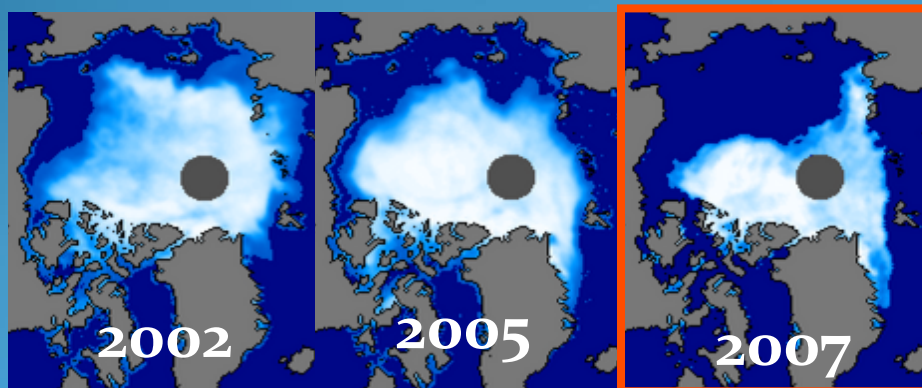


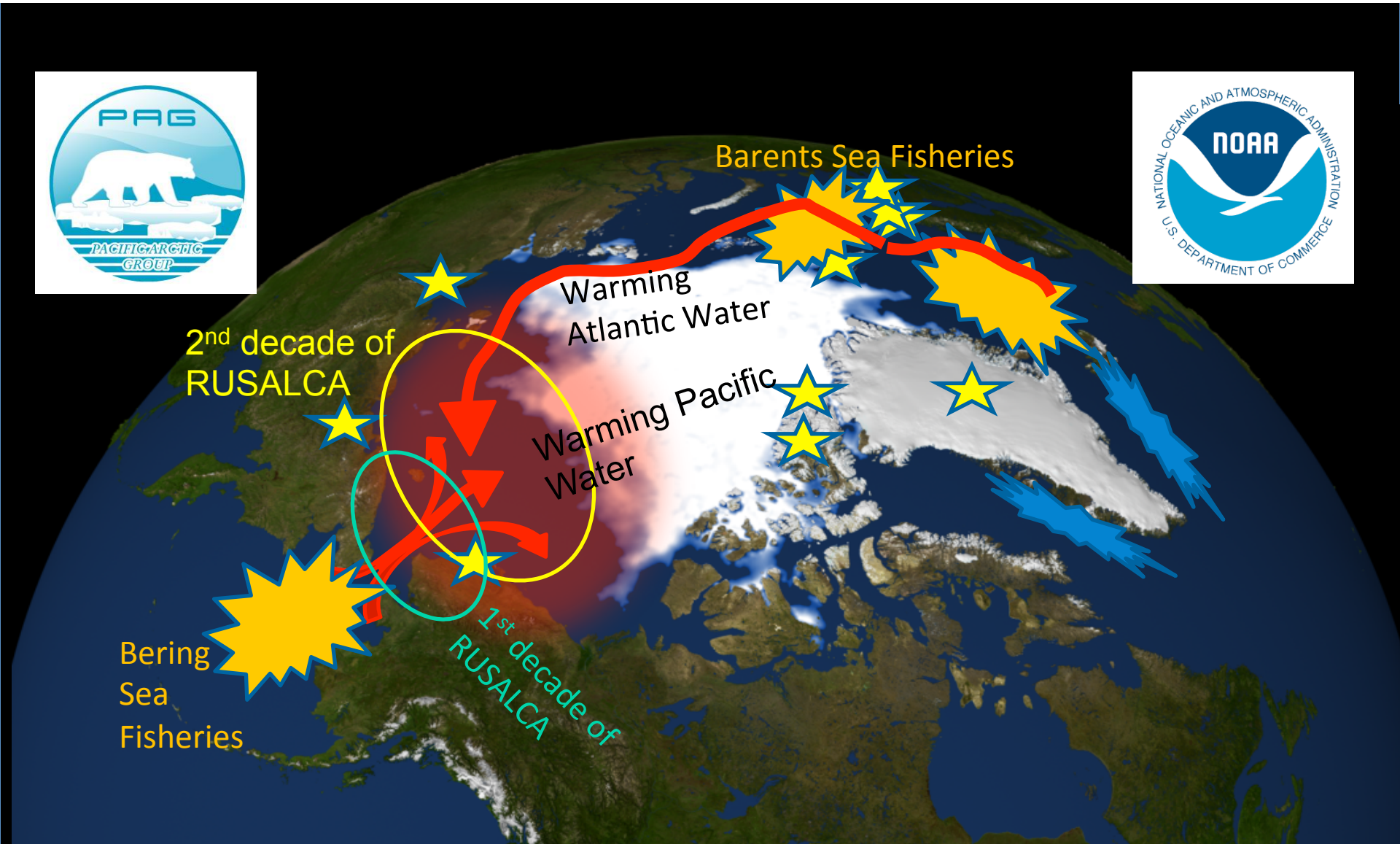


Suggestions for Repeat Climate-Ecosystem Transects of the Arctic: To better understand causes and consequences of sea ice change

K. Crane
Arctic Research Program, NOAA



From 2016-2020, RUSALCA will move northwards to observe the Pacific Arctic hot spot with members of the Pacific Arctic Group



Sandy Pinned & Pushed West
Makings of a "Frankenstorm"



