

*Project Number: 070340*

*Project Title: Long-term oceanographic monitoring of the Gulf of Alaska Ecosystem*

*PI Name: Thomas Weingartner.....*

*Time period covered by report: 10/1/08 – 8/31/09*

*Date of Report: 8/25/09*

*Report prepared by: Thomas Weingartner..*

*Project website address (if applicable): <http://www.ims.uaf.edu/gak1/>.*

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**Work Performed:**

We:

1. have conducted the monthly CTD sampling at station GAK 1
2. have continued archiving and quality controlling Middleton and Prince William Sound weather buoy and computed air-sea heat flux time series from these data.
3. recovered and re-deployed the GAK 1 mooring, including the ISUS nitrate sensors provided by the Alaska Ocean Observing System. The instruments from the GAK 1 mooring are undergoing post-calibration at the manufacturer's (Seabird).
4. Will shortly submit a manuscript on the temperature changes observed at GAK 1 and the mechanisms responsible for these.

The anomalously cold conditions detected in the winter-spring of 2006-2007 and s007/08 at station GAK 1 continued into spring 2009. The cooling in winter 2008-09 - 08 was primarily confined to the upper 100 m of the water column and did not penetrate to the bottom of the shelf as occurred during the anomalous cooling observed in 2006-07. We believe that the primary reason for this is that the lower 150 meters of the Gulf of Alaska shelf were saltier than normal due to unusually strong winter upwelling. This subsurface salinity increase resulted in a mid-depth enhancement of the ocean stratification that limited deep mixing and cooling to depths greater than ~100 m. Hence the cold anomaly that developed in 2006-07 was moderately reduced at depths greater than 100 m, but intensified at shallower depths. We are collecting and comparing the wind and heat flux data for this winter and spring for comparison with other years.

**Future Work:** We will continue the monthly CTD sampling through September 2009 and recover the GAK 1 mooring in March 2010. At that time we will re-deploy it assuming that our recently submitted proposal to the EVOSTC is approved. We will also include an ISUS nitrate sensor provided by AOOS. If the EVOSTC proposal is approved, Dr. Jeremy Mathis (also of UAF) will enhance the GAK 1 mooring by inclusion of a pH sensor in order to begin systematic sampling of ocean acidification in the Gulf of Alaska. We will continue our analyses of the unusual cooling observed in the winter of 2008-09 and report on this in detail at the Alaska Marine Science Symposium. We anticipate submitting a manuscript to the Journal of Geophysical Research that describes the 2006/07 and 2007/08 cooling on the Gulf of Alaska

shelf by September 10, 2009. That manuscript is a direct outgrowth of the measurements supported by EVOSTC at GAK 1

**Coordination/Collaboration:** We collaborate with T. Royer and C. Grolsch (Old Dominion University) on the analyses of these data. We have provided several fisheries scientists (R. Heintz, F. Muter, G. Kruse) with our GAK 1 data for use in the various fisheries studies.

**Community Involvement/TEK & Resource Management Applications:** N/A although we communicate our results to several fishermen and community organizations. For example, UAF graduate student Markus Janout described the recent winter cooling in the northern Gulf of Alaska at community for a in Cordova and Kodiak in April 2009.

### **Information Transfer:**

The project and the data are available at <http://www.ims.uaf.edu/gak1/>

Janout, M. A., T. J. Weingartner, T. Royer, and S. Danielson, Temperature controlling processes and the recent cooling in the northern Gulf of Alaska. Oral presentation at the Alaska Marine Science Symposium, Anchorage Alaska, January 2009.

Janout, M. A., T. J. Weingartner, T. Royer, and S. Danielson, On the nature of winter cooling and the recent temperature shift on the northern Gulf of Alaska shelf (to be submitted to the Journal of Geophysical Research)

Janout, M. A., T. J. Weingartner, D. L. Musgrave, S. R. Okkonen, and T. E. Whitledge, Some characteristics of Yakutat eddies propagating along the continental slope of the northern Gulf of Alaska, (in press Deep-Sea Research).

Janout, M. A., S. Danielson, T. Weingartner, and T. Royer, Anomalously cold conditions on the northern Gulf of Alaska shelf in spring 2007, (poster presented at the Alaska Marine Science Symposium, January 2008, Anchorage Alaska).

Janout, M. A., S. Danielson, T. Weingartner, and T. Royer, On the nature of the 2006-07 cooling on the northern Gulf of Alaska shelf. (poster presented at the AGU/ASLO Ocean Sciences Meeting, February 2008, Orlando, Florida)

### **Other publications (since 2004) that have used GAK 1 data\*:**

Bechtol, W.R., 2009. **Abundance, recruitment, and environmental forcing of Kodiak red king crab**. University of Alaska Fairbanks, Doctoral dissertation, 205 p

Tribuzio, C.A., 2009. **Life history, demography and ecology of the spiny dogfish (*Squalus acanthias*) in the Gulf of Alaska: Critical information for aiding management**. University of Alaska Fairbanks, Doctoral dissertation, in prep.

Ebbesmeyer, C. C., W. J. Ingraham, T. C. Royer, and C. E. Grosch, 2007, **Tub Toys Orbit the Pacific Subarctic Gyre**, *Eos Trans. AGU*, 88(1), 1.

Sarkar, N., 2007, **Mixed layer dynamics along the Seward Line in the northern Gulf of Alaska**, Ph.D. dissertation, Old Dominion University, Norfolk, VA, 71p.

- Schroeder, I. D., 2007, **Annual and interannual variability in the wind field and hydrography along the Seward Line in the northern Gulf of Alaska**, Ph.D. dissertation, Old Dominion University, Norfolk, VA, 81p.
- Royer, T. C. and C. E. Grosch, 2006, **Ocean warming and freshening in the northern Gulf of Alaska**, Geophysical Research Letters, 33 (16), L16605,doi:10.1029/2006GL026767
- Capotondi, A., M. A. Alexander, C. Deser and A. J. Miller, 2005, **Low-Frequency Pycnocline Variability in the Northeast Pacific**, Journal of Physical Oceanography, V. 35, 8, 1403-1420
- Ingolfsson, A., 2005, **Community structure and zonation patterns of rocky shores at high latitudes: an interocean comparison**, Journal of Biogeography, 32(1), 169-182, doi:10.1111/j.1365-2699.2004.01150.x
- Royer, T.C., 2005, **Hydrographic responses at a coastal site in the northern Gulf of Alaska to seasonal and interannual forcing**, Deep-Sea Research Part II-Topical Studies in Oceanography, 52 (1-2): 267-288
- Sarkar, N, T. C. Royer and C. E. Grosch, 2005. **Hydrographic and mixed layer depth variability on the shelf in the northern Gulf of Alaska, 1974-1998**. Cont. Shelf. Res. 25: 2147 – 2162.
- Weingartner, T.J., Danielson, S.L. and Royer, T.C., 2005, **Freshwater variability and predictability in the Alaska Coastal Current**, Deep-Sea Research Part II-Topical Studies in Oceanography, 52 (1-2): 169-191

**\*Note that this list may be incomplete since we are alerted to the data use only when a scientist informs us that they have downloaded the data from the GAK 1 website and provided us with the citation. A complete list of citations that have used GAK 1 data are listed on the project website.**

**Budget:** NO CHANGE