

Distributed Biological Observatory (DBO)

Linking Physics & Biology in the Arctic

The Distributed Biological Observatory (DBO): 2014 Updates of Activities and Data Workshops

Jacqueline M. Grebmeier

Chesapeake Biological Laboratory

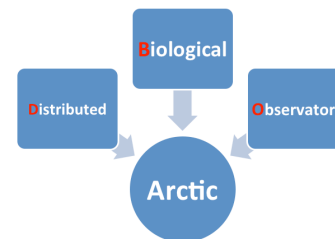
University of Maryland Center for Environmental Science, Solomons, MD, USA

Pacific Arctic Group

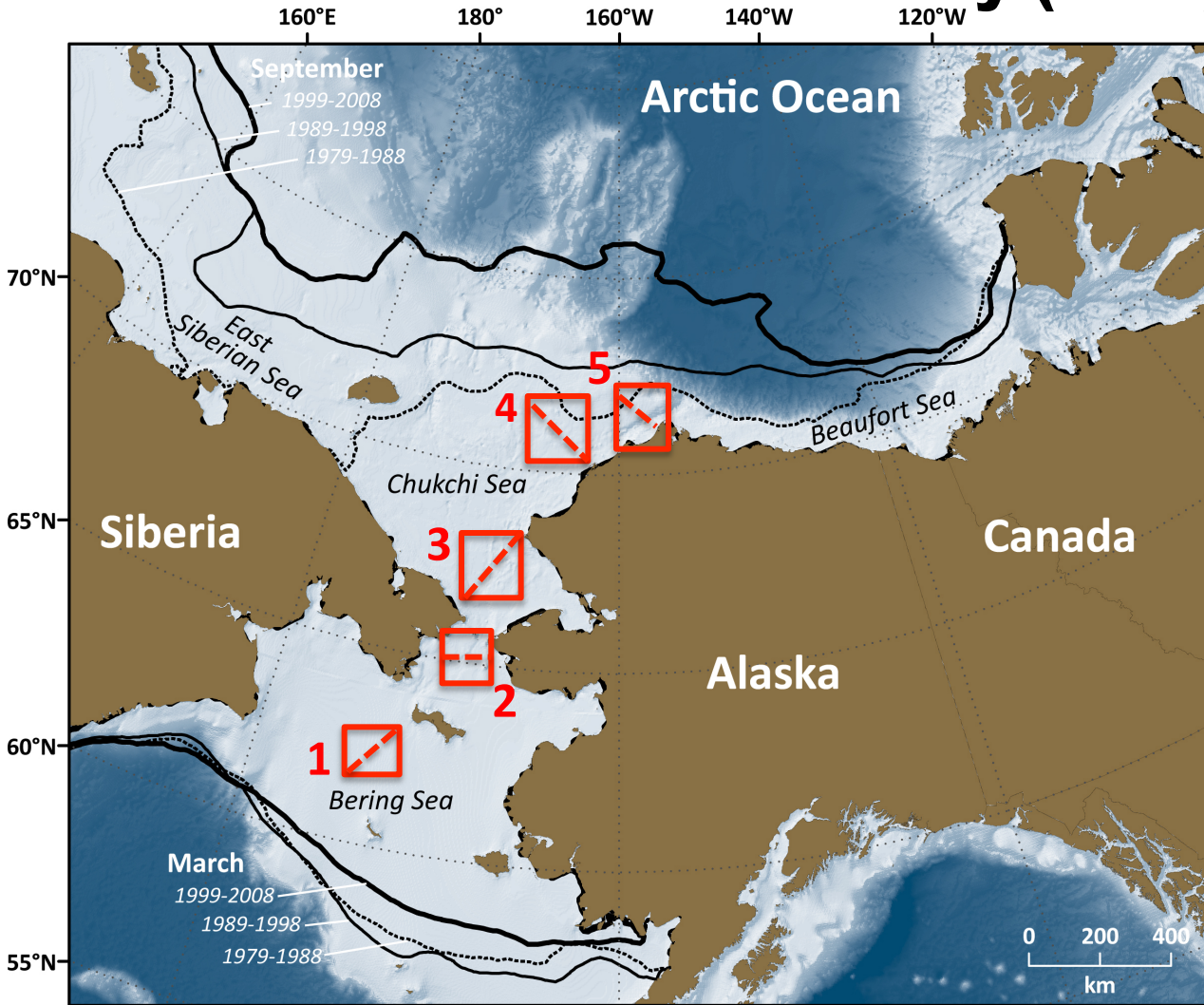
April 6-7, 2014

Arctic Science Summit Week

Helsinki, Finland



Linking Physics to Biology: the Distributed Biological Observatory (DBO)



[modified by Karen Frey from Grebmeier et al. 2010, EOS 91]

- DBO sites (red boxes) are regional “hotspot” transect lines and stations located along a latitudinal gradient
- DBO sites are considered to exhibit high productivity, biodiversity, and overall rates of change
- DBO sites will serve as a change detection array for the identification and consistent monitoring of biophysical responses
- Sites occupied by national and international entities with shared data plan



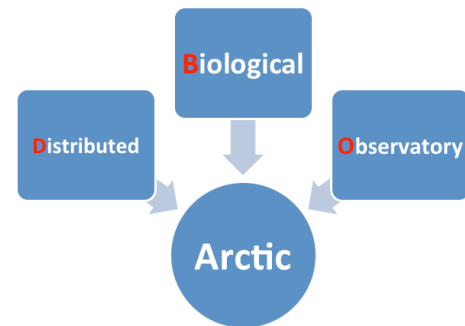
DBO 2nd Data Workshop-planning fall 2014



The 1st DBO Data Workshop (Feb 27-Mar 1, 2013) focused on 4 objectives:

- Present results from the 2010-2012 pilot study and determine a basis for multidisciplinary paper(s) to showcase the DBO international effort
- Archive metadata with either link to data set in a national archive or submitting the DBO data to common data archive
- Discuss DBO site criteria and identify NE Chukchi Sea DBO4 line and other DBO lines, and
- Determine how to plan for full implementation for the DBO

2nd DBO Data Workshop will evaluate the continued international data collections on up to 5 DBO lines seasonally, discuss the current submission of data to the DBO data sharing sites, develop publication plans, and coordinate future activities