NORTH AMERICA

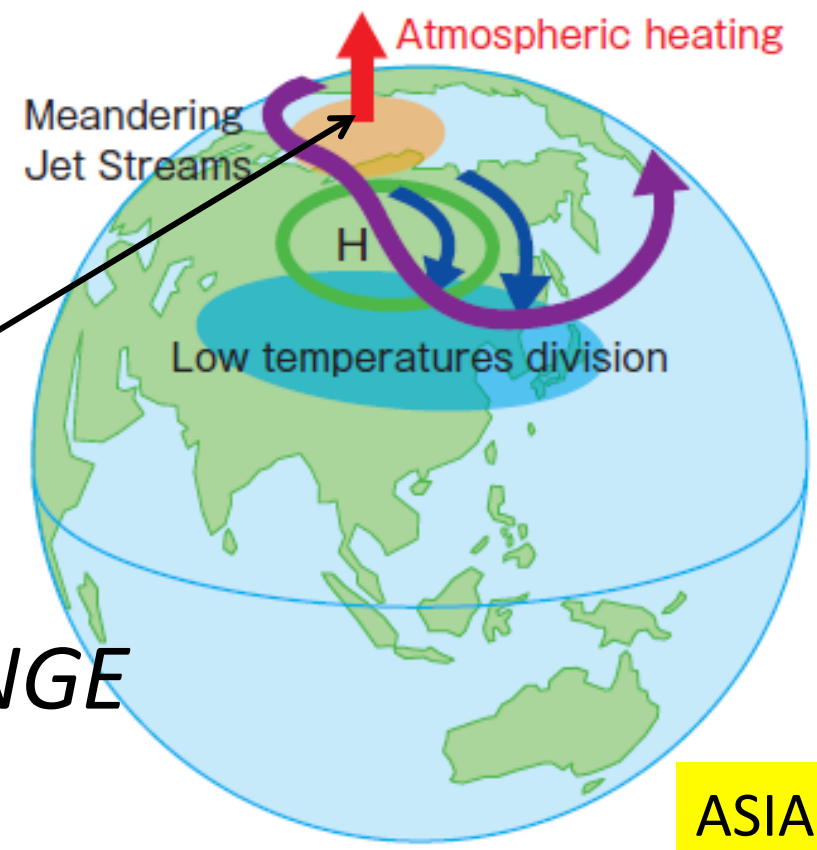
NEED OBSERVATIONS FROM THE
PACIFIC ARCTIC HOT SPOT

**IMPACTS OF ARCTIC CHANGE
ON THE MID-LATITUDES**

Which parts of the Globe are responding
to Arctic Change



The impacts of Arctic changes on weather
and climate in Japan



ASIA



Arctic Research Program- Ocean-Ecosystem Observations

GOALS: 2004-2014

- To understand the causes and consequences of climate change in the Arctic.
- To capture the transition of the Arctic from an ice covered ocean to an ocean where ice may disappear in the summer.
- To facilitate and deploy Arctic system-wide observing tools to track Pan-Arctic ice-ocean-ecosystem changes and impacts (3 main programs)
 - **RUSALCA,**
 - **CBMP,**
 - **PAG**



U. S. Strategic Partners:

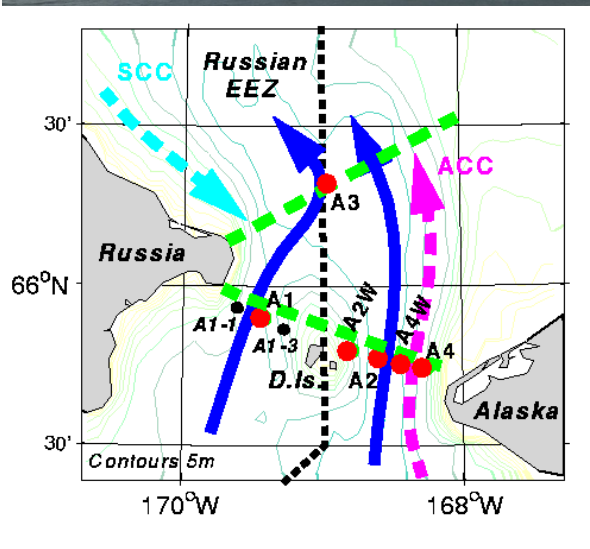
OAR OER, ESRL, PMEL, GLERL, AOML, GFDL
NOAA Lines NMFS-AFSC, NESDIS-NIC, NOS-AOOS
Interagency NSF, ONR, FWS, BOEM, NASA, USGS
US Academia UAF, WHOI, UW, UMD, OSU, Cis

International Strategic Partners: Arctic Council countries, China, Korea, Japan

RUSALCA 1st Decade



- Monitor fresh water, heat, nutrient fluxes through the Bering Strait
- Monitor ecosystem indicators of climate change in the Chukchi Sea and Pacific Arctic region
- Model and forecast changes in ecosystems and Arctic wide physical systems



RUSALCA Contributes to the Circumpolar Marine Biodiversity Monitoring Program of CAFF ARCTIC COUNCIL

Arctic Council effort
uses existing member
nation monitoring sites:

U.S. sites are coincident
with the *Distributed
Biological Observatory*
and *RUSALCA* stations.



Arctic Biodiversity Portal

Monitoring

Google Custom Search

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Home Monitoring Assessments Strategies Policy Data Expert Groups Publications Program view

- The CBMP
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 - Freshwater Ecosystem
 - Terrestrial Ecosystem
 - Coastal Ecosystem
 - Community based monitoring
- Protected Areas
- Indices and Indicators
- Projects
- e-CBMP Newsletter
- Contact us

October 2011

Su	Mo	Tu	We	Th	Fr	Sa
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

Circumpolar Biodiversity Monitoring Programme - CBMP

Home Monitoring

The Circumpolar Biodiversity Monitoring Program (CBMP) is an international network of scientists, government agencies, Indigenous organizations and conservation groups working together to harmonize and integrate efforts to monitor the Arctic's living resources.

Our goal is to facilitate more rapid detection, communication, and response with respect to the significant biodiversity-related trends and pressures affecting the circumpolar world. The CBMP is the cornerstone program of the Arctic Council's Conservation of Arctic Flora and Fauna (CAFF) Working Group. The CBMP has been endorsed by the Arctic Council and is the biodiversity component of the Sustaining Arctic Observing Networks (SAON).

Events

No events

Greenland Quest Documentary

The documentary of the record-breaking Greenland Quest expedition is now showcasing on Emirates Airline inflight TV, prior to it's planned broadcast on National Geographic Channel next month.

The Circumpolar Biodiversity Monitoring Program organized the scientific programme for this trip - this included having the explorers take wind and snow measurements at regular intervals along the route as well as document biological observations (e.g. Ivory Gull nesting locations) along the route.

