

Herald Canyon Dynamics: Oxygen-18 in Seawater, Benthic Macrofaunal Composition and Biomass, Sediment Dynamics and Carbon Cycling

Jackie Grebmeier and Lee Cooper

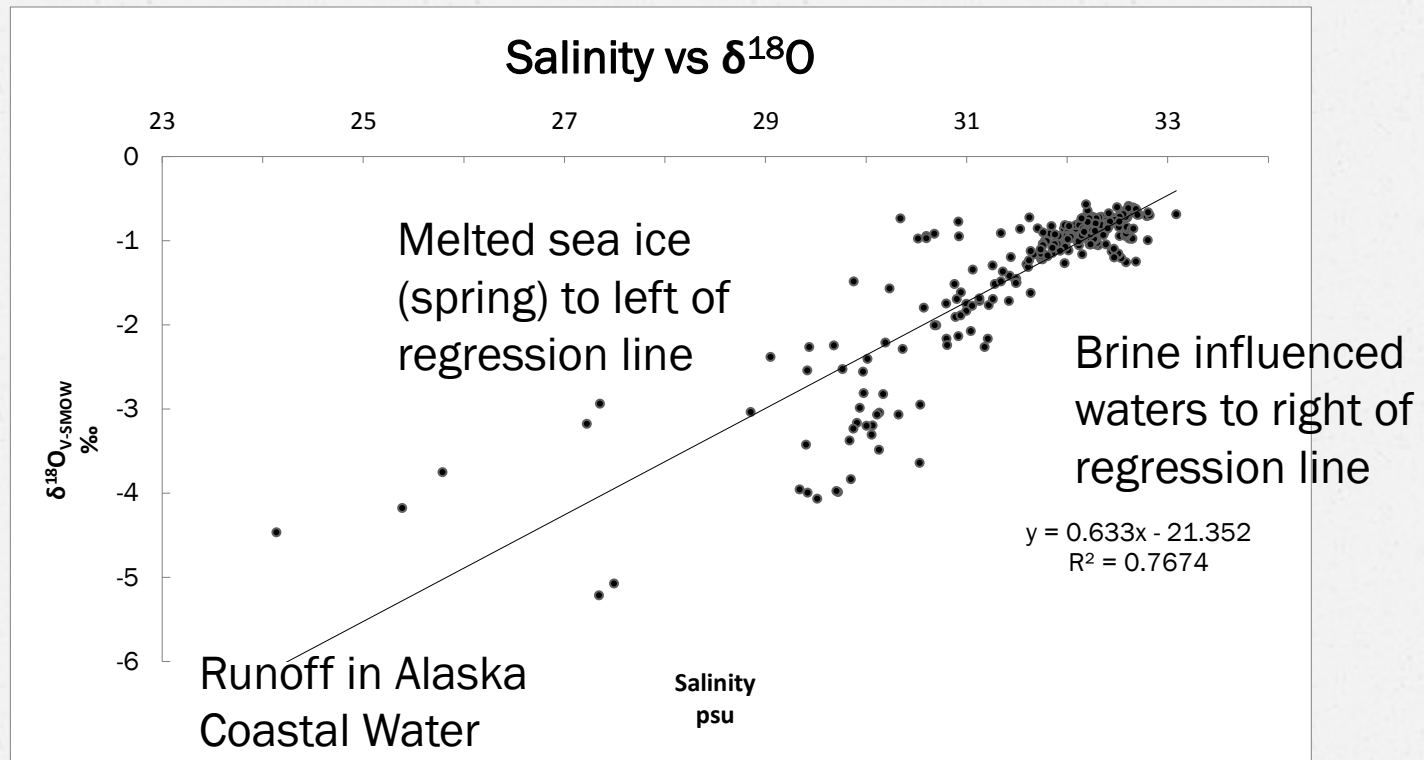
Chesapeake Biological Laboratory, University of Maryland Center
for Environmental Sciences, Solomons, Maryland, USA