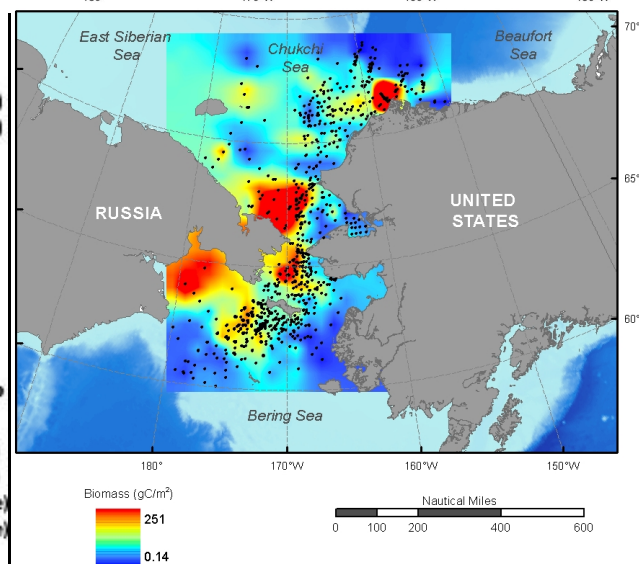
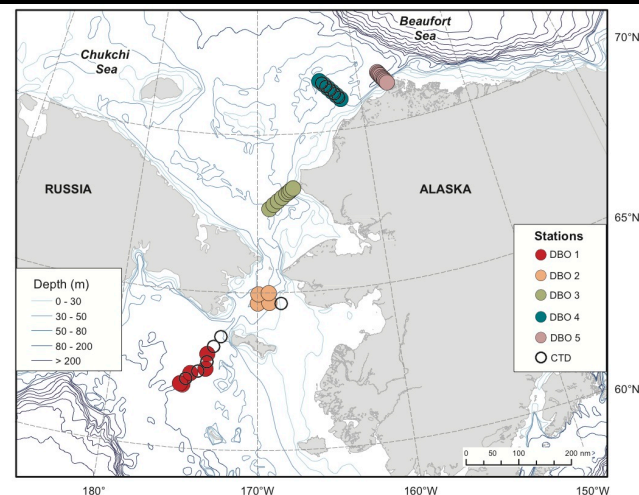
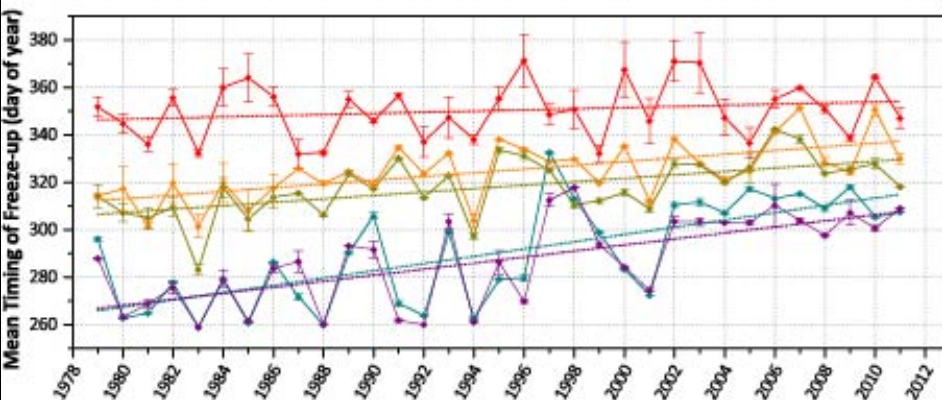
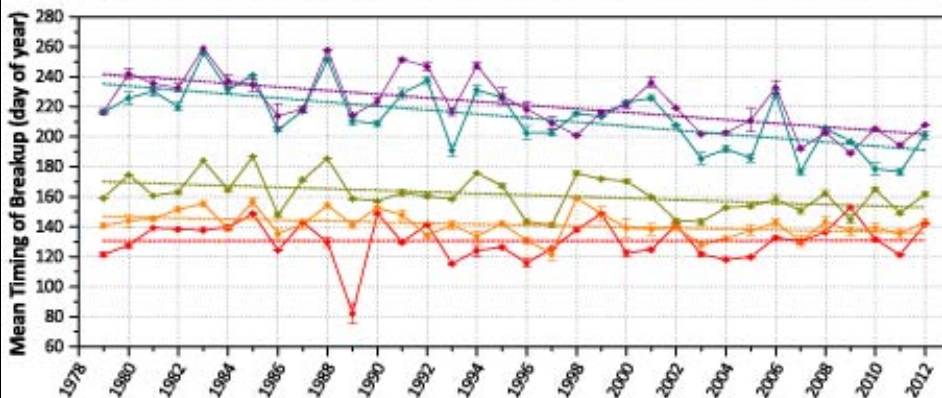
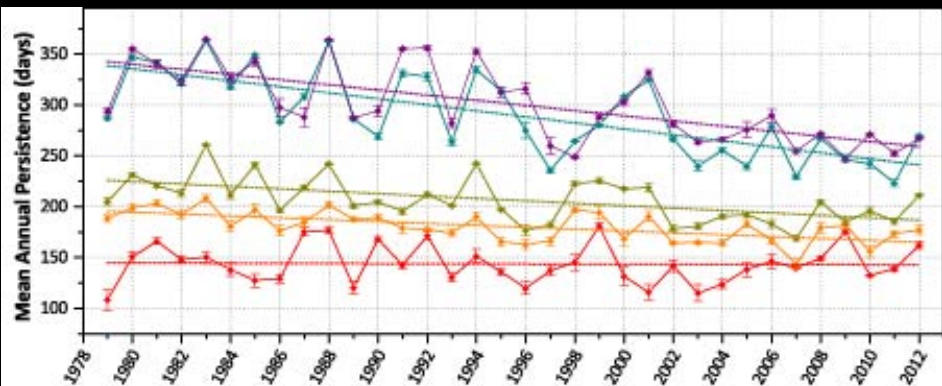


<http://www.arctic.noaa.gov/dbo/>

DBO data sets from pilot program

		DBO 3-SCS			DBO 5-BC		
		2010	2011	2012	2010	2011	2012
	Physics	C30, CHAOZ, Chinare	C30, CHAOZ	C30, CHINARE, Rusalca, Mirai, CHAOZ	C30, CHAOZ, Mirai, Anaka Marie, HLY01,03	C30, CHAOZ	Comida HS, Mirai, Chaoz, AON, (pickart, ashjian)
T/S	CTD	C30, CHAOZ, Chinare	C30, CHAOZ	C30, CHINARE, Rusalca, Mirai, CHAOZ	C30, CHAOZ, Mirai	C30, CHAOZ	Comida HS, Mirai, Chaoz, AON, (Pickart, Ashjian)
Currents	ADCP	C30, CHAOZ, Chinare?	C30, CHAOZ	C30, CHINARE?, Rusalca, Mirai, CHAOZ	C30, CHAOZ, Mirai, Anaka Marie, HLY01,03	C30, CHAOZ	Comida HS, Mirai, Chaoz, AON, (Pickart, Ashjian)
Nutrients	Nutrients	C30, CHAOZ, CHINAIRE	C30, CHAOZ, CHINAIRE	C30, CHAOZ, CHINAIRE	C30, AON-Ashjian, CHAOZ	C30, AON-CA, CHAOZ	Comida, HS, CHAOZ
Primary production	Satellite Primary Prod	K.Frey	K.Frey, C30(1stn)	K.Frey, Sang Lee 2, Diana 1	K.Frey	K.Frey	K.Frey
Phytoplankton	chl	C30	C30	C30	C30	C30	C30
	species		C30	RUSALCA, C30		C30	COMIDA HS
Zooplankton	standing stock	C30, CHAOZ	C30, CHAOZ	C30 July, CHAOZ Aug, Greene Sept, Acoustic	C30, CHAOZ	C30, CHAOZ	COMIDA HS, Ashjian, CHAOZ, Greene
	species	C30, CHAOZ	C30	C30 July, CHAOZ Aug, Greene Sept, Acoustic	C30, CHAOZ	C30, CHAOZ	COMIDA HS, Ashjian, CHAOZ, Greene
Benthos	standing stock	C30, infauna, CHINARE	C30	C30, RUSALCA epi-benthos, CHINARE	C30	C30	COMIDA HS, AKM, Jouett/Dasher
	species	C30	C30	C30	C30	C30	C30
Marine mammals	survey	CHAOZ, AOS/transist	CHAOZ	CHAOZ	CHAOZ	CHAOZ	CHAOZ
	watch	RUSALCA mooring	C30, RUSALCA mooring	RUSALCA mooring, Greene, Acoustic	BOWFEST	BOWFEST, Akmap-Day	COMIDA, Greene
Seabirds	survey	Kuletz, C30-Bentley?, AOS/transist, Greene	Kuletz, C30-Bentley?, AOS/transist, Greene	Kuletz, C30-Bentley?, AOS/transist, Greene	Kuletz	Kuletz, AKMAP-Day	Kuletz, Greene