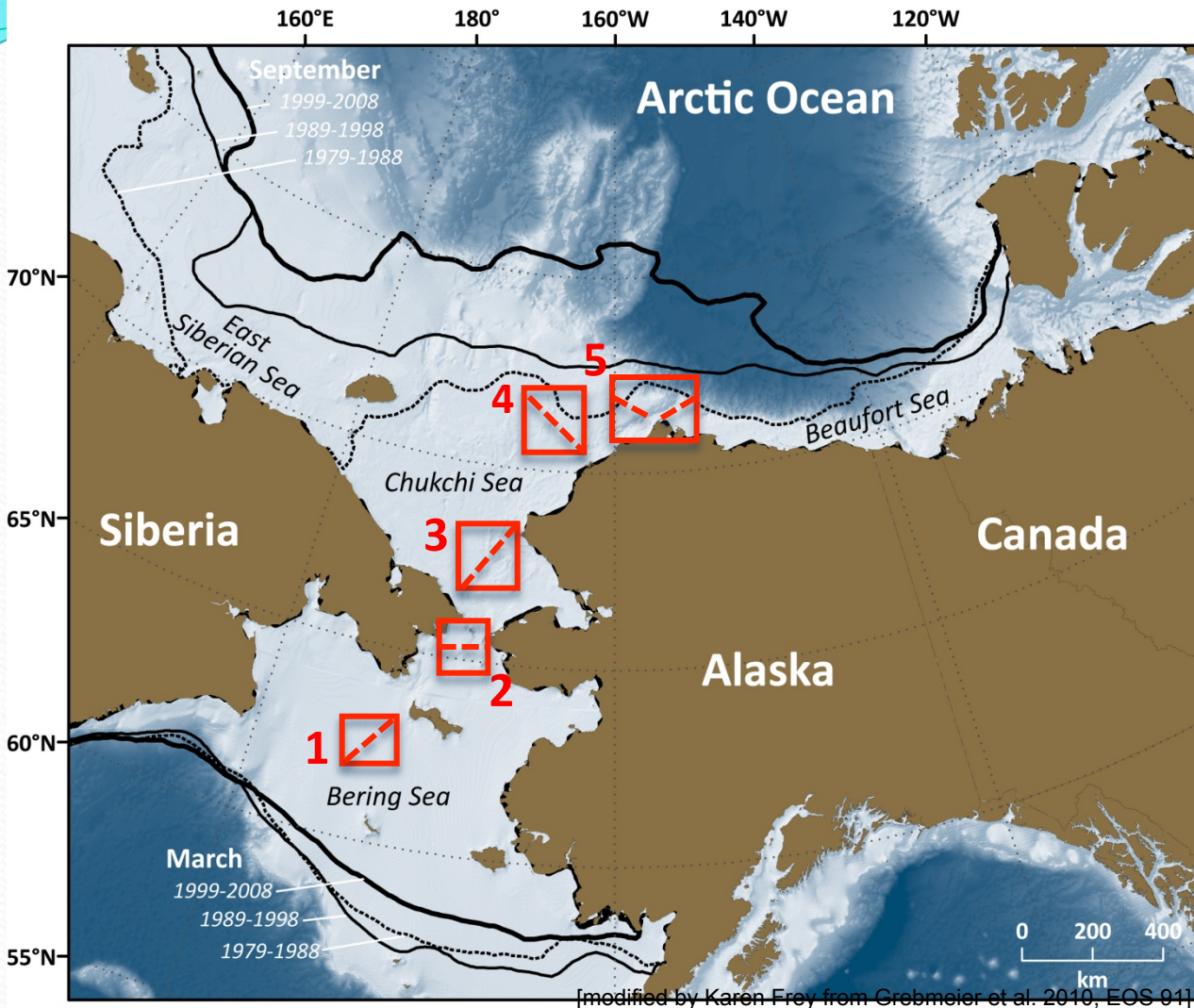
CBMP Latest Publications

- Marine Monitoring Plan
- Polar Bear Discussion
- Arctic Biodiversity Trends 2010

Logos: Arctic Council, CAFF, Inuit, and various national flags.

Flags: Denmark, Finland, Iceland, Norway, Sweden, United States.

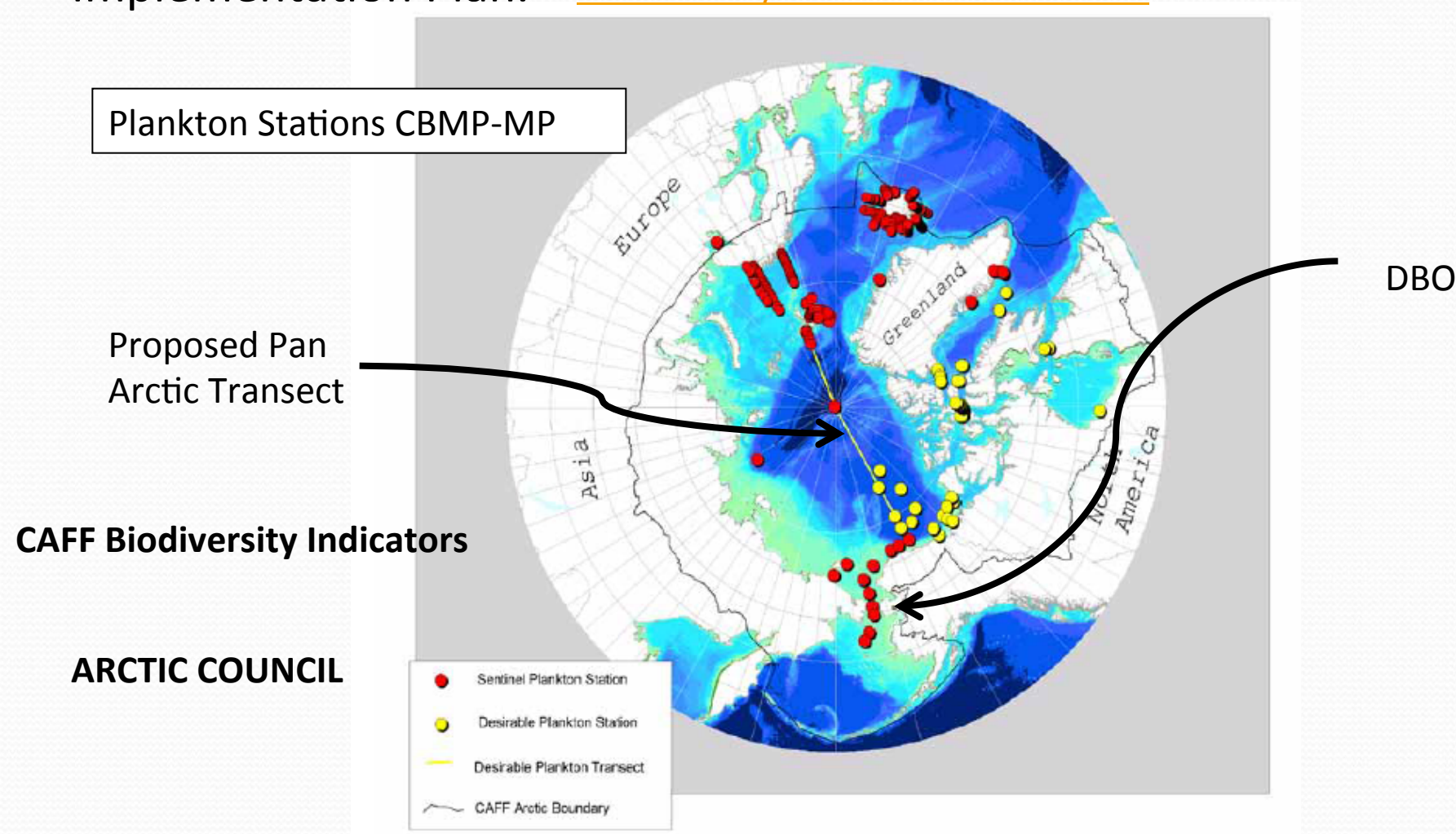
Linking Physics to Biology: the Distributed Biological Observatory (DBO)



