

Benthic Carbon Cycling within the RUSALCA Program

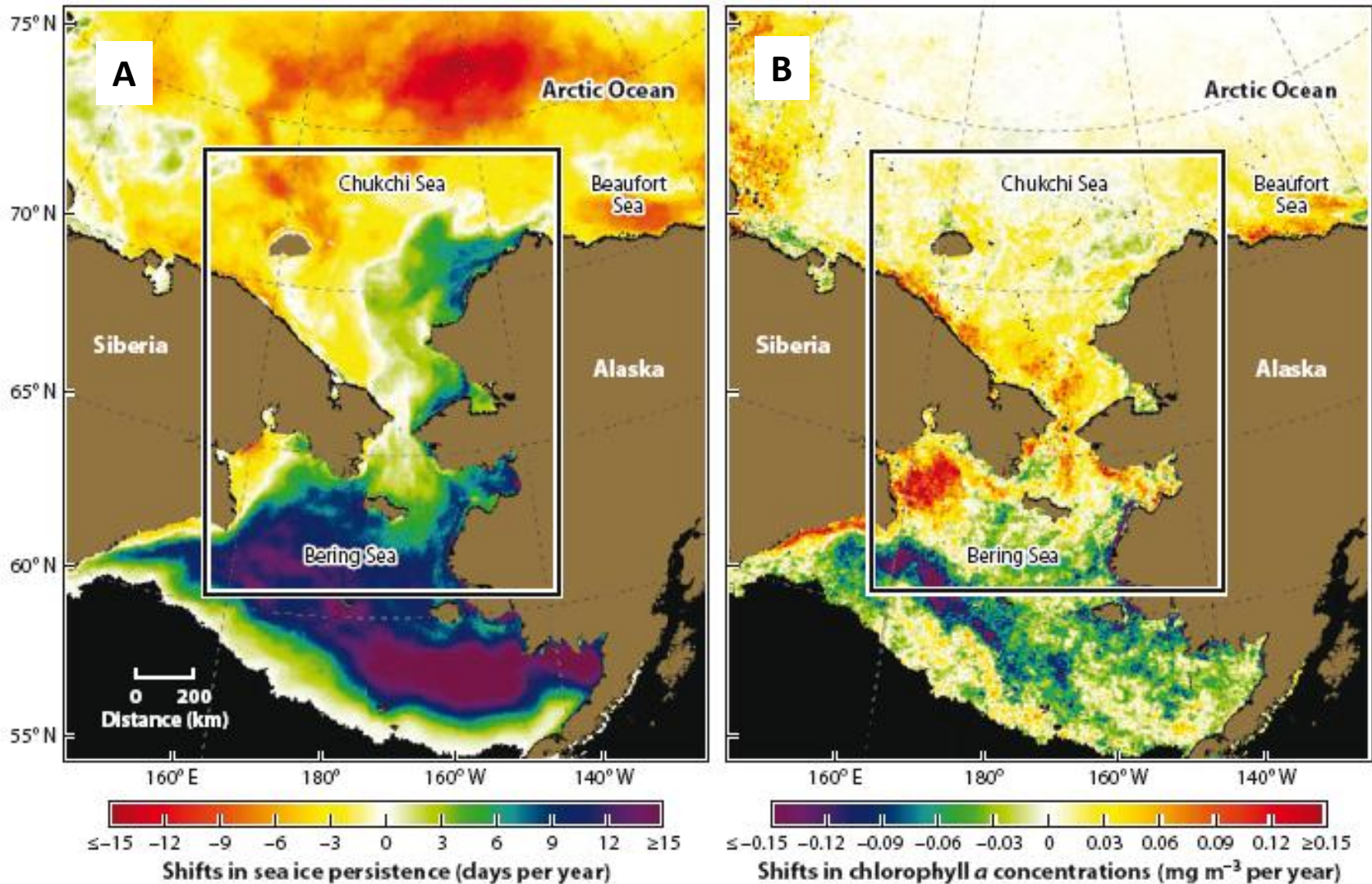
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Warming Chukchi Sea



Shifts in (A) annual sea ice persistence and (B) chlorophyll *a* concentrations between 2003 and 2009. Fig. updated and modified from Grebmeier et al. 2010, courtesy of Karen Frey.