Sea Ice Persistence, Timing of Break-up, and Freeze-Up from DBO1 (south) to DBO5 (north) in relation to benthic biomass “hotspots”

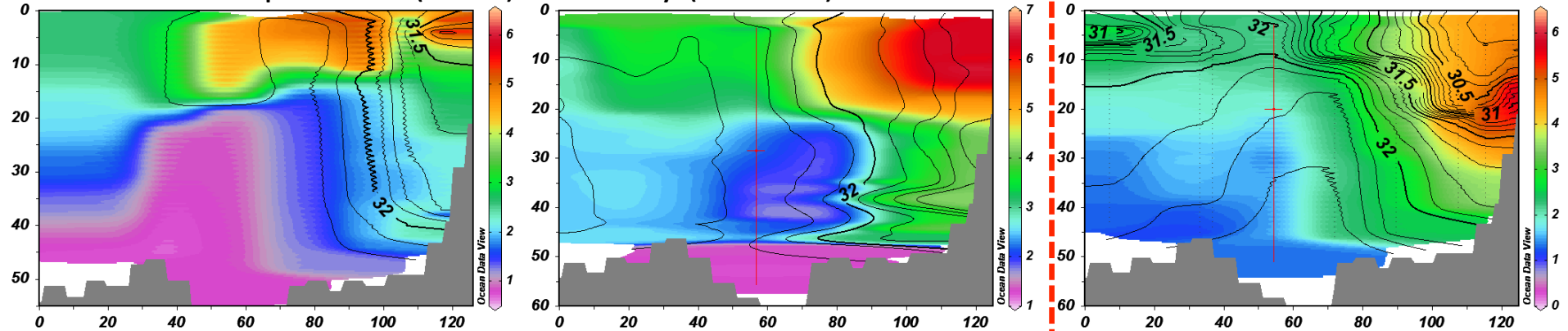


[Grebmeier et al. in prep, SOAR]

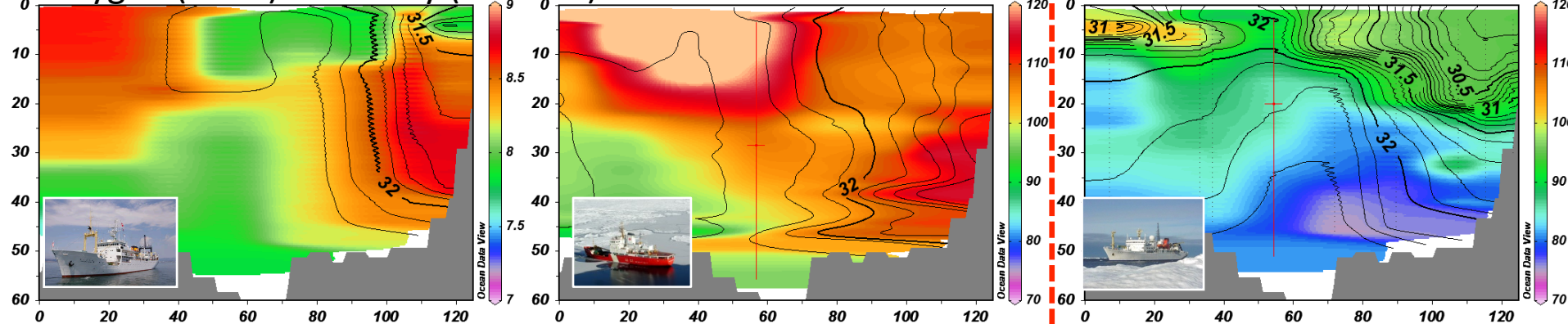
PAG related observational activities in 2013

Comparison of CTD data on the DBO-3 line among Oshoro-maru (Jul.16), SWL (Jul.19-20), & Mirai (Oct.2-3)

Potential temperature (color) & Salinity (contour)



Oxygen (color) & Salinity (contour)



TS Oshoro-Marui (Jul.16)

CCGS S. W. Laurier (Jul.19-20)

RV Mirai (Oct.2-3)

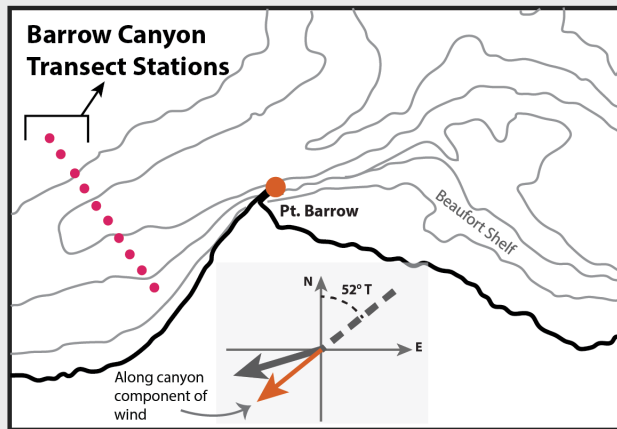
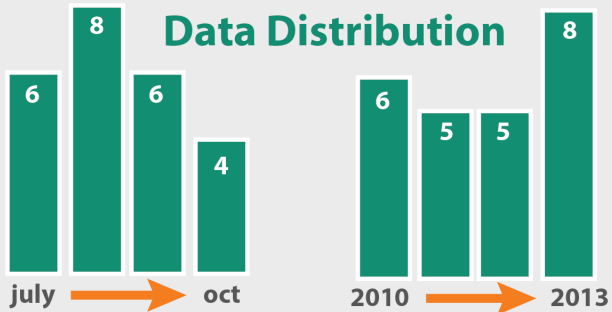
(courtesy Takashi Kikuchi)