February 21-22, 2014
RUSALCA PI Meeting
Honolulu, Hawaii

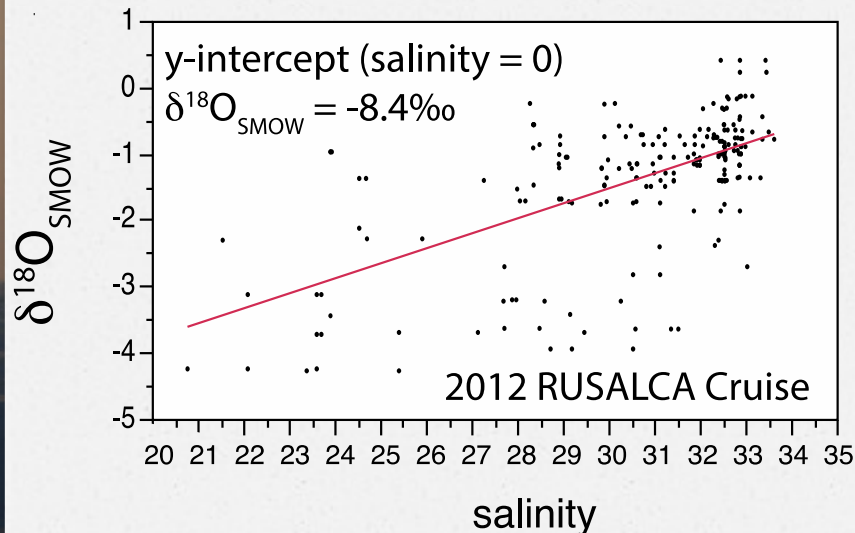
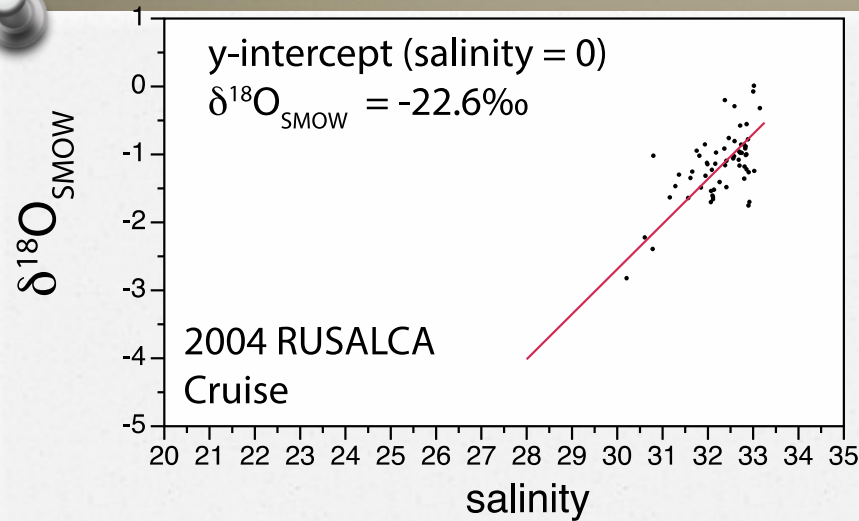


y-intercept for 0 salinity
($\delta^{18}\text{O} \sim -21$) is similar to
Yukon River

Bering Strait Salinity – $\delta^{18}\text{O}$ mixing line



Updated (2013) from Cooper et al. 2006, Arctic 59:129-141



Shift between
2004 and 2012
Freshwater
end-member ~
Kolyma River
(2004) to
mostly melted
sea ice (2012)

Rusalca 2009 isotope analysis has been completed, but...

- It would help to have a unified, sharable bottle file tabulating physical parameters at the time Niskins were closed.

RUSALCA | AOOS Ocean Workspace

<https://workspace.aos.org/group/6062/projects>

RUSALCA

Search...