Benthic Carbon Cycling and Ecosystem Structure in the Pacific Arctic Region as part of RUSALCA



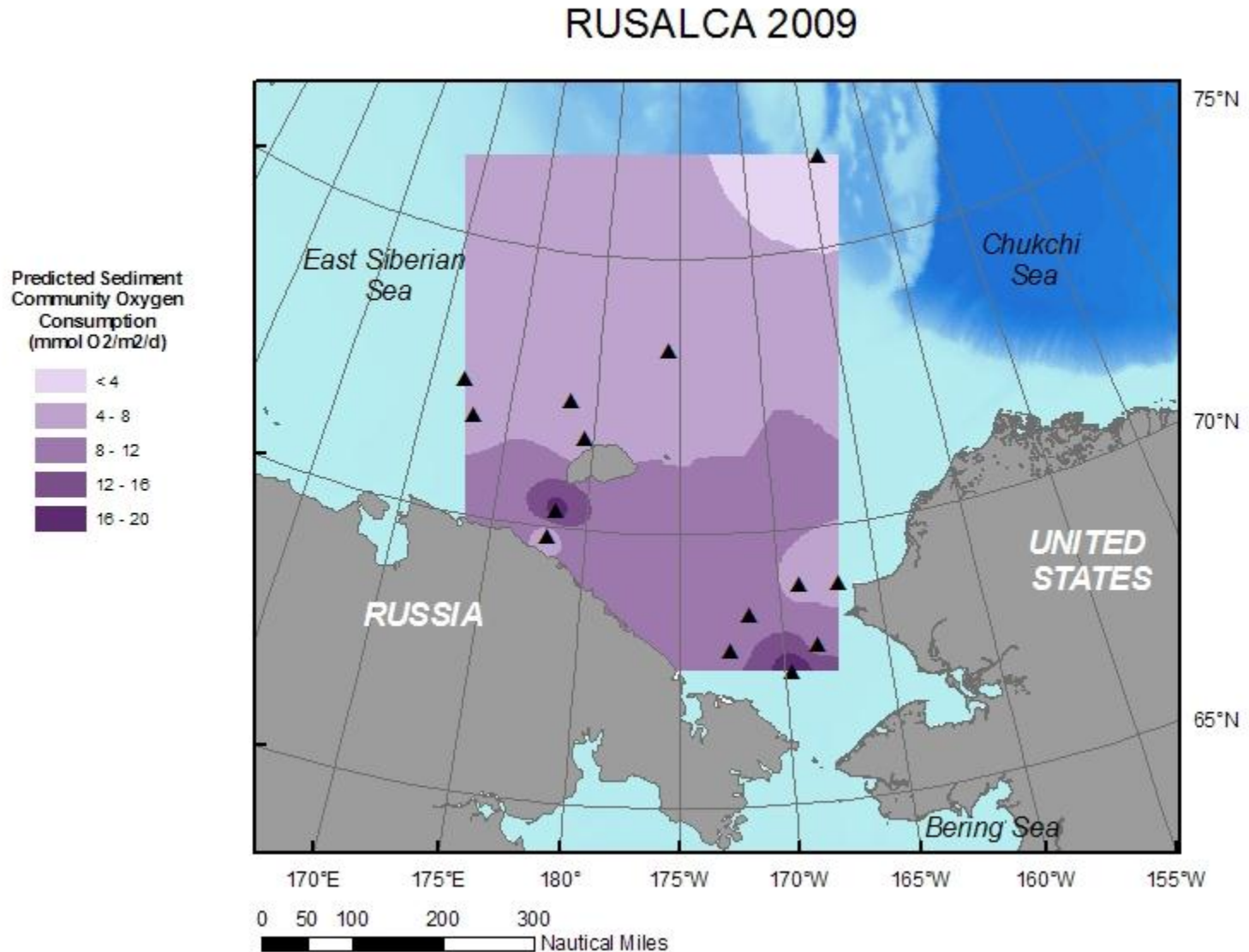
Objectives

- evaluate carbon export to benthos via sediment oxygen uptake and nutrient exchange studies (HAPS corer)
- sediment indicators (TOC, chl a, grain size)
- benthic infaunal population structure and biomass (133 cm² cores and 0.1 m² van Veen grabs)
- stable and radioisotope analyses