DBO line 5 Barrow Canyon

24 occupations

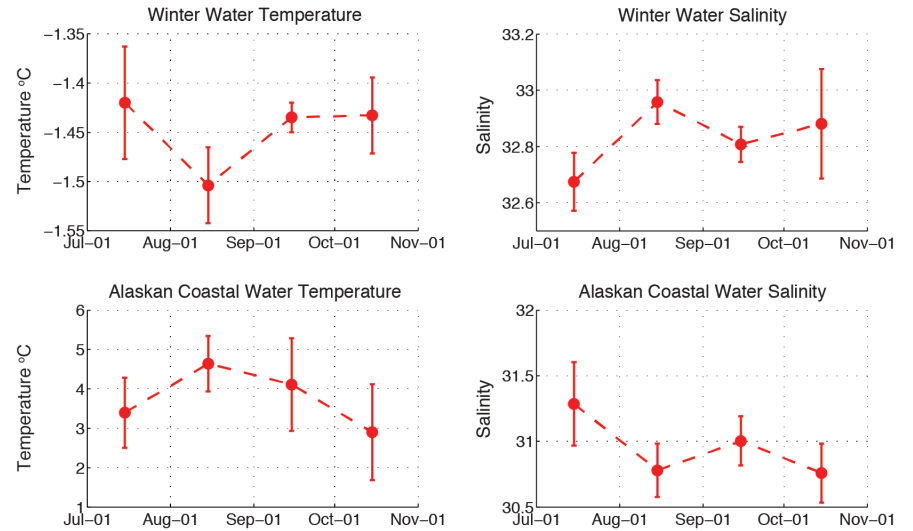
11 chief scientists

202 total CTD casts

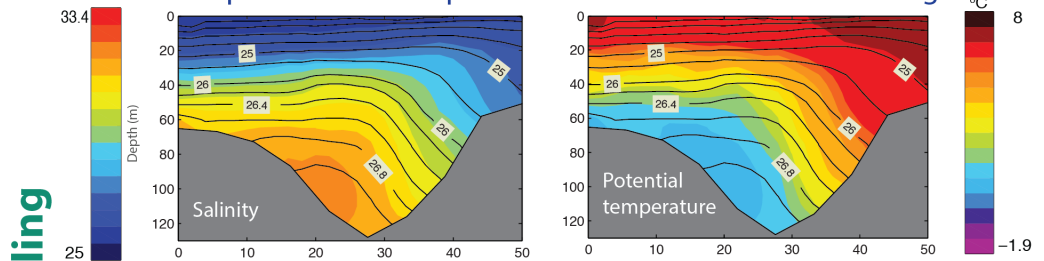


Monthly mean water mass properties in the absence of wind forcing

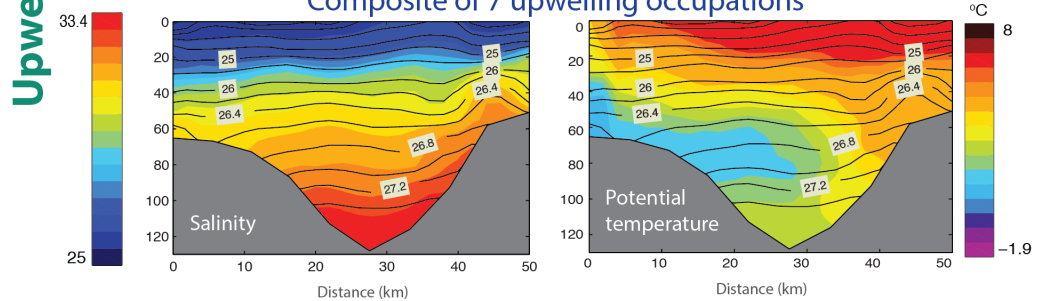
Seasonality



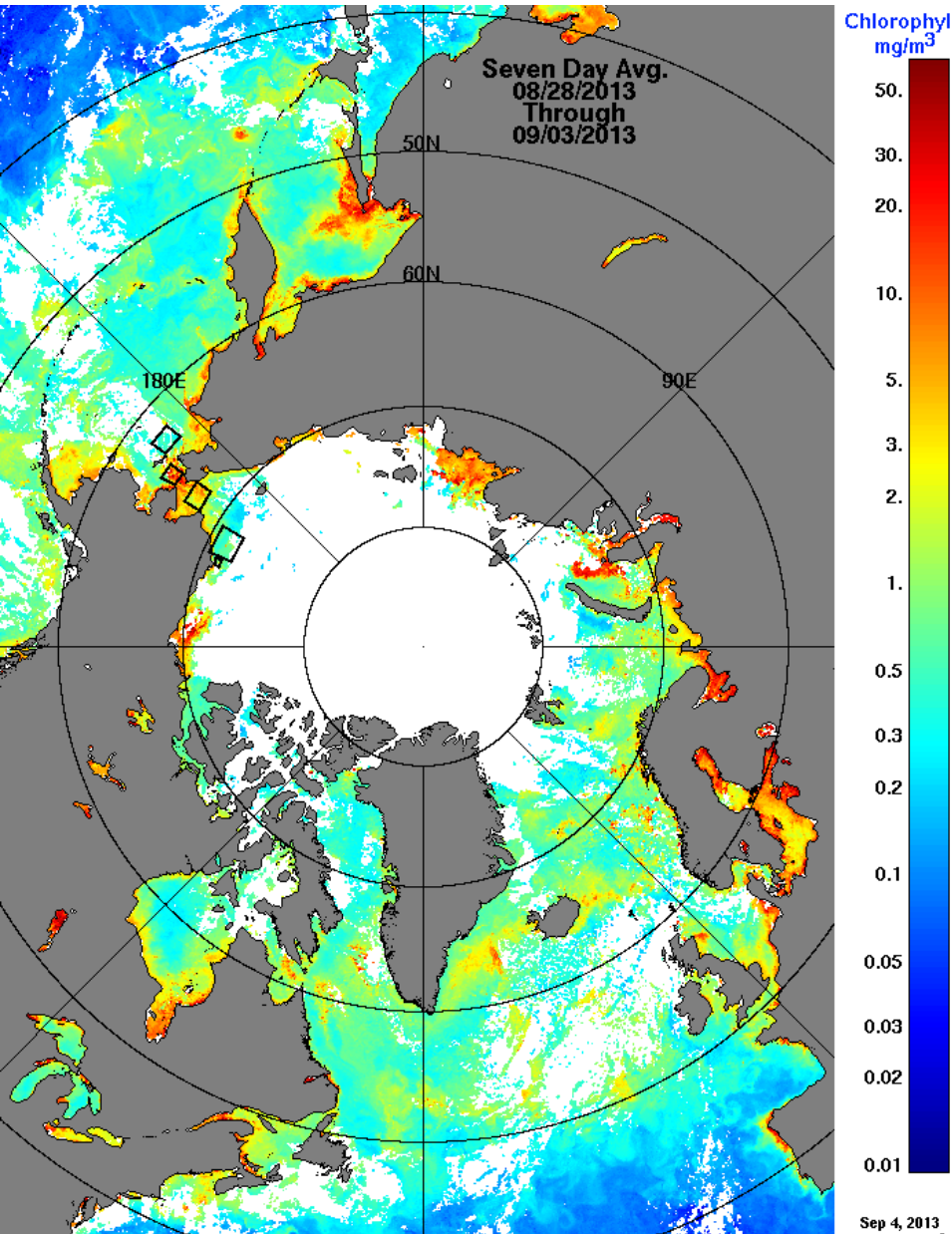
Composite of 16 occupations in the absence of wind forcing



