The Northern Gulf of Alaska Long-term Ecological Research Program: coming to an ocean near you in 2018

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Russell Hopcroft[1], Suzanne Strom[2], Ana Aguliar-Islas[1], Seth Danielson[1], Jerome Fiechter[3]

[1]University of Alaska Fairbanks, [2]Western Washington University, [3]University of California Santa Cruz

1970–1997:
UAF oceanography professor Tom Royer led dozens of Seward Line **physics day-trips** and **research expeditions**.

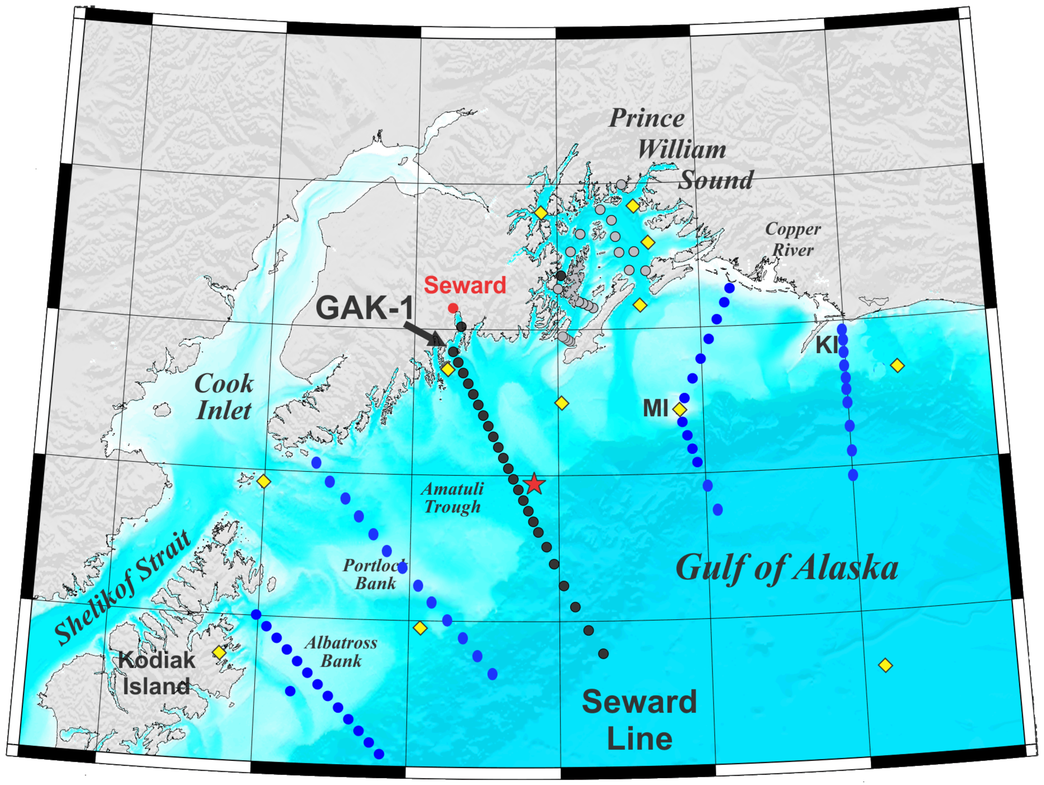
1997–2004:
GAK1 mooring begins.
Sampling expanded to include **chemistry and biology** with 6-7 cruises per year as part of the U.S. Global Ocean Ecosystem Dynamics (GLOBEC) program, jointly funded by NSF and NOAA.

2005–2017:
May and September cruises have been **funded by a consortium** of the North Pacific Research Board, the Alaska Ocean Observing System, and the Exxon Valdez Oil Spill Trustee Council through the Gulf Watch Alaska program.

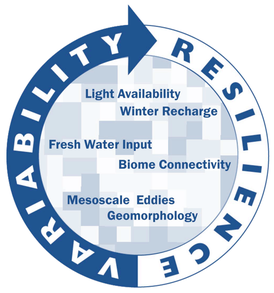
2018–forever
NSF's **Long Term Ecological Research** program joins the Seward Line Consortium to support May, July, and September cruises annually in 6-yr cycles.

LTER Network Mission:
Provide scientists, policy makers, and society with knowledge and predictive understanding necessary to conserve, protect, and manage the nation's ecosystems, their biodiversity, and the services they provide.

Network Goals:
- Understanding
- Synthesis
- Information
- Legacies
- Education
- Outreach



NGA LTER Hypotheses center on the interplay between the hydrologic cycle and the ecosystem's structure and properties. Topics of interest include:

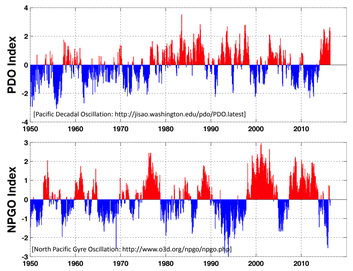


- Temperature/salinity structure
- Spring bloom production
- Hot spots of high summer primary and secondary production
- Trophic match/mismatch between producers and consumers
- Structure and composition of biological communities

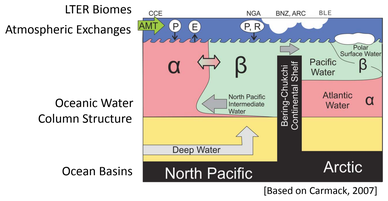
Core Research Areas:
- Primary Production
- Population Studies
- Movement of Organic Matter
- Movement of Inorganic Nutrients
- Disturbance Patterns

Physics and Environmental Drivers

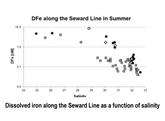
Many decades of North Pacific observations allow us to interpret LTER biological and chemical measurements in the context of rapid and slow environmental changes.