- 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 Gear brought into international consensus as per the Circumpolar Biodiversity Monitoring Program–Marine Implementation Plan. www.caff.is/indices-and-indicators2

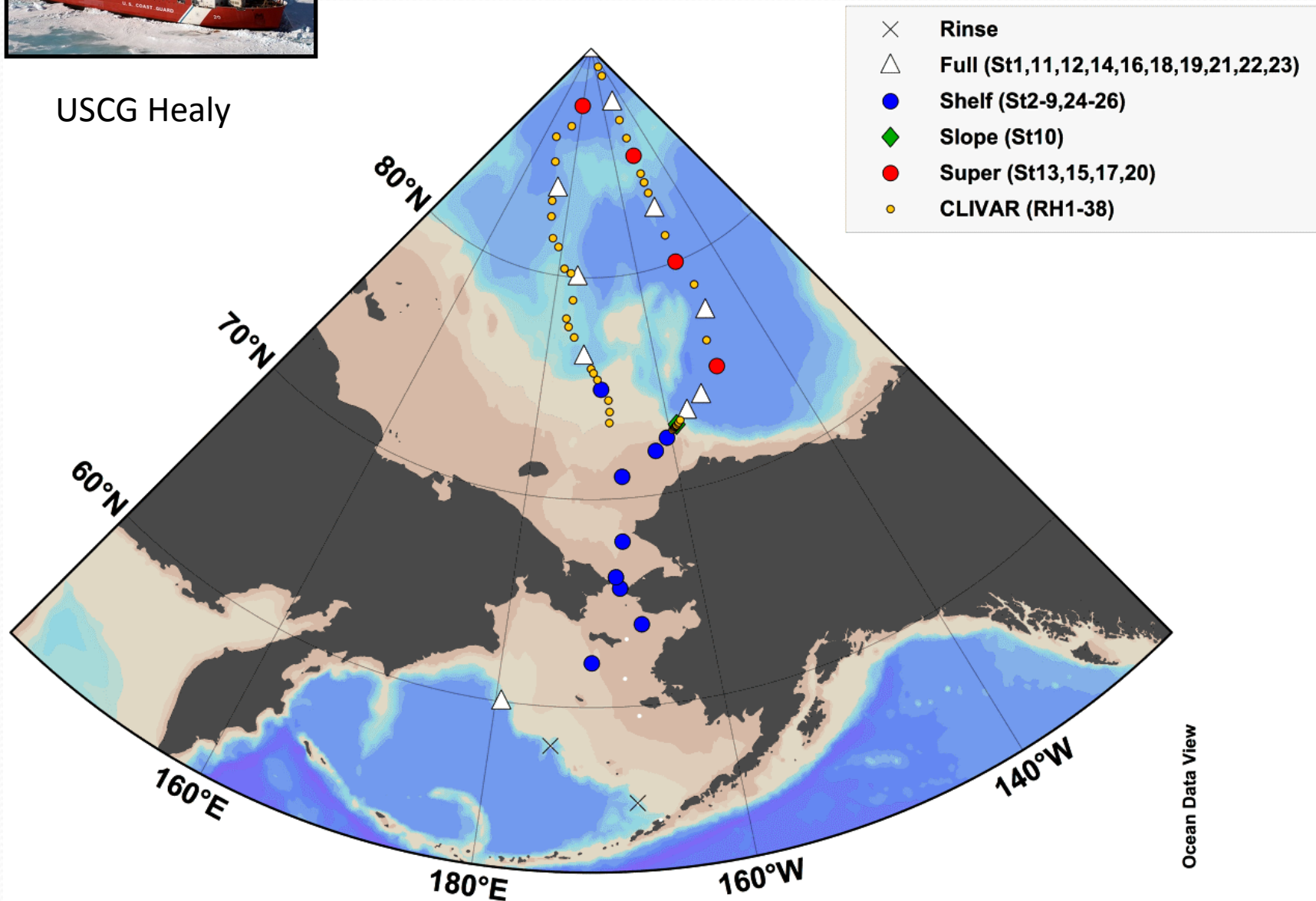


(From Circumpolar Biodiversity Monitoring Program–Marine Plan)