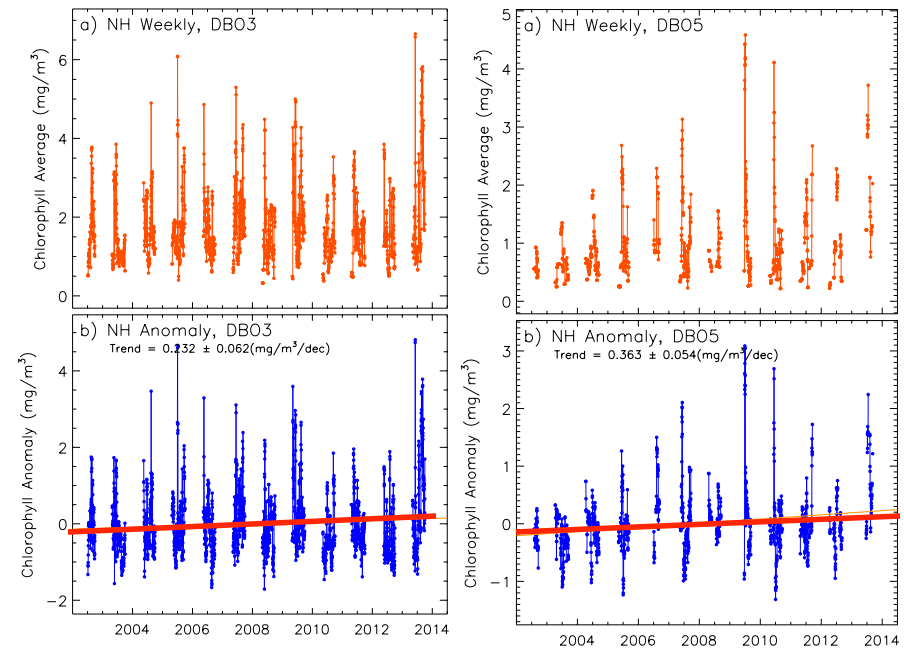
Composite of 7 upwelling occupations



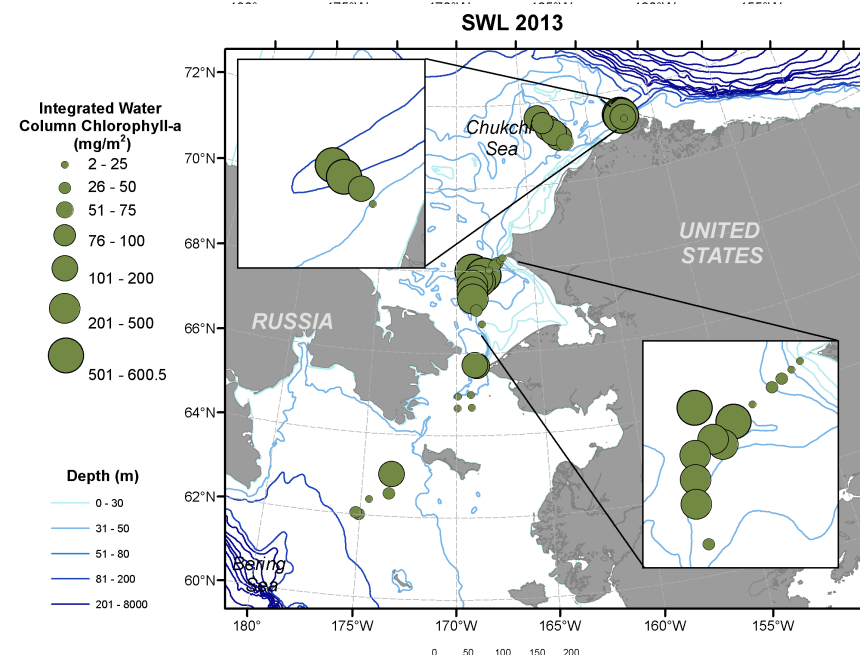
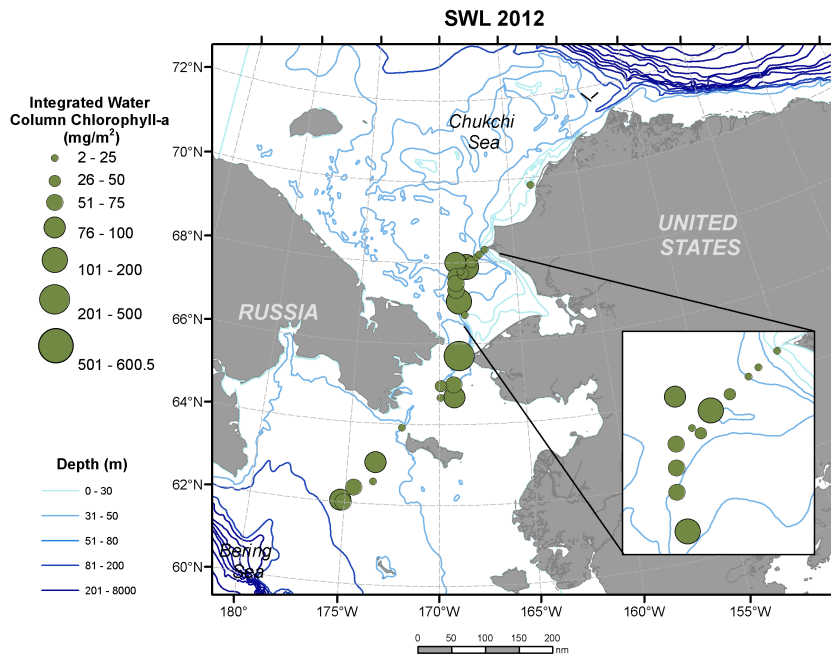
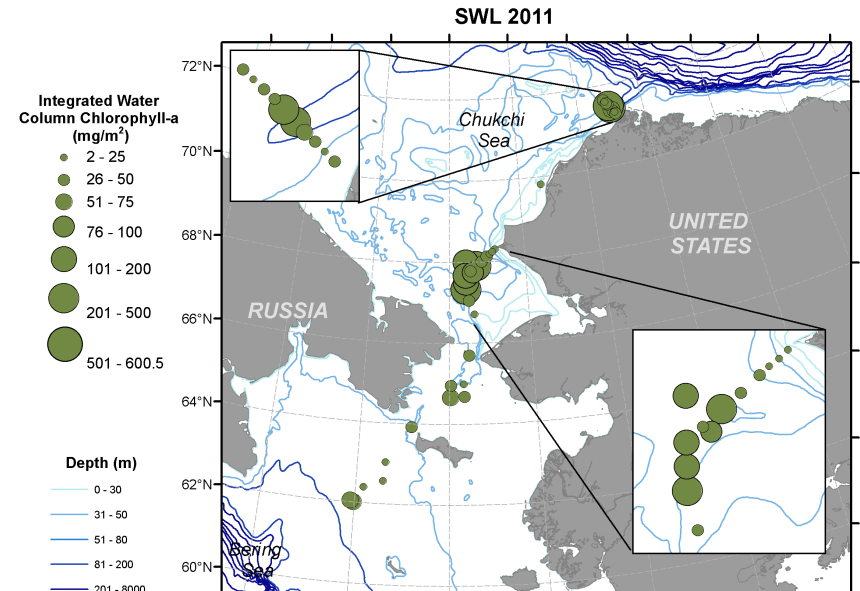
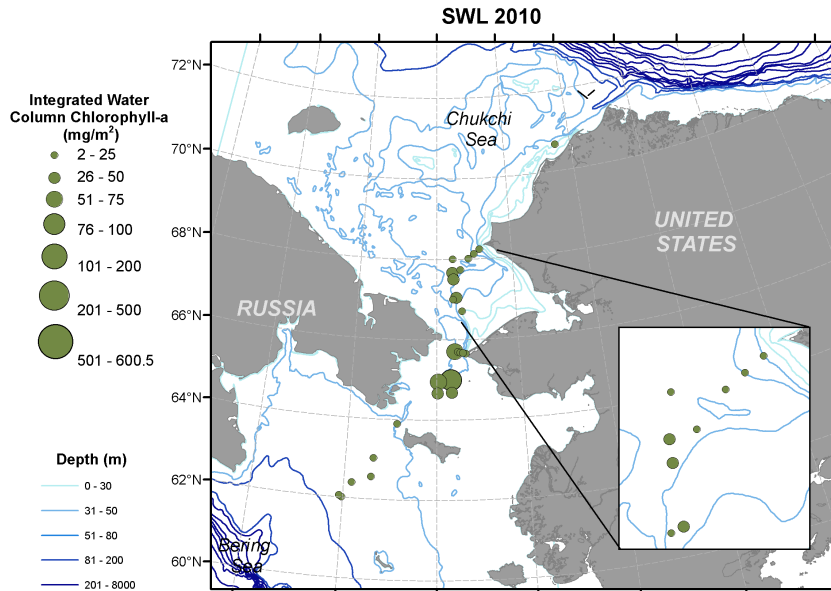
NASA DBO-surface chlorophyll and field collected integrated values