Lee Cooper

CTD profiles

All folders

- CTD 2000 (1)
- CTD 2004 (4)
- CTD 2005
- CTD 2007 (3)
- CTD 2009 (5)
- CTD 2012 (1)

Add files Actions

Name	Size	Uploaded By	Updated
RUX09_Processing_Report_V3.pdf	204.1 kB	Chris Turner	Aug 16, 2012
intermediate.tar	1.1 MB	Nathan Hollenbeck	Aug 16, 2012
RUSALCA2009CTD_data.csv	1.0 MB	Nathan Hollenbeck	Aug 16, 2012
as_delivered.tar	1.9 MB	Nathan Hollenbeck	Aug 16, 2012
RUSALCA2009CTD_Header.csv	5.3 kB	Nathan Hollenbeck	Aug 16, 2012

Salinity and station
information

Nutrient data from
bottles

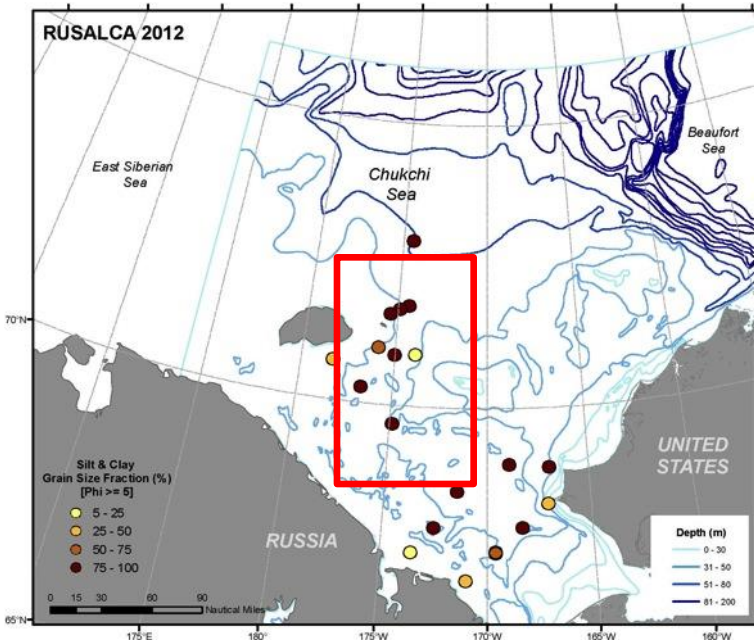
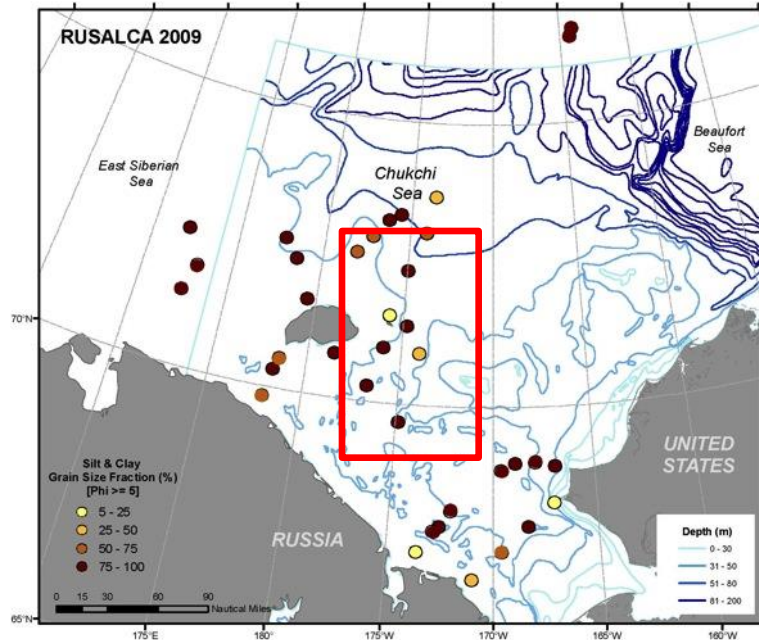
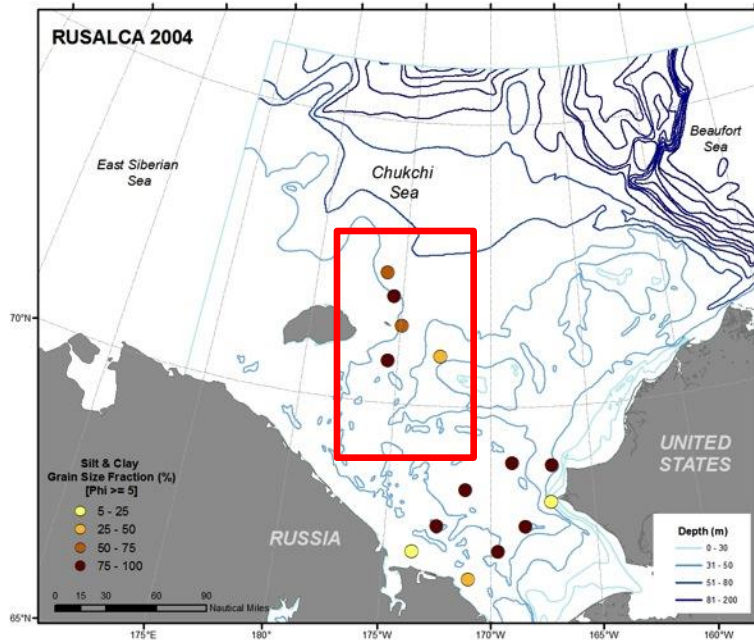
Our $\delta^{18}\text{O}$
data