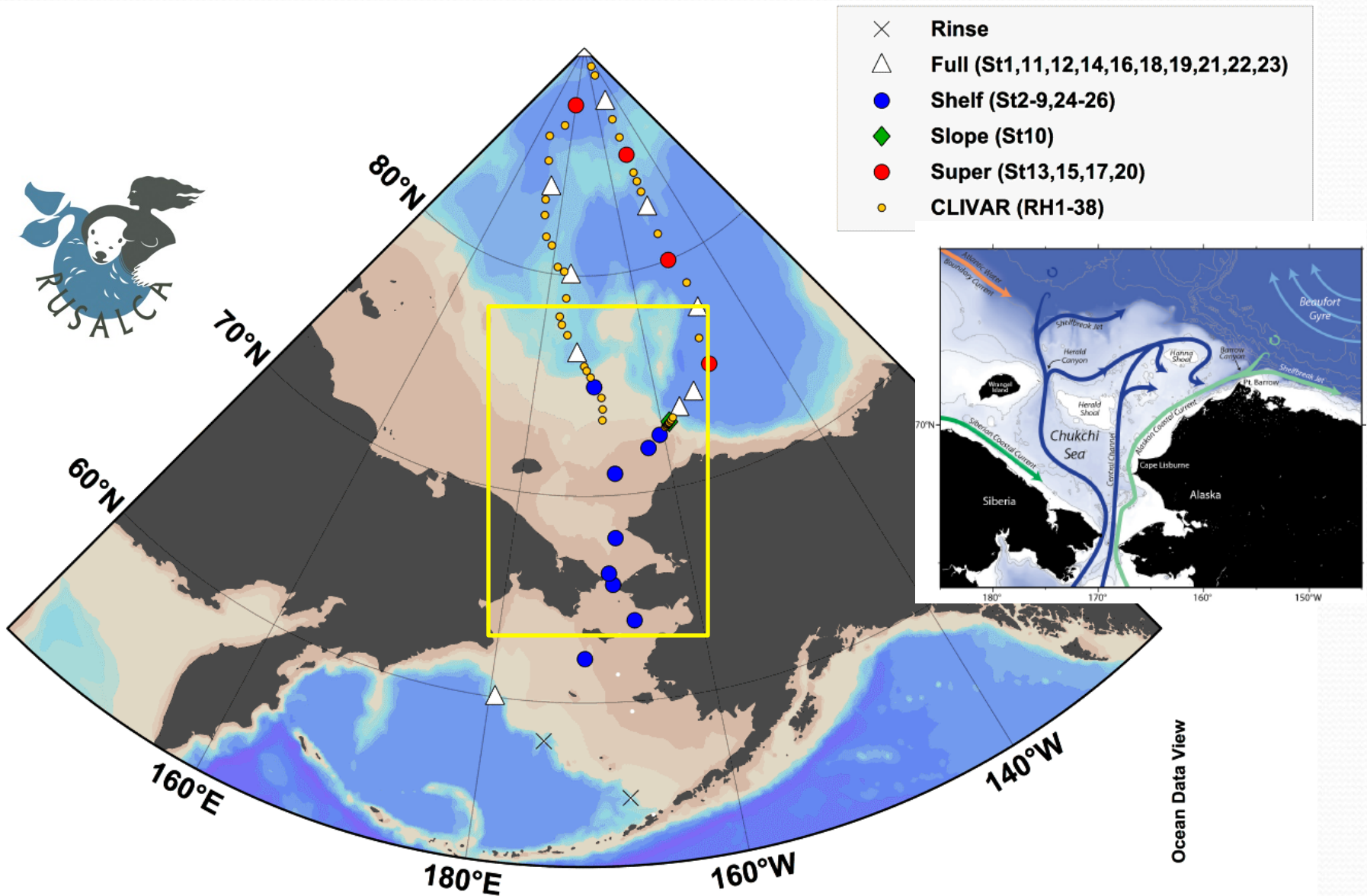


USCG Healy

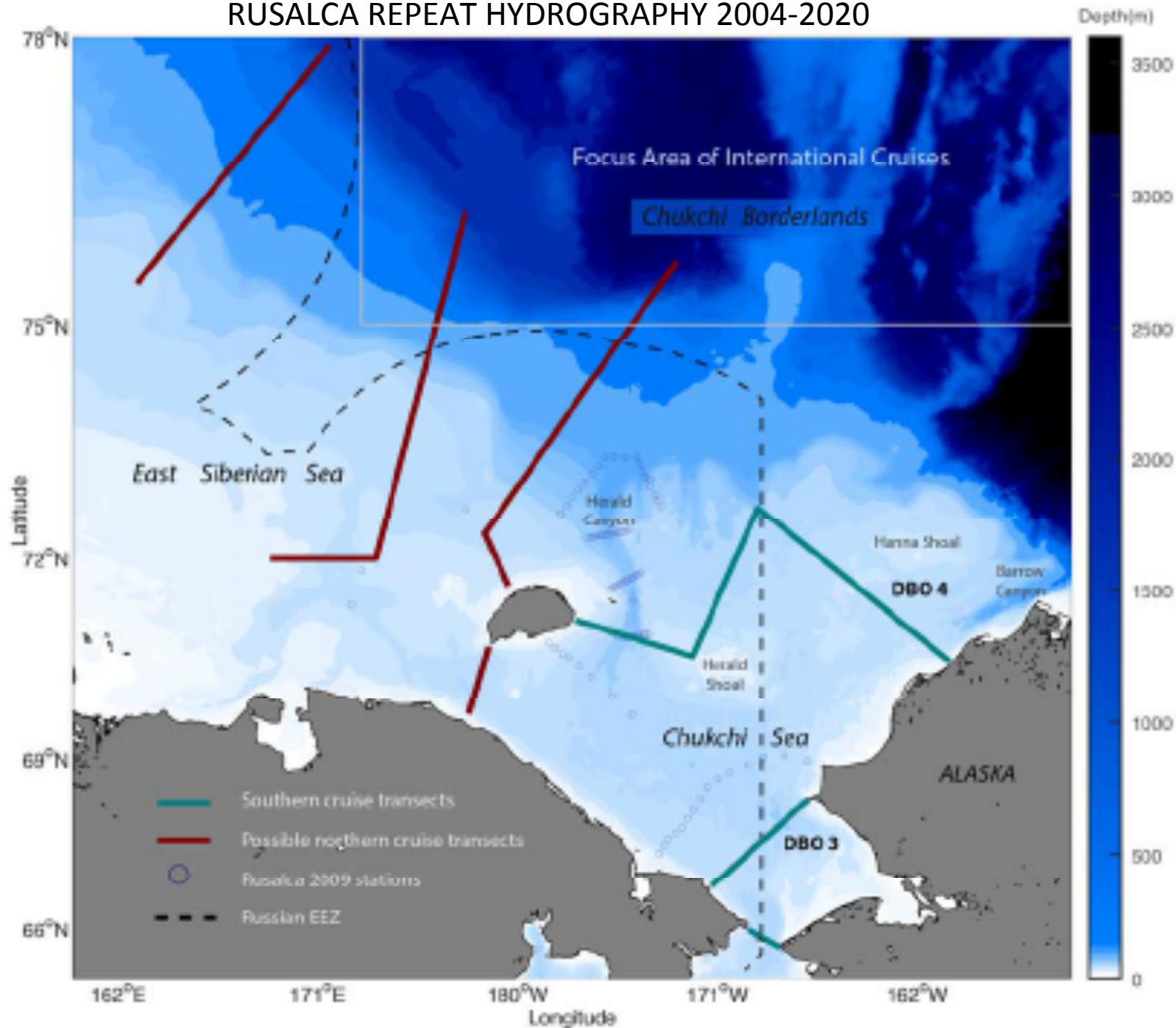
U.S. contributions to Repeat Hydrography, 1994, 2005, 2015 (J. Swift)