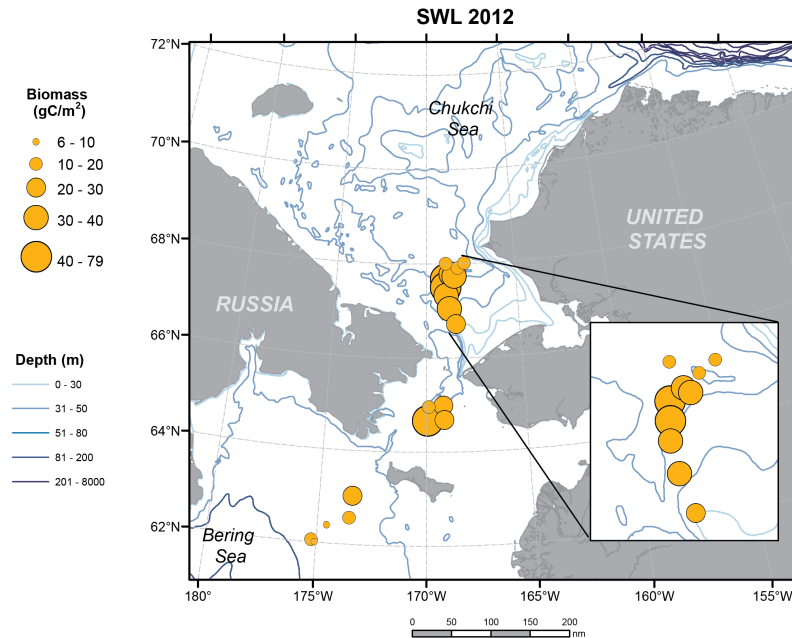
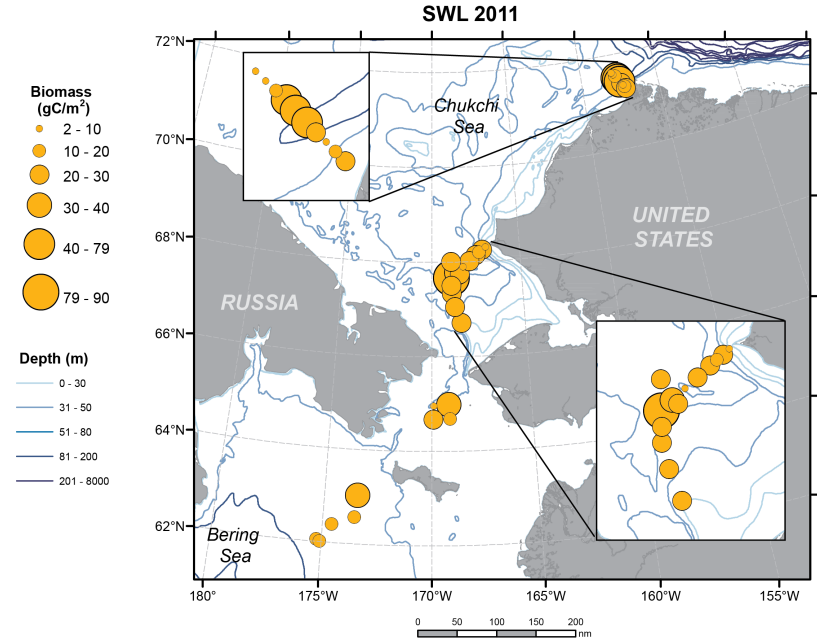
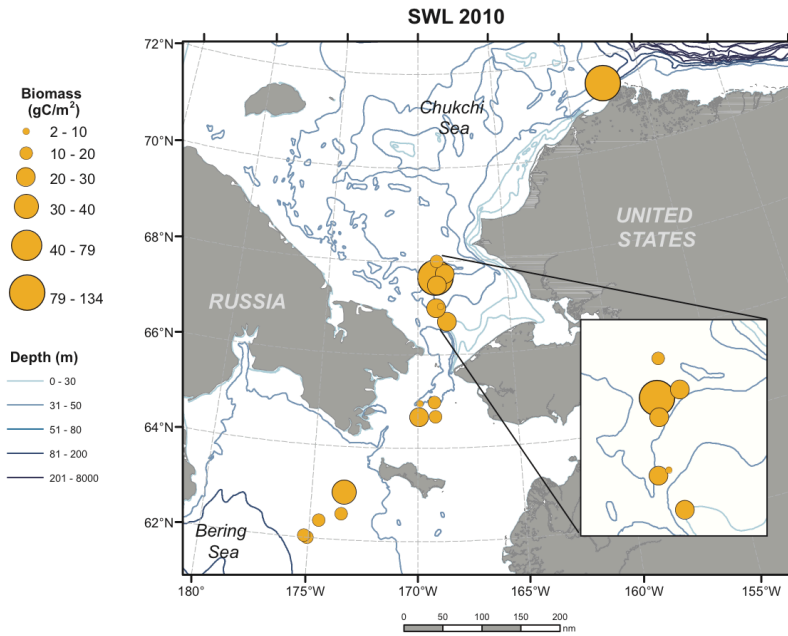
- Increasing trend annually in chl a from south (DBO3) to north (DBO5) in Chukchi Sea
- Coincident with earlier season ice retreat and later fall ice production at DBO5 than DBO3



DBO Integrated Chlorophyll a (mg/m²) during July (DBO/C30)



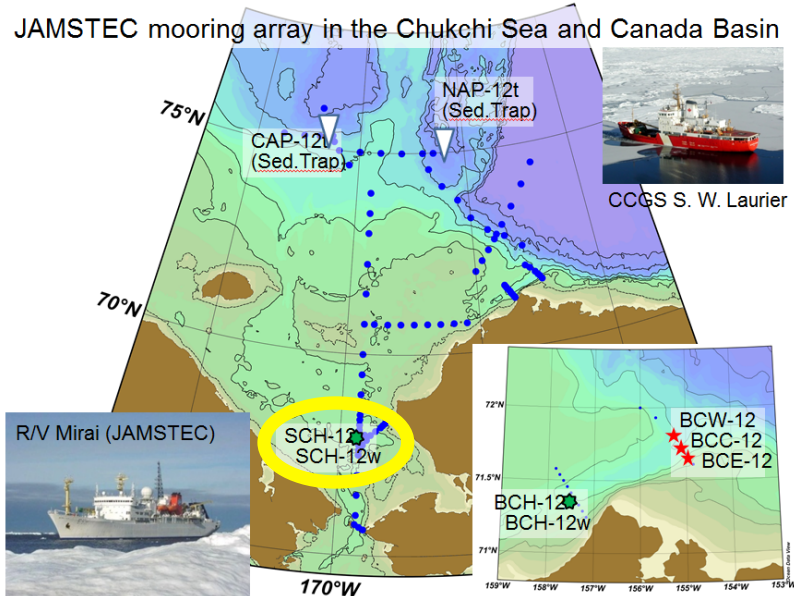
Distribution of macroinfaunal biomass (gC/m²) 2010-2012 (DBO/C30)



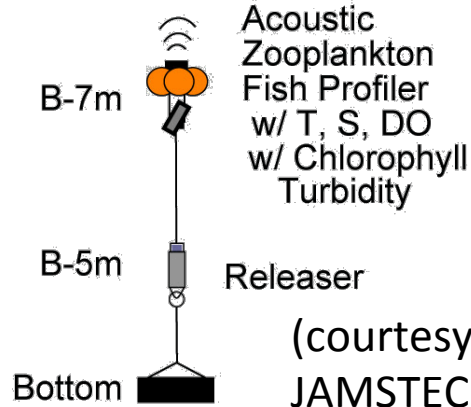
SCH mooring

Time series of T, S, Chl-a,
Turbidity, and Oxygen Saturation
(Oct. 2, 2012 to Jul.20, 2013)

