades) from Glacier Bay National Park and Preserve. The two datasets combined are revealing new insights to the functioning of coastal Gulf of Alaska waters from southeast to south-central Alaska. For example, while the GAK1 record shows a progressive warming from the 1990s to the present, the Glacier Bay record has not warmed, apparently as a result of the sensible heat inputs provided by the ablating glacier mass. Such insights are useful to the National Park Service (NPS) as they consider issues of stewardship, management and public education. These analyses are based on collaborative data sharing and analysis between the GAK1 project and the NPS Inventory and Monitoring program of the Southeast Alaska Network.

Since 2011, the GAK1 project has provided the mooring as a platform for near-bottom ocean acidification sensors. These sensors are operated and maintained by UAF's Ocean Acidification



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Research Center with funding over the years from the Alaska Ocean Observing System, NOAA Ocean Acidification Program, the North Pacific Research Board, and the State of Alaska.

*Native and Local Communities*

Via the umbrella of the Northern Gulf of Alaska Long Term Ecological Research program, which includes both the GAK1 project and the Seward Line project, PI Danielson works with Katie Gavenus of the Center for Alaskan Coastal Studies. Ms. Gavenus, a CORaL Network collaborator, helps our researchers interface with communities throughout southcentral Alaska and coordinates visits by faculty and students to local classrooms virtually and in person. In the past, Ms. Nicole Webster has joined the Collective Alaska Native Perspectives (CANP) initiative led by the Chugach Regional Resources Commission and partners; in spring 2026 PI Danielson will join a CANP gathering in Homer, Alaska.

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**4. Response to EVOSTC Review, Recommendations and Comments:**

No review, recommendations, or comments were provided in 2025. This project responded to comments in the FY24 annual report.

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**5. Budget:**

Two unavoidable expenses have increased since proposal submission. The cost of the vessel charter has gone up a bit, but the cost of CTD calibrations has gone up significantly. Due to the delay in the FY24 NOAA grant until January 2025, the project delayed equipment purchases and some salary (to the degree possible) to buffer for the uncertainties. Also, by holding off on equipment purchases, the project may get better quality discounts. The underspending will start to level out in the coming year.



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**EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL  
PROJECT BUDGET PROPOSAL AND REPORTING FORM**

<b>Budget Category:</b>	Proposed FY 22	Proposed FY 23	Proposed FY 24	Proposed FY 25	Proposed FY 26	5- YR TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	\$43,544	\$44,921	\$46,045	\$85,132	\$87,420	\$307,062	\$124,135
Travel	\$6,528	\$6,562	\$6,599	\$6,635	\$6,673	\$32,997	\$10,301
Contractual	\$7,200	\$7,385	\$7,573	\$7,769	\$7,968	\$37,895	\$41,181
Commodities	\$3,150	\$3,229	\$3,310	\$3,392	\$3,478	\$16,559	\$5,152
Equipment & F&A Exempt	\$49,552	\$63,680	\$60,473	\$59,081	\$61,202	\$293,988	\$95,698
Indirect Costs Rate = 25% (non-equipment)	\$15,106	\$15,524	\$15,882	\$25,732	\$26,385	\$98,628	\$33,556
<b>SUBTOTAL</b>	<b>\$125,080</b>	<b>\$141,301</b>	<b>\$139,882</b>	<b>\$187,741</b>	<b>\$193,126</b>	<b>\$787,129</b>	<b>\$310,023</b>
General Administration (9% of subtotal)	\$11,257	\$12,717	\$12,589	\$16,897	\$17,381	\$70,842	N/A
<b>PROJECT TOTAL</b>	<b>\$136,337</b>	<b>\$154,018</b>	<b>\$152,471</b>	<b>\$204,638</b>	<b>\$210,507</b>	<b>\$857,971</b>	
Other Resources (In-Kind Funds)						\$0	

**COMMENTS:**  
 Two unavoidable expenses have increased since proposal submission. The cost of the vessel charter has gone up a bit, but the cost of CTD calibrations has gone up significantly. Due to the delay in the FY24 NOAA grant until January 2025, the project delayed equipment purchases and some salary (to the degree possible) to buffer for the uncertainties. Also, by holding off on equipment purchases, the project may get better quality discounts. The underspending will start to level out in the coming year.

Indirect Costs: Facilities and Administrative (F&A) Costs are calculated at 25.0% of the Modified Total Direct Costs (MTDC), as per the proposal guidelines. MTDC includes Total Direct Costs minus tuition, scholarships, participant support costs, rental/lease costs, subaward amounts over \$25,000, and equipment. A copy of the agreement is available at: <http://www.alaska.edu/cost-analysis/negotiation-agreements/>.

<b>FY22-26</b>	<b>Project Number: 25120114-I</b> <b>Project Title: GAK-1 Mooring</b> <b>Primary Investigator: Danielson (UAF)</b>	<b>NON-TRUSTEE AGENCY SUMMARY PAGE</b>
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