Russian-American Repeat Observations



RUSALCA REPEAT HYDROGRAPHY 2004-2020

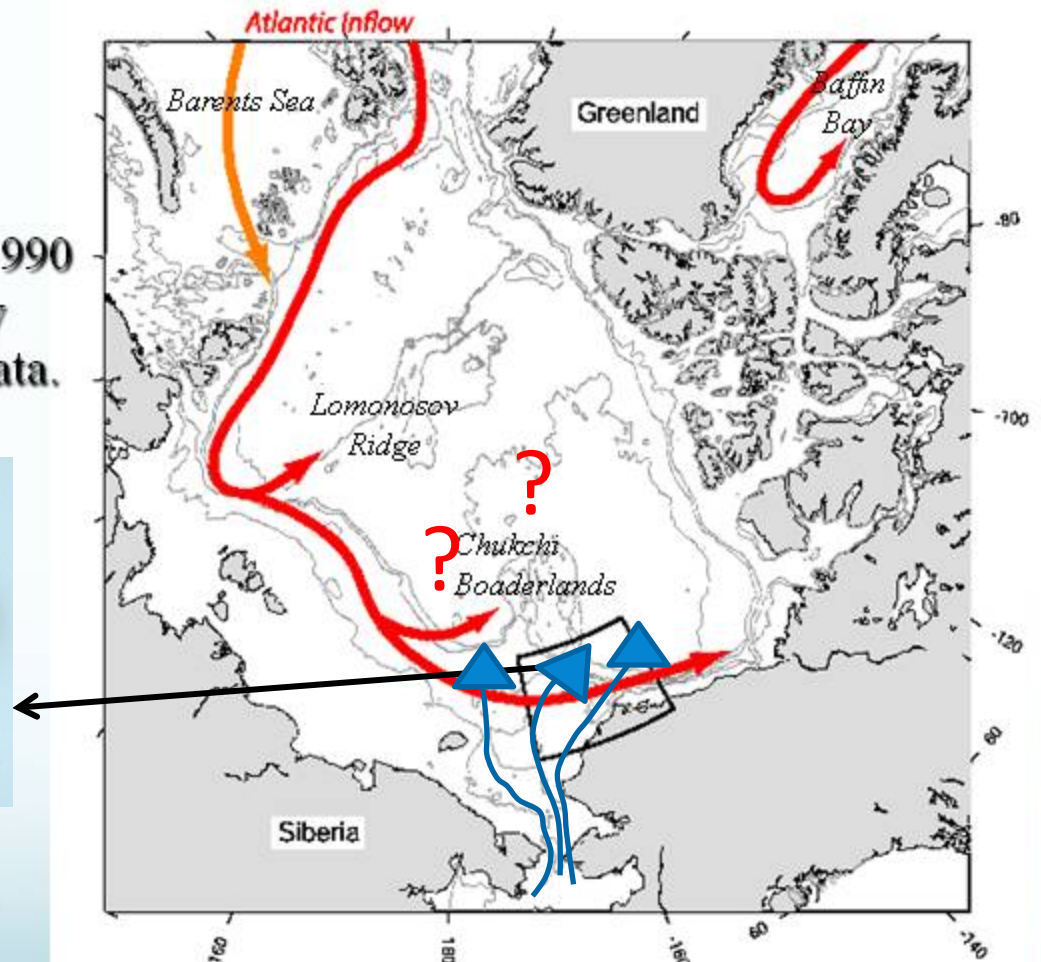


Role of Atlantic Water Transport and Warming on the Migration of Atlantic Arctic Fish into the Pacific Arctic

- Warming of AW inflow since 1980.
- Two pronounced pulses: one around 1990 and the other around 2000, tracked by hydrographic sections and mooring data.