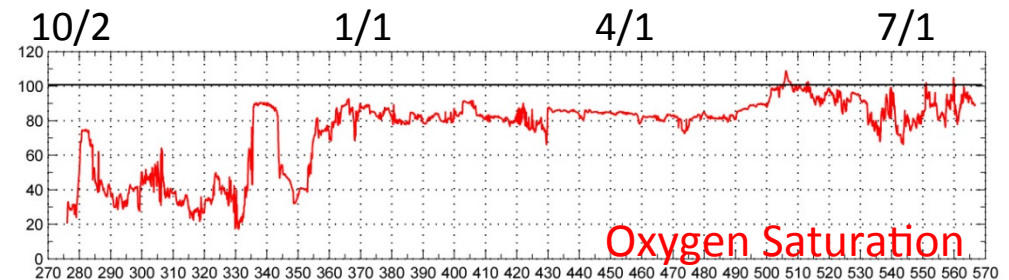
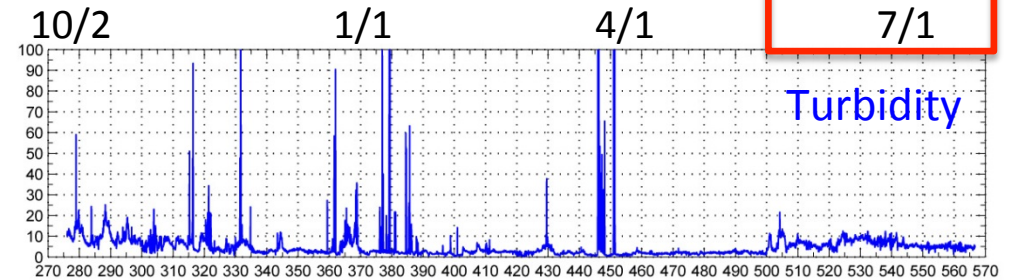
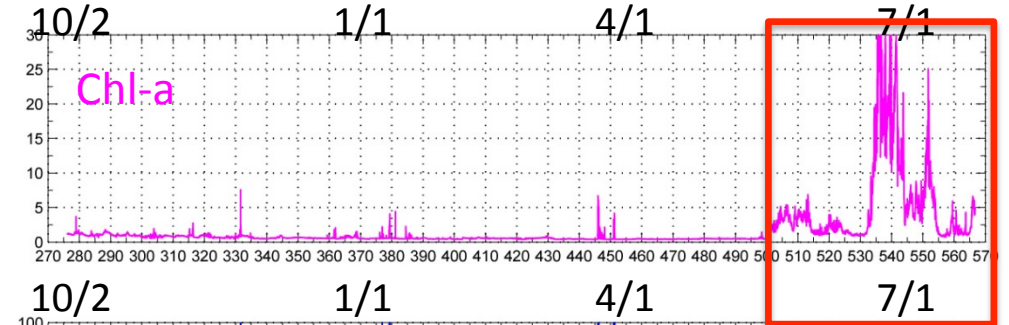
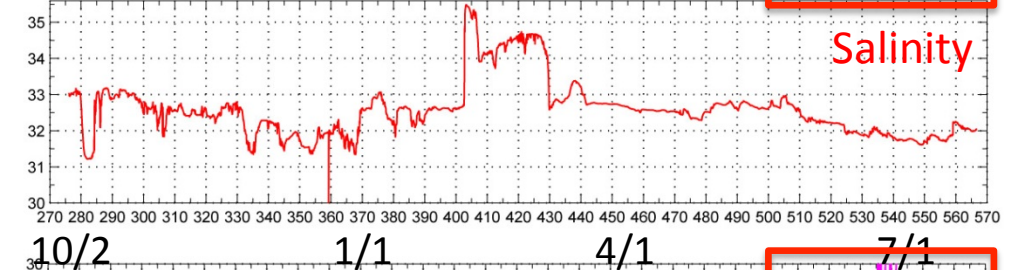
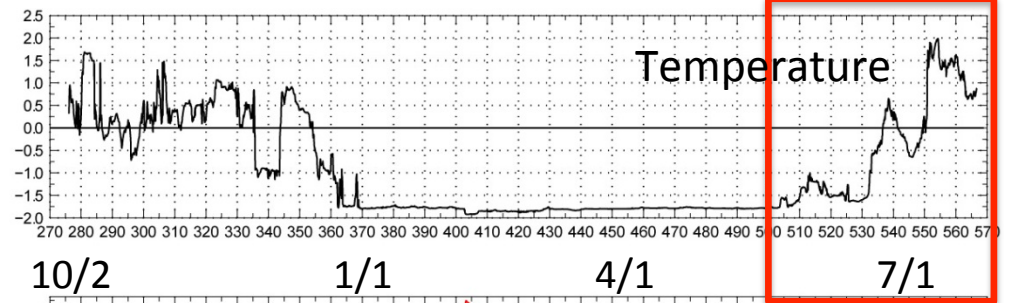
JAMSTEC mooring array in the Chukchi Sea and Canada Basin