PIs: Jackie Grebmeier and Lee Cooper, UMCES/CBL

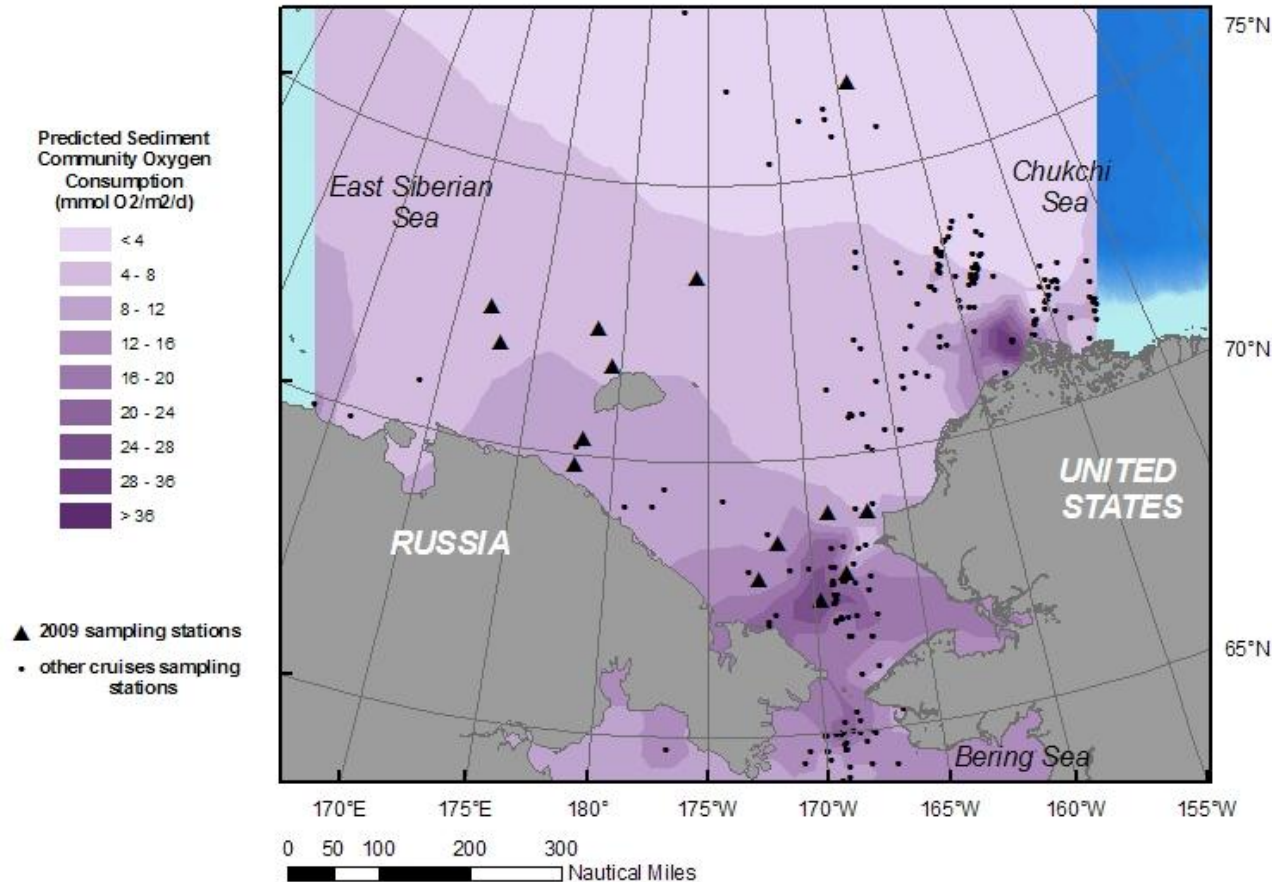


Sediment Community Oxygen Consumption-RUSALCA 2009



Sediment community oxygen consumption 1984-2010

RUSALCA 2009



- spatial patterns indicative of the amount of carbon reaching the sediments

[updated from Grebmeier et al. 2006, unpubl. data]