Example: 2004 Rusalca bottle file

T_S_chl-a_Nuts2 for RUSALCA 2004.xls

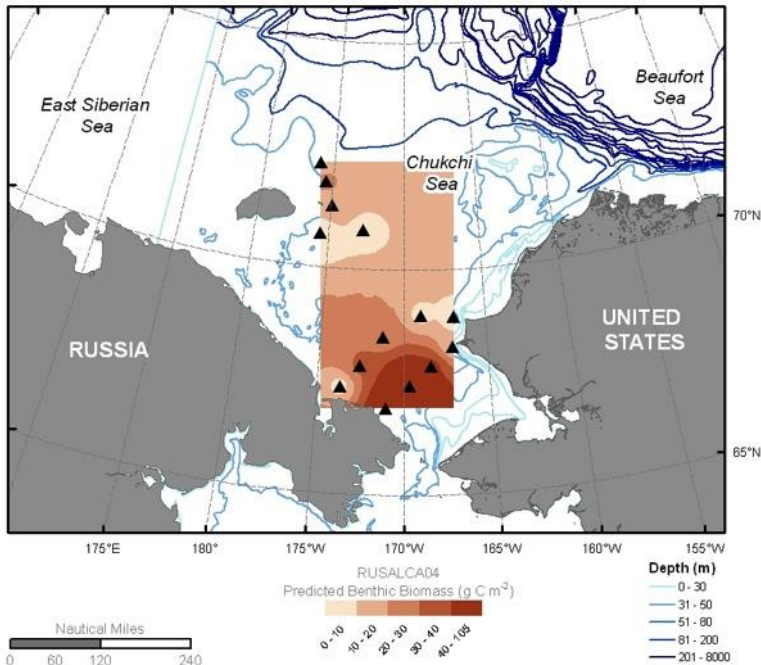
D1		E		F		G		H		I		J		K		L		M		N		O		P		Q		R		S		T		U		V		W		X		Y		Z		AA	
mon/day/yr	h/m	lon	lat	Bot. Depth	P-DM	QF	Temperature	QF	Salinity	QF	density/sign	QF	FluorChl	QF	oxygen/m ³	QF	PO4	QF	SiO4	QF	N-N	QF	NO2	QF	NH4	QF	DIN	QF	delta O-18	QF	PO4	QF	SiO4	QF	N-N	QF	NO2	QF	NH4	QF	DIN	QF	delta O-18	QF			
1	8/21/04	0:00	-168.296	65.6728	49	0	13.6785	1	27.59	1	20.5317	1	1.476	1	5.32139	1	0.554	1	13.181	1	0.147	1	0.053	1	0.159	1	0.306	1	-5.03658	1	0.554	1	13.181	1	0.147	1	0.053	1	0.159	1	0.306	1	-5.03658	1			
2	8/21/04	0:00	-168.296	65.6728	49	3	13.4907	1	27.7842	1	20.7176	1	1.3961	1	5.30854	1	0.591	1	11.285	1	0.079	1	0.05	1	0.032	1	0.11	1	-0.064	1	0.591	1	11.285	1	0.079	1	0.05	1	0.032	1	0.11	1	-0.064	1			
3	8/21/04	0:00	-168.296	65.6728	49	5	13.1904	1	28.1135	1	21.0291	1	1.3642	1	5.22458	1	0.541	1	7.754	1	0.154	1	0.048	1	0.064	1	0.217	1	-0.045	1	0.541	1	7.754	1	0.154	1	0.048	1	0.064	1	0.217	1	-0.045	1			
4	8/21/04	0:00	-168.296	65.6729	49	10	11.8912	1	29.471	1	22.3188	1	1.1406	1	5.77222	1	0.566	1	6.36	1	0.157	1	0.045	1	0.159	1	0.316	1	-0.042	1	0.566	1	6.36	1	0.157	1	0.045	1	0.159	1	0.316	1	-0.042	1			
5	8/21/04	0:00	-168.296	65.6729	49	15	11.3292	1	30.0107	1	22.8368	1	0.933	1	6.14621	1	0.591	1	6.474	1	0.232	1	0.042	1	0.032	1	0.264	1	-0.048	1	0.591	1	6.474	1	0.232	1	0.042	1	0.032	1	0.264	1	-0.048	1			
6	8/21/04	0:00	-168.296	65.6729	49	20	11.0649	1	30.196	1	23.0287	1	0.9489	1	6.27746	1	0.604	1	6.713	1	0.236	1	0.04	1	0.222	1	0.458	1	-2.82223	1	0.604	1	6.713	1	0.236	1	0.04	1	0.222	1	0.458	1	-2.82223	1			
7	8/21/04	0:00	-168.296	65.6728	49	25	10.9735	1	30.204	1	23.0487	1	0.885	1	6.2717	1	0.629	1	6.827	1	0.239	1	0.037	1	0.159	1	0.398	1	-0.075	1	0.629	1	6.827	1	0.239	1	0.037	1	0.159	1	0.398	1	-0.075	1			
8	8/21/04	0:00	-168.296	65.6728	49	30	10.7944	1	30.2899	1	23.146	1	0.885	1	6.25555	1	0.541	1	5.056	1	0.242	1	0.034	1	0.508	1	0.75	1	-2.22265	1	0.541	1	5.056	1	0.242	1	0.034	1	0.508	1	0.75	1	-2.22265	1			