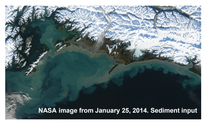


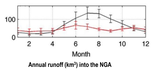
Conceptual models describe our understanding of ecosystem drivers, structure, and functioning. These models are valuable tools for contrasting biomes and for developing and testing research hypotheses.



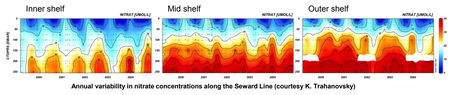
Nutrients



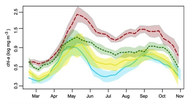




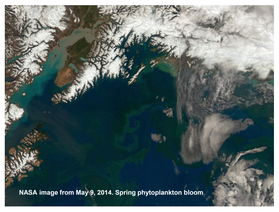
Seasonal surveys collect hydrographic, nutrient, and biological data to measure variability.

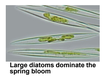


Process study experiments determine how light, nutrients, iron, and grazing interact to regulate primary production.

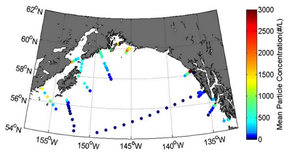


Phytoplankton



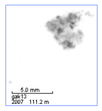


Particles



Mean concentration of large particles (64 µm to 2.5 cm) detected over the entire depth of the water column measured by the UVP5 (#/L) during cruises in June-August 2015 (Turner et al. 2017).

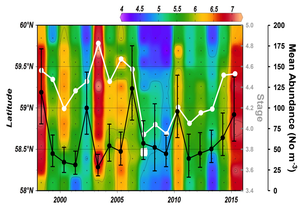
Optical instruments measure the size and concentration of **marine particles**. These include suspended sediments, detritus, and zooplankton fecal pellets, and are an important source of carbon, nutrients, and energy in the NGA.



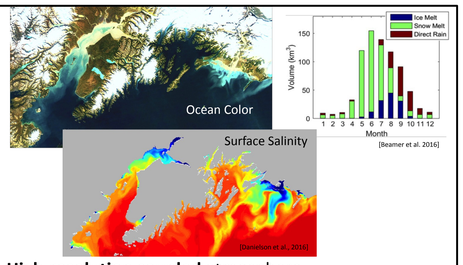
Zooplankton

Microzooplankton and mesozooplankton respond to both bottom-up and top-down drivers (i.e. both food and predators) so they link primary producers and upper trophic level consumers.

Neocalanus spp. mean abundance (black) and life stage (white) during early May (1998–2015) on the Seward Line. Temperature averaged over the upper 100 m from nearshore (top) to offshore (bottom) is shown in color.

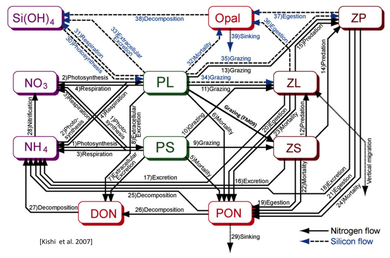


Modeling

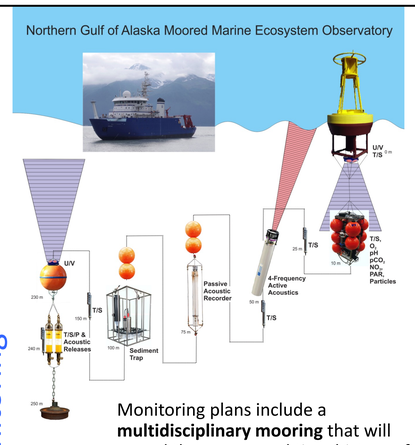


High-resolution coupled atmosphere, hydrology, ice, and ocean circulation models bridge the terrestrial–marine interface and support investigations at biologically important time and space scales.

Biogeochemical modeling embedded within the circulation model will allow testing and improvement of our mechanistic understanding of ecosystem dynamics.



Autonomous Monitoring



Monitoring plans include a **multidisciplinary mooring** that will record the year-round time history of the northern Gulf of Alaska beginning in 2019.

Uninterrupted datasets that continue between the research cruises will contribute to our understanding of subseasonal variability.

M.J. Murdock Charitable Trust

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NSF
NOAA
U.S. GLOBEC Northeast Pacific Program
North Pacific Research Board
GulfWatch Alaska
AOOS Alaska Ocean Observing System
UAF University of Alaska Fairbanks