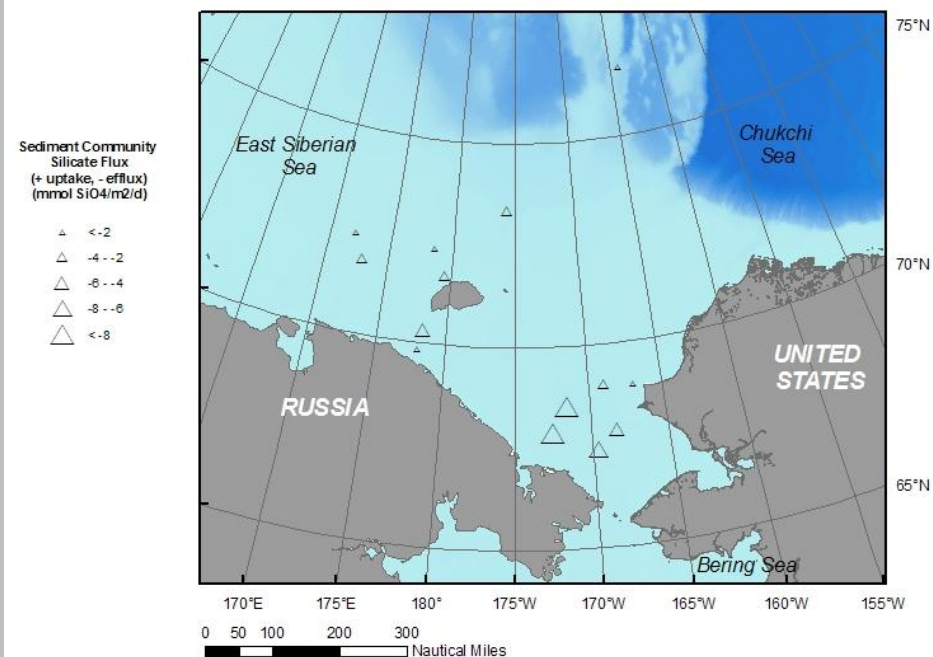
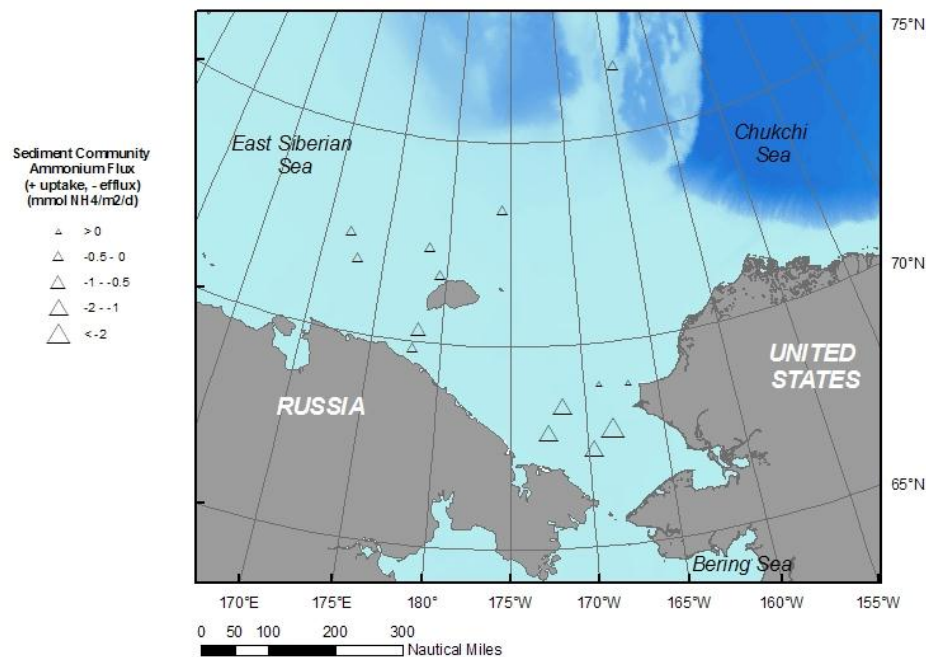
High nutrient efflux from sediments in regions of high organic carbon deposition during RUSALCA 2009

Sediment Community Ammonium flux (mM/m²/d)

Sediment Community Silicate flux (mM/m²/d)