9	8/21/04	0:00	-168.296	65.6728	49	35	10.6784	1	30.5284	1	23.3513	1	0.7573	1	6.3254	1	0.465	1	4.416	1	0.174	1	0.032	1	0.349	1	0.523	1	-1.46782	1	0.465	1	4.416	1	0.174	1	0.032	1	0.349	1	0.523	1	-1.46782	1			
10	8/21/04	0:00	-168.296	65.6728	49	40	10.5277	1	30.6062	1	23.4373	1	0.7573	1	6.46095	1	0.126	1	0.383	1	0.034	1	0.029	1	0.032	1	0.066	1	-0.032	1	0.126	1	0.383	1	0.034	1	0.029	1	0.032	1	0.066	1	-0.032	1			
11	8/21/04	0:00	-168.574	65.7872	55	0	10.5591	1	31.2804	1	23.9626	1	0.6833	1	6.12103	1	0.126	1	0.371	1	0.038	1	0.026	1	0.032	1	0.069	1	-0.032	1	0.126	1	0.371	1	0.038	1	0.026	1	0.032	1	0.069	1	-0.032	1			
12	8/21/04	0:00	-168.574	65.7872	55	5	10.5691	1	31.3087	1	23.9766	1	0.6934	1	6.12307	1	0.126	1	0.371	1	0.038	1	0.026	1	0.032	1	0.069	1	-0.032	1	0.126	1	0.371	1	0.038	1	0.026	1	0.032	1	0.069	1	-0.032	1			
13	8/21/04	0:00	-168.574	65.7873	55	10	10.5452	1	31.3211	1	23.9903	1	0.9649	1	6.12965	1	0.126	1	0.485	1	0.041	1	0.079	1	0.032	1	0.073	1	-0.032	1	0.126	1	0.485	1	0.041	1	0.079	1	0.032	1	0.073	1	-0.032	1			
14	8/21/04	0:00	-168.574	65.7874	55	15	10.5316	1	31.3178	1	24.0204	1	1.1566	1	6.18188	1	0.189	1	1.478	1	0.116	1	0.021	1	0.032	1	0.148	1	-1.2986	1	0.189	1	1.478	1	0.116	1	0.021	1	0.032	1	0.148	1	-1.2986	1			
15	8/21/04	0:00	-168.574	65.7875	55	20	10.1395	1	31.361	1	24.3976	1	2.1149	1	6.43894	1	0.403	1	3.225	1	0.263	1	0.074	1	0.445	1	0.707	1	-0.032	1	0.403	1	3.225	1	0.263	1	0.074	1	0.445	1	0.707	1	-0.032	1			
16	8/21/04	0:00	-168.574	65.7876	55	25	9.9572	1	31.7241	1	25.1853	1	2.1149	1	6.35707	1	0.629	1	4.846	1	0.266	1	0.127	1	0.794	1	1.06	1	-0.032	1	0.629	1	4.846	1	0.266	1	0.127	1	0.794	1	1.06	1	-0.032	1			
17	8/21/04	0:00	-168.574	65.7876	55	30	9.7475	1	31.6806	1	25.1704	1	1.8114	1	7.46218	1	0.881	1	5.714	1	0.341	1	0.069	1	1.651	1	1.992	1	-0.032	1	0.881	1	5.714	1	0.341	1	0.069	1	1.651	1	1.992	1	-0.032	1			
18	8/21/04	0:00	-168.574	65.7877	55	35	9.6555	1	31.6627	1	25.1647	1	1.6836	1	7.40355	1	0.893	1	5.702	1	0.345	1	0.066	1	1.715	1	2.059	1	-0.032	1	0.893	1	5.702	1	0.345	1	0.066	1	1.715	1	2.059	1	-0.032	1			