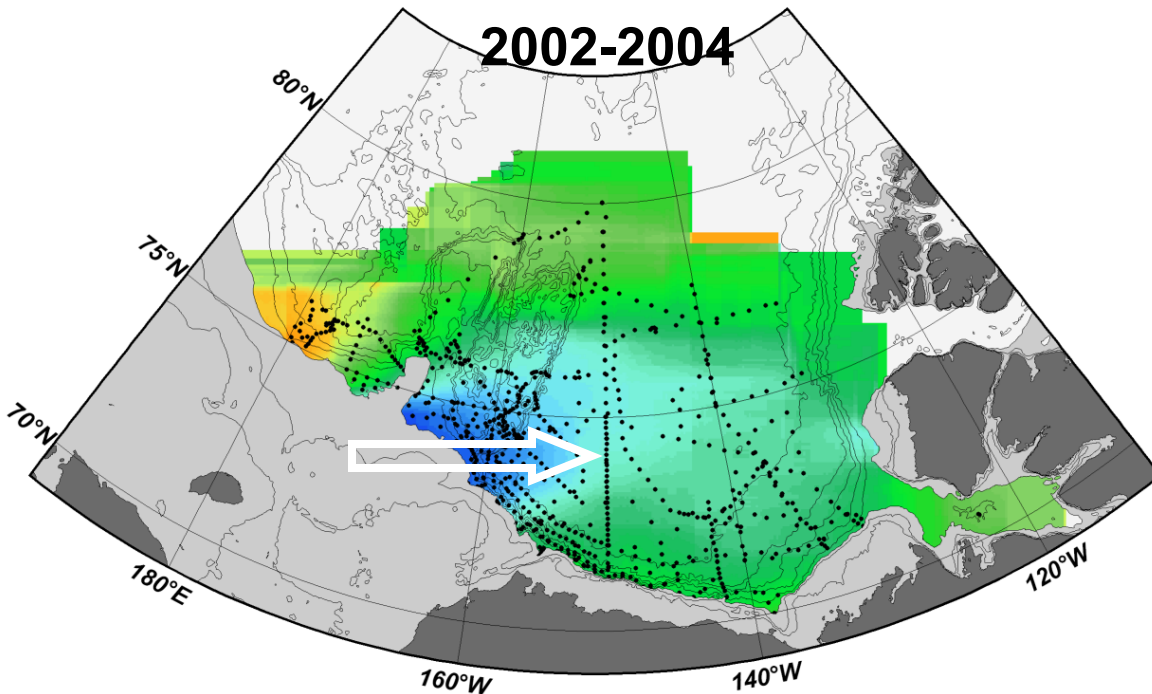


Atlantic Hookear Sculpin



Mecklenburg, 2010
Pickart, 2010

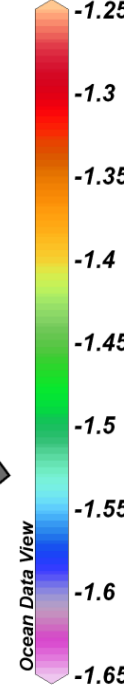
CONSEQUENCE OF ARCTIC WARMING: MIGRATING FISH? Deep mixing in the Pacific Arctic?



2002-2004

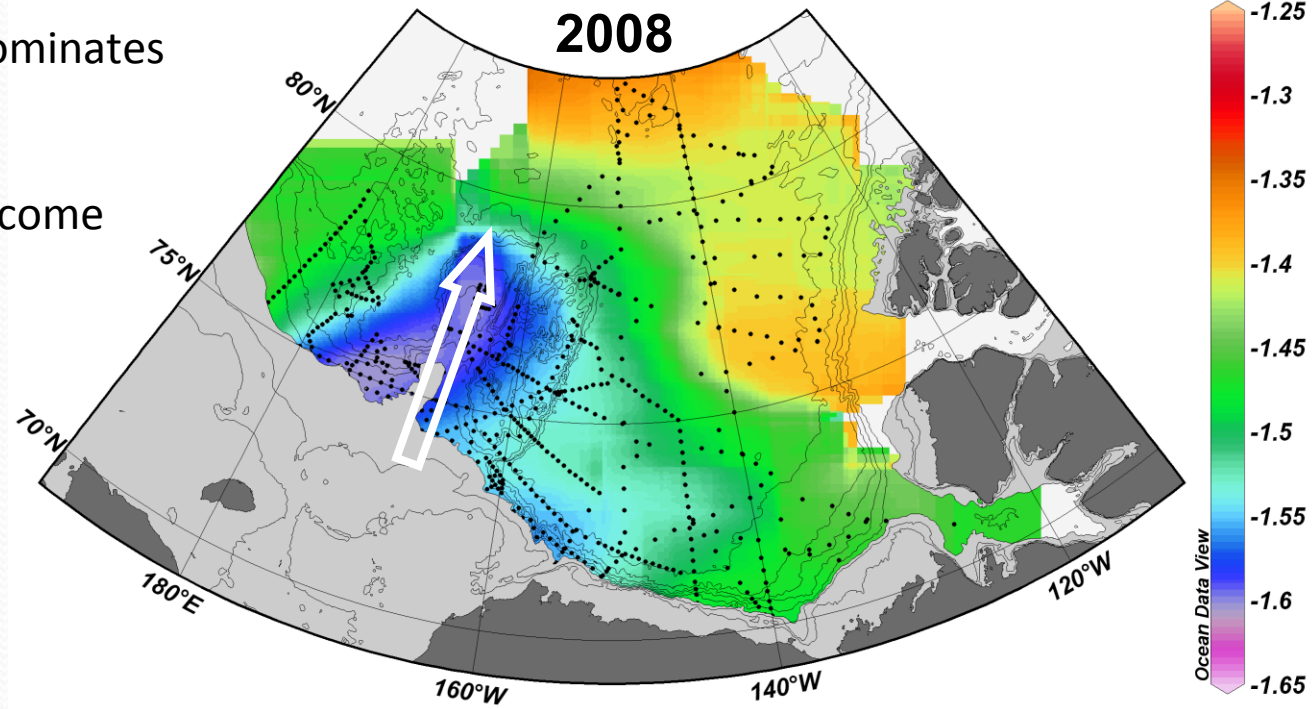
Spreading of Pacific Water, highly variable.