RUSALCA 2009

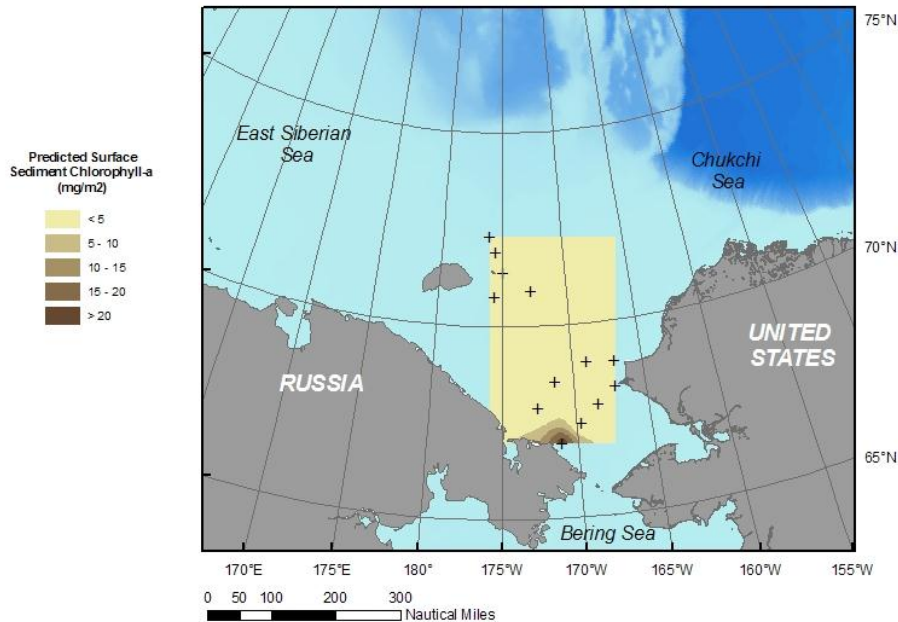
RUSALCA 2009



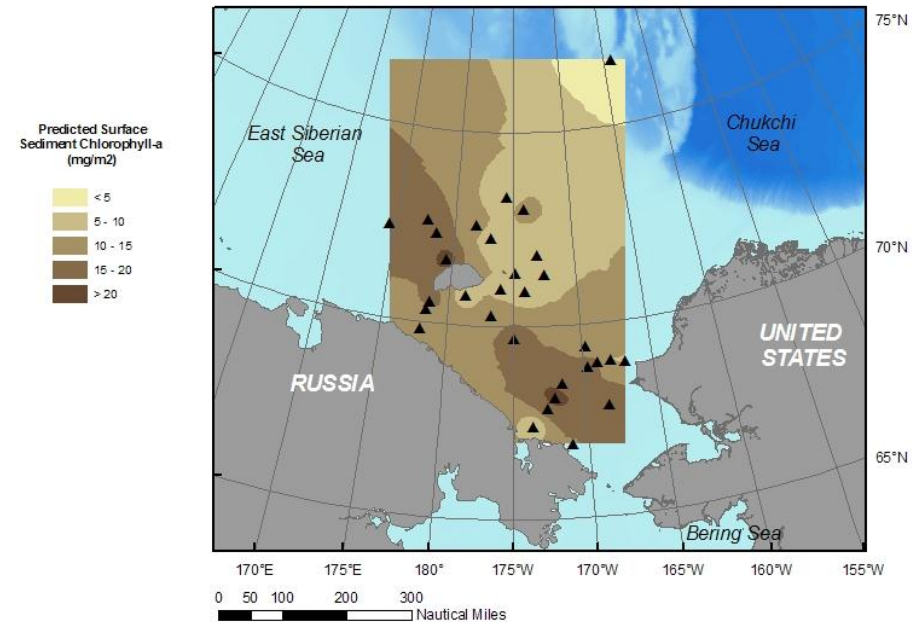
- highest outflux nutrients in SE Chukchi Sea “hotspot” where highest carbon export and benthic infaunal biomass
- lowest outflux nutrients in offshore East Siberian Sea and north of Pt. Hope off Alaska