19	8/21/04	0:00	-168.574	65.7878	55	40	9.6341	1	31.6569	1	25.1602	1	1.5718	1	7.40201	1	0.893	1	5.69	1	0.277	1	0.119	1	1.556	1	1.832	1	-0.032	1	0.893	1	5.69	1	0.277	1	0.119	1	1.556	1	1.832	1	-0.032	1			
20	8/21/04	0:00	-168.573	65.7879	55	45	9.6336	1	31.6561	1	25.1615	1	1.5254	1	7.39654	1	0.893	1	5.678	1	0.28	1	0.116	1	1.651	1	1.931	1	-0.032	1	0.893	1	5.678	1	0.28	1	0.116	1	1.651	1	1.931	1	-0.032	1			
21	8/21/04	0:00	-168.573	65.788	55	50	9.6415	1	31.6538	1	25.159	1	1.6357	1	7.39331	1	0.906	1	5.666	1	0.212	1	0.114	1	1.778	1	1.99	1	-1.25356	1	0.906	1	5.666	1	0.212	1	0.114	1	1.778	1	1.99	1	-1.25356	1			
22	8/21/04	0:00	-169.106	65.8733	46.8	0	2.2602	1	32.1791	1	25.693	1	1.7475	1	7.85567	1	0.854	1	10.416	1	1.636	1	0.026	1	2.523	1	4.18	1	-0.97365	1	0.854	1	10.416	1	1.636	1	0.026	1	2.523	1	4.18	1	-0.97365	1			
23	8/21/04	0:00	-169.104	65.8737	46.8	5	2.0953	1	31.9928	1	25.5561	1	1.5718	1	7.40255	1	0.928	1	10.528	1	1.951	1	0.053	1	2.443	1	4.394	1	-0.032	1	0.928	1	10.528	1	1.951	1	0.053	1	2.443	1	4.394	1	-0.032	1			
24	8/21/04	0:00	-169.104	65.8739	46.8	10	2.0722	1	32.007	1	25.5691	1	1.5079	1	7.40014	1	0.99	1	11.143	1	2.603	1	0.023	1	2.649	1	5.252	1	-0.032	1	0.99	1	11.143	1	2.603	1	0.023	1	2.649	1	5.252	1	-0.032	1			
25	8/21/04	0:00	-169.104	65.874	46.8	15	2.1245	1	32.0539	1	25.603	1	1.6996	1	7.4008	1	1.114	1	12.638	1	4.547	1	0.272	1	1.775	1	6.321	1	-1.15941	1	1.114	1	12.638	1	4.547	1	0.272	1	1.775	1	6.321	1	-1.15941	1			
26	8/21/04	0:00	-169.103	65.8742	46.8	20	2.6713	1	32.3793	1	25.821	1	4.0634	1	7.30388	1	1.478	1	20.038	1	10.504	1	0.02	1	1.377	1	11.881	1	-0.032	1	1.478	1	20.038	1	10.504	1	0.02	1	1.377	1	11.881	1	-0.032	1			
27	8/21/04	0:00	-169.103	65.8743	46.8	25	2.7799	1	32.4418	1	25.862	1	3.9676	1	7.09604	1	1.602	1	21.658	1	11.157	1	0.047	1	1.678	1	12.833	1	-0.032	1	1.602	1	21.658	1	11.157	1	0.047	1	1.678	1	12.833	1	-0.032	1			
28	8/21/04	0:00	-169.103	65.8744	46.8	30	2.9737	1	32.5287	1	25.9151	1	3.3128	1	7.00134	1	1.637	1	23.33	1	10.878	1	0.073	1	1.661	1	12.339	1	-0.032	1	1.637	1	23.33	1	10.878	1	0.073	1	1.661	1	12.339	1	-0.032	1			
29	8/2																																														

% Silt and clay content-indicator of deposition zones

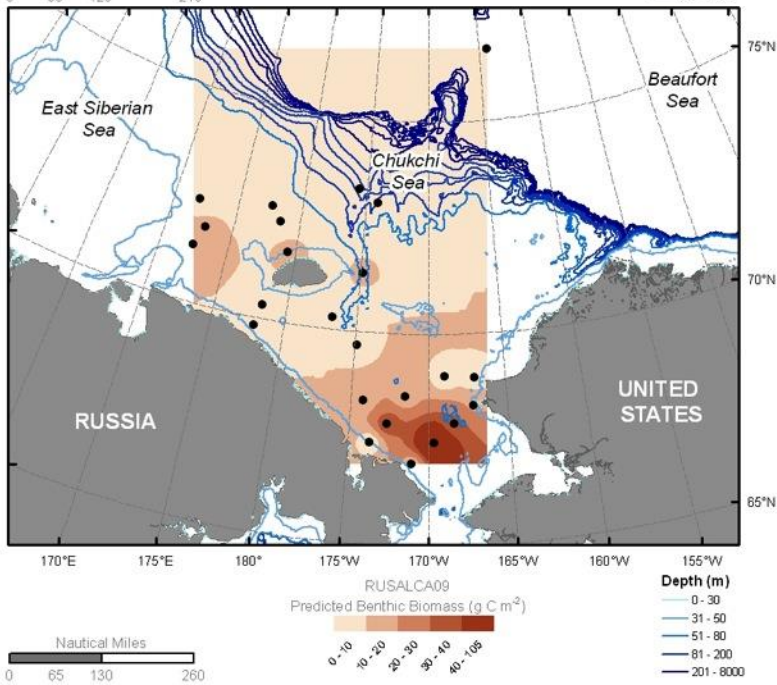
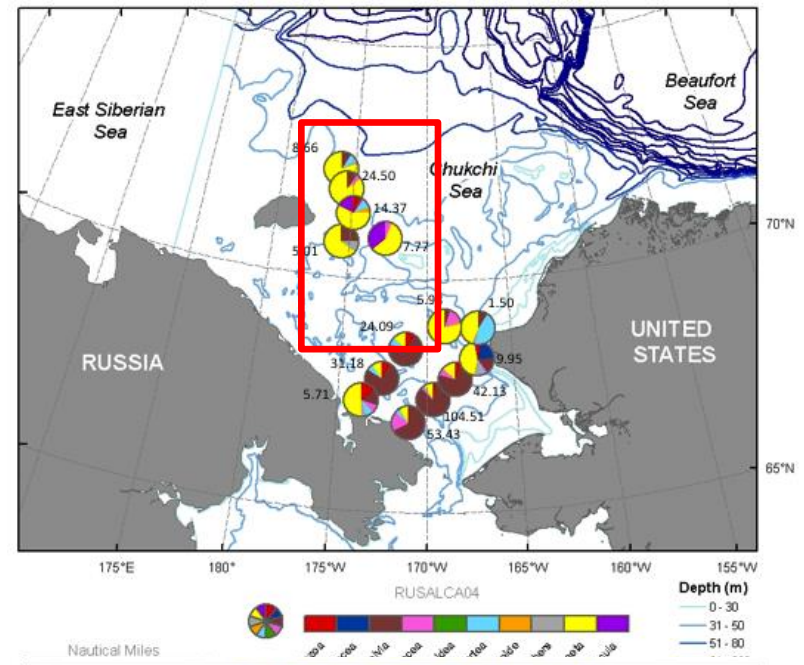