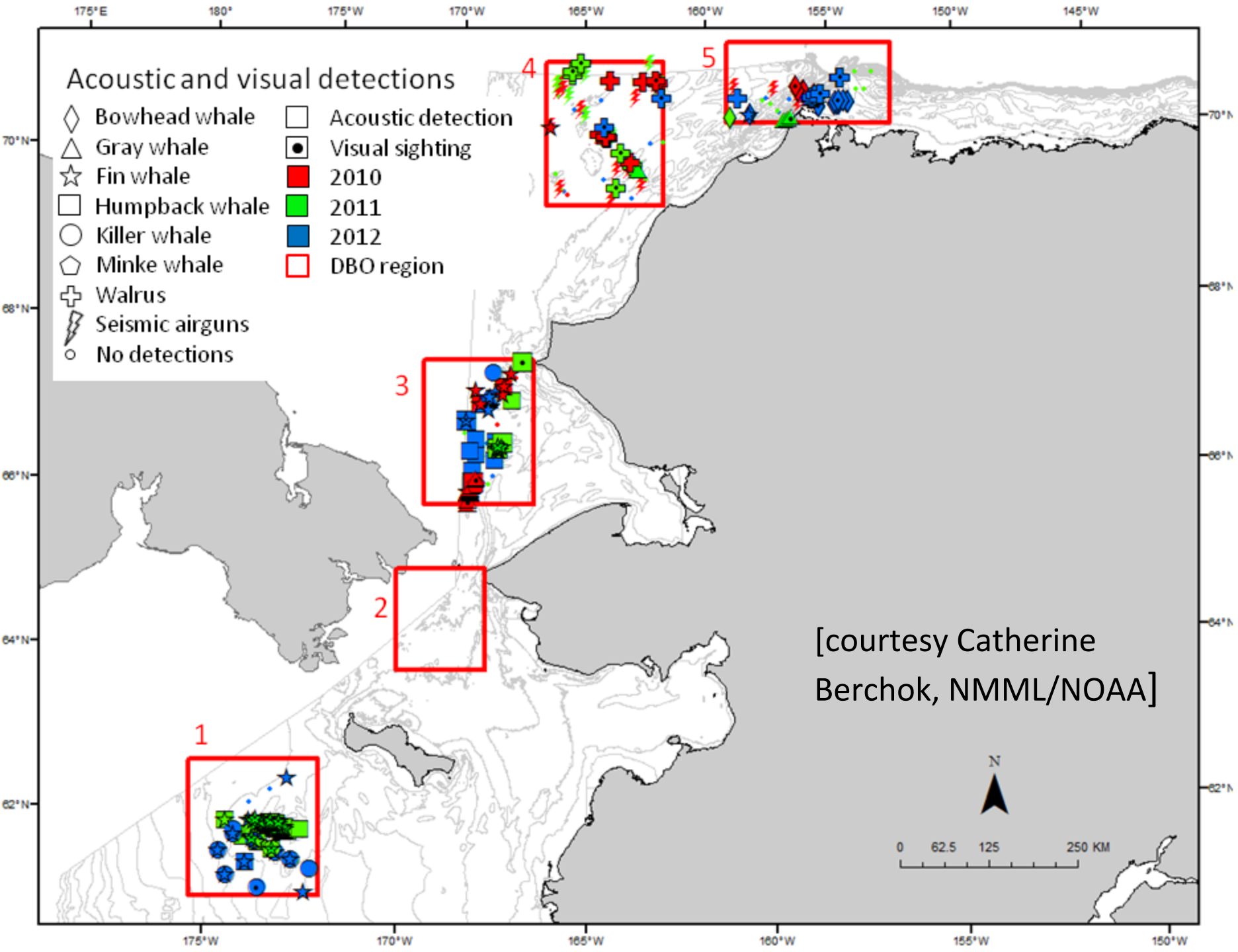


SCH-12

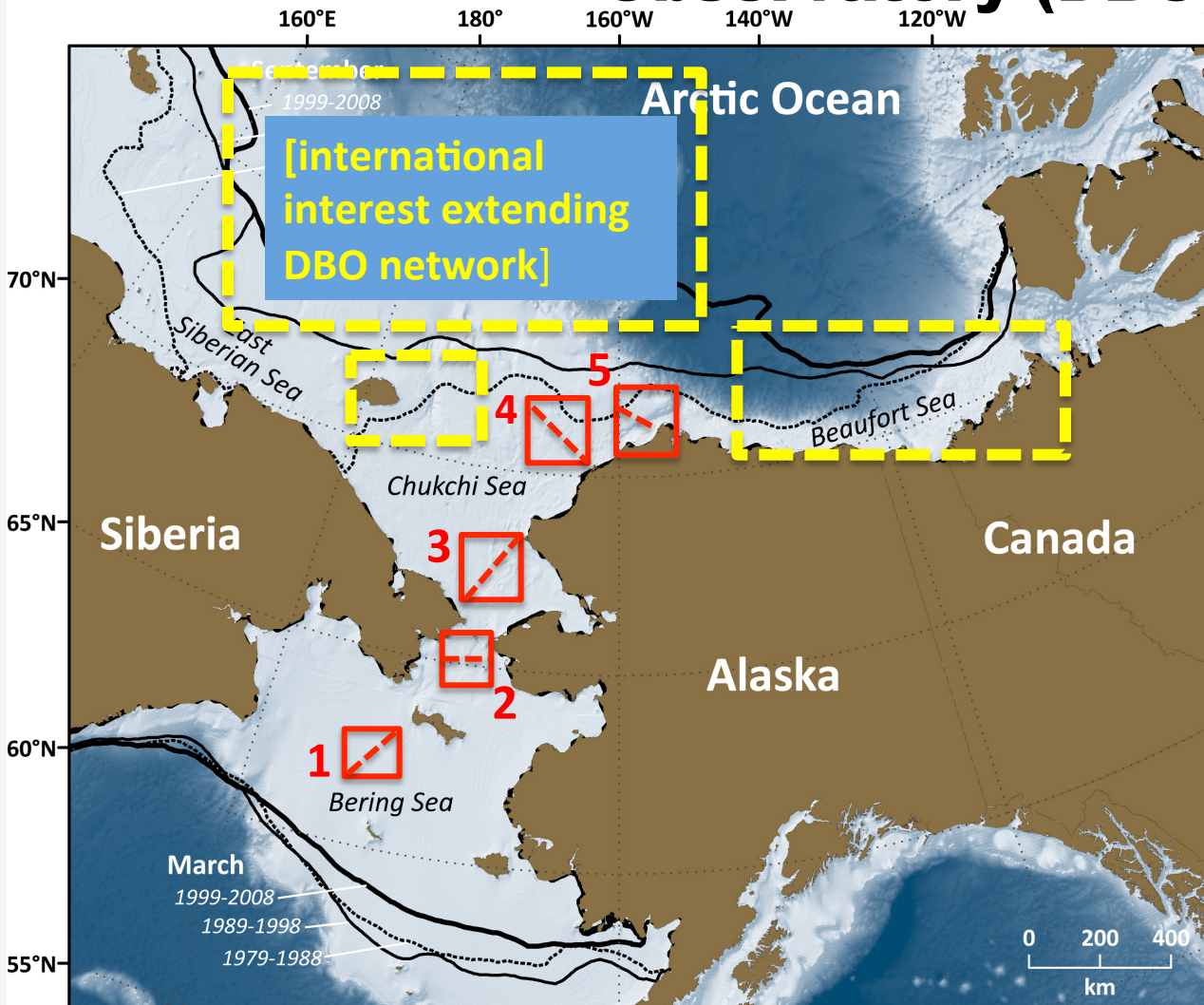


(courtesy T. Kikuchi,
JAMSTEC 2013)





Linking Physics to Biology: the Distributed Biological Observatory (DBO)



[modified by Karen Frey from Grebmeier et al. 2010, EOS 91]

- DBO sites (red boxes) are regional “hotspot” transect lines and stations located along a latitudinal gradient
- DBO sites are considered to exhibit high productivity, biodiversity, and overall rates of change
- DBO sites will serve as a change detection array for the identification and consistent monitoring of biophysical responses
- Sites occupied by national and international entities with shared data plan



Project View: AOOS DBO workspace for all participants in program

AOOS Ocean Workspace Distributed Biological Observatory Search... Jackie Grebmeier

Create a project

Notices ALL (7) MY PROJECTS 0

- Cruise Reports Mar 25 (16 items, Chris)
- DBO1 — St. Lawrence Island Mar 25 (14 items, Chris)
- DBO2 — Northern Bering Sea Mar 25 (5 items, Chris)
- DBO3 — Southern Chukchi Sea Mar 25 (18 items, Chris)
- DBO4 — Central Chukchi Sea Apr 01 (37 items, Chris)
- DBO5 — Barrow Canyon Mar 25 (26 items, Chris)
- DBO Presentations & Administrative Documents Jan 23 (6 items, Chris)

Latest activity

- 3 days ago: Jerry added 20 files (DBO4 — Central Chukchi Sea: CESP_PLK_BIOMAS..., CESP_PLK_Biomass..., CESP_PLK_ABUNDA...)
- 7 days ago: Jerry joined the group.
- 7 days ago: Christie joined the group.
- 10 days ago: Jackie added 8 files (Cruise Reports: DBO1-5 map Grebmeier..., 5 DBO... GPS Mar 25)

- in each DBO region folder is a listing of common data parameters
- drop and load capability with metafile

- Steamlines working access for DBO participants, but short-term password protected
- Retains continued use national data archives
- In process to develop visualization tools
- Data migrate to long-term archive

Developing Insights and Questions for DBO

- How will changes in the advective nature of the Pacific Arctic region influence nutrient loading, phytoplankton production and export production to the underlying sediments?
- What are the biological impacts of declining sea ice production on ice dependent species, such as walrus and diving seabirds, both in habitat quality and overall prey base?
- Can we utilize tracking of pelagic and benthic processes coincident with predator-prey interactions in the context of changing hydrographic features to facilitate our understanding of key processes maintaining biological “hot spot” sites and the overall system function?
- The DBO (Distributed Biological Observatory) is one example of a biologically-driven observation network through national and international collaboration to track status and change in the Pacific Arctic
- Ongoing discussions internationally for a pan-Arctic network of DBO-type sampling on standard lines, including PAG, European countries, CBMP