Sediment Chlorophyll a (mg/m²)-short-term indicator of carbon supply to benthos

RUSALCA04



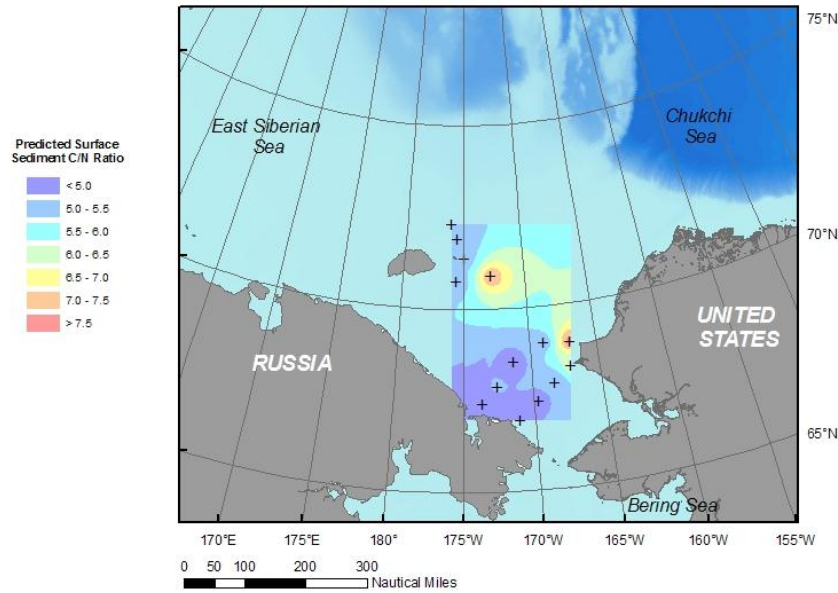
RUSALCA 2009



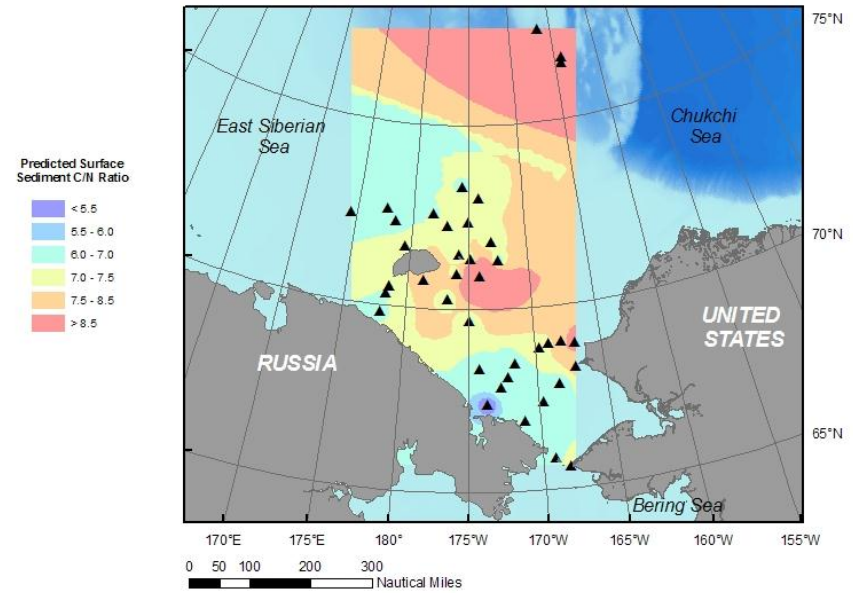
- Depends on overlying water column production seasonally