- Higher silt and clay (%) in upper/central Herald Valley and western side of Herald Canyon
- Percent total organic carbon has similar patterns

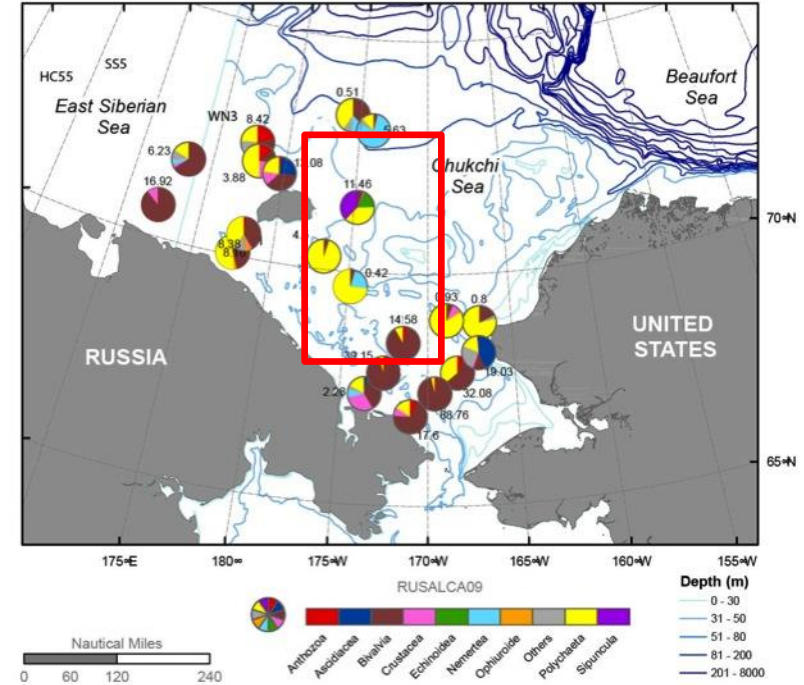
Infaunal biomass and community composition during RUSALCA04 and 09



2004



2009



Summary

- Oxygen-18: Shift between 2004 and 2012; Freshwater end-member ~ Kolyma River (2004) to mostly melted sea ice (2012)
- Higher silt and clay (%) in upper/central Herald Valley and western side of Herald Canyon
- Benthic macrofaunal biomass range 4-12 gC/m², with highest mid-Herald Canyon for sub-region
- Community composition dominated by polychaetes