Less ice, more storms, more mixing; possibly with Atlantic Water

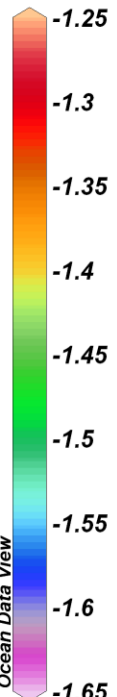


buoyancy driven currents dominates

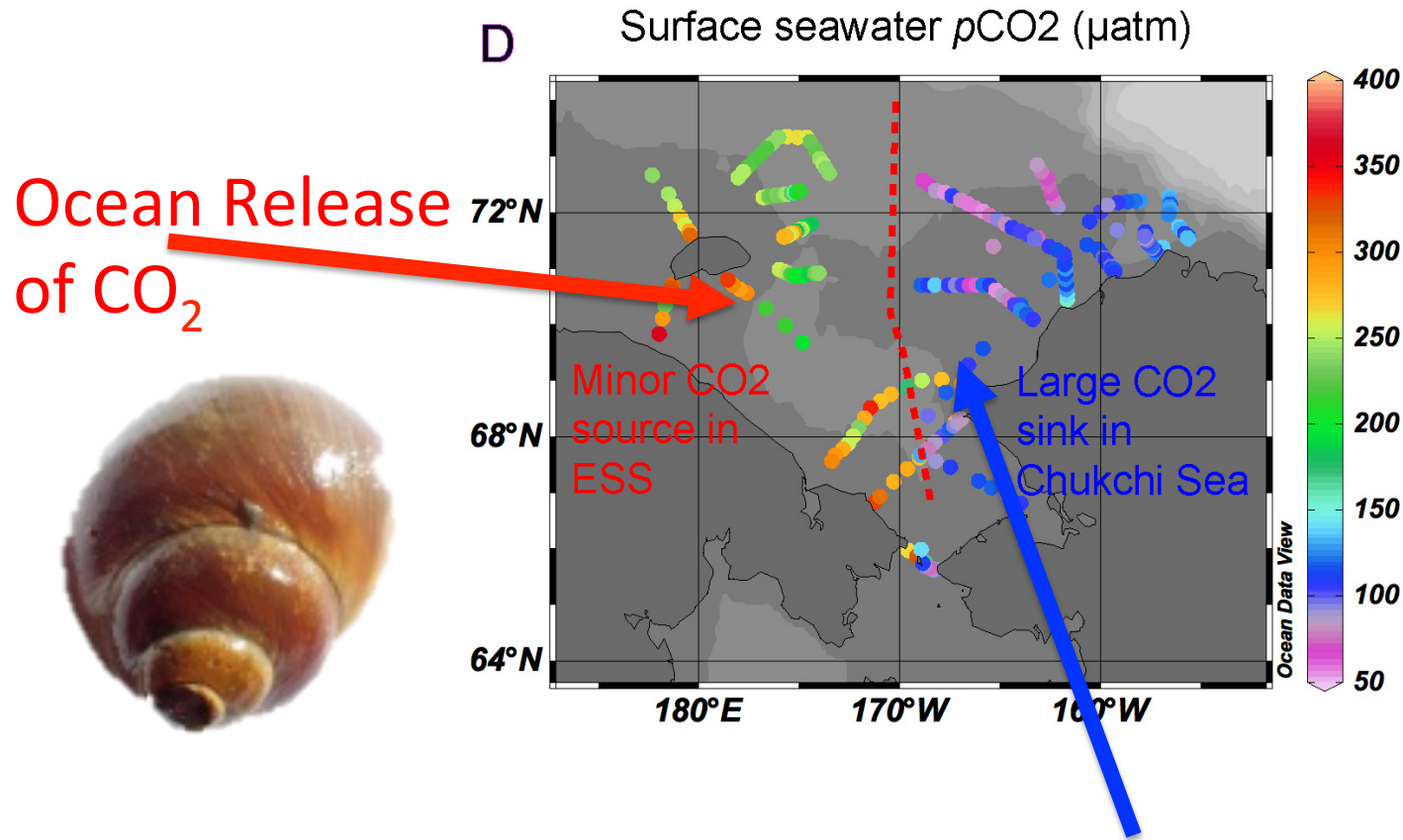
Wind driven currents overcome buoyancy driven currents



2008

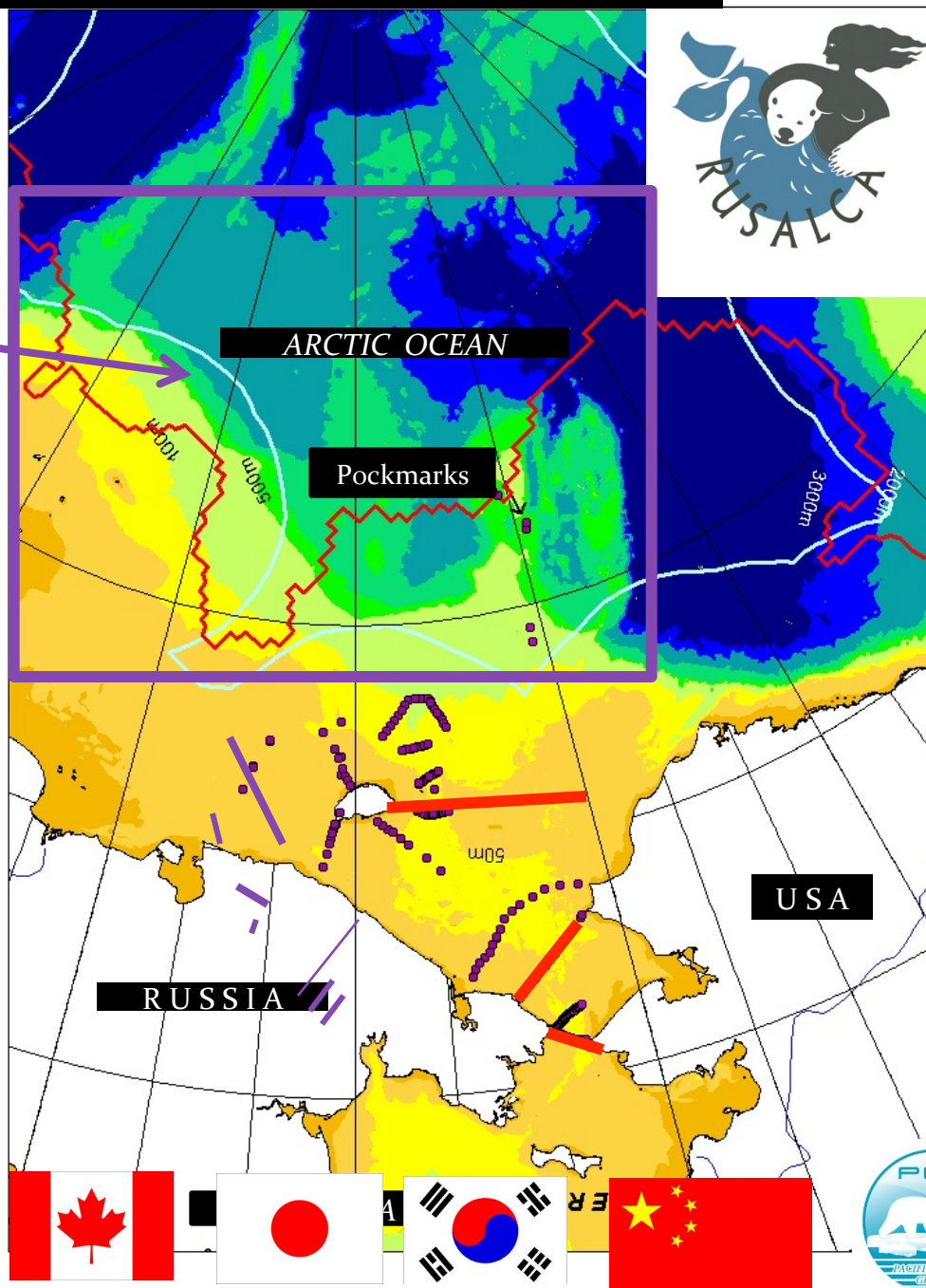