C/N surface sediments-indicator of quality food supply

RUSALCA 2004



RUSALCA 2009



RUSALCA 2004 & 2009

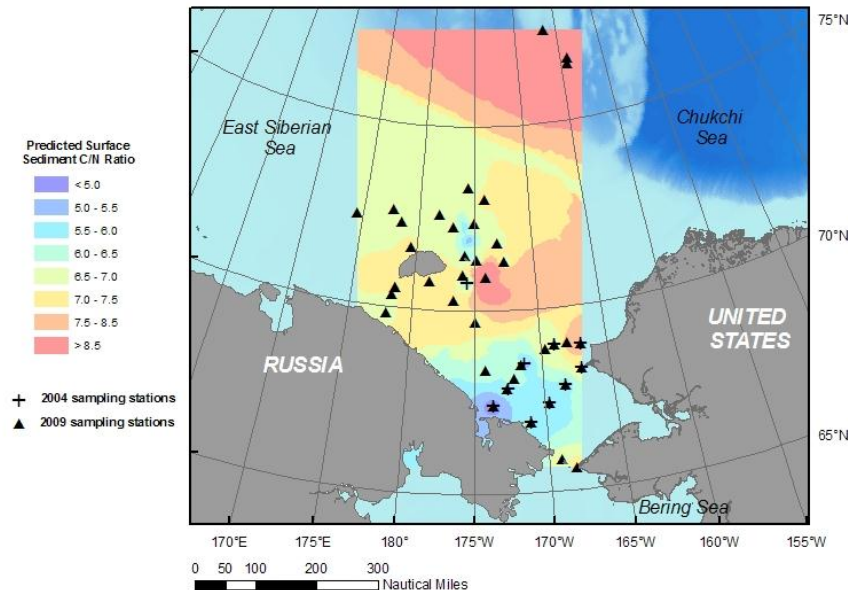
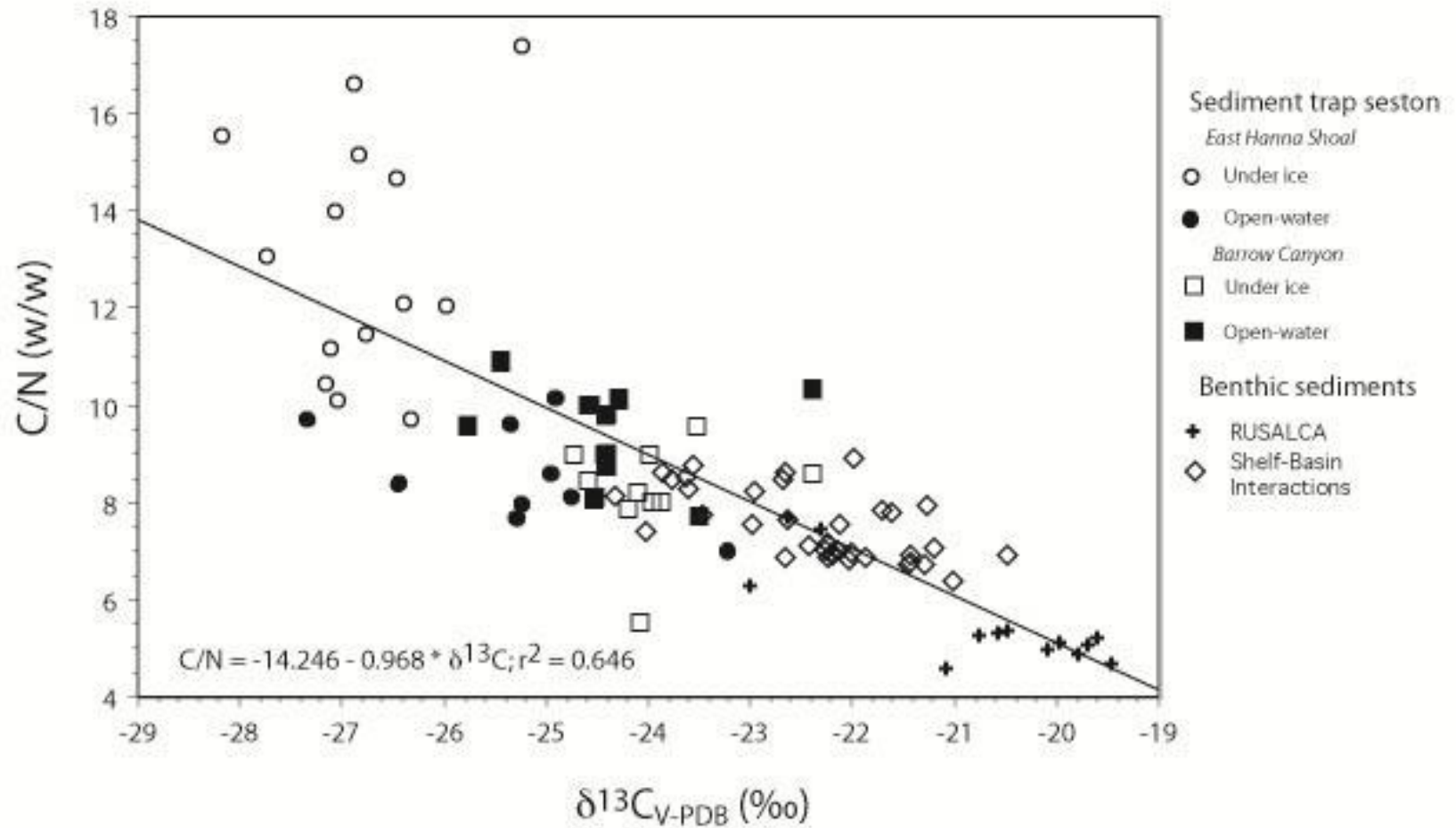
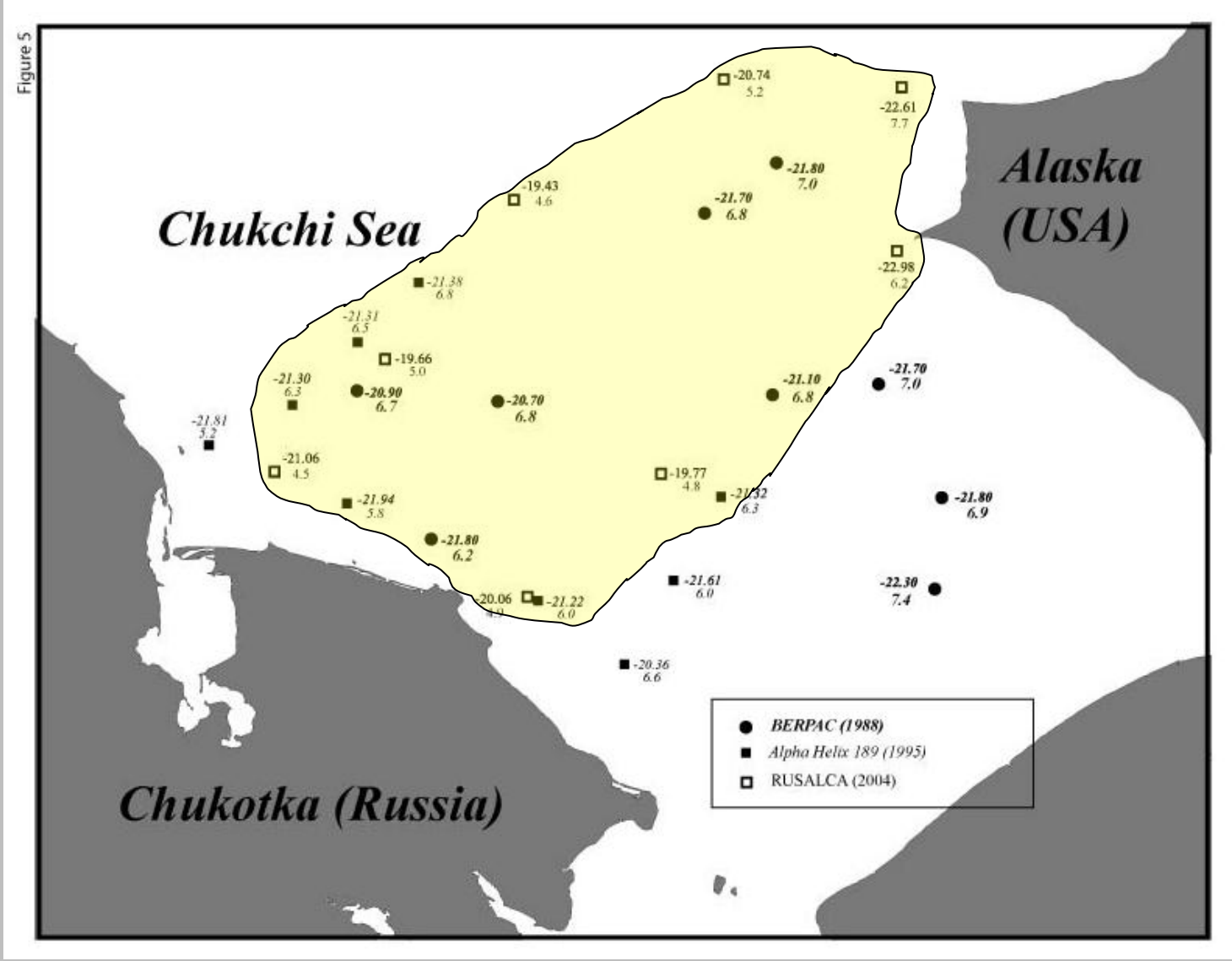


Figure 4

C/N versus C-13 carbon isotope relationship



Comparison $\delta^{13}\text{C}$ values over time series (1993, 1995, 2004) in the Chukchi Sea



SUMMARY

1. Sediment community oxygen consumption (SCOC) and surface sediment chlorophyll (sed chl a) were highest under the Anadyr water in the SE Chukchi Sea and in portions of the East Siberian Sea and Long Strait, indicative of efficient carbon export to the benthos.
2. Areas of highest carbon export to the benthos (SCOC, sed chl a) coincident with highest areas of infaunal biomass (gC/m^2) which are important prey to walrus gray whales, and bearded seals.

Thank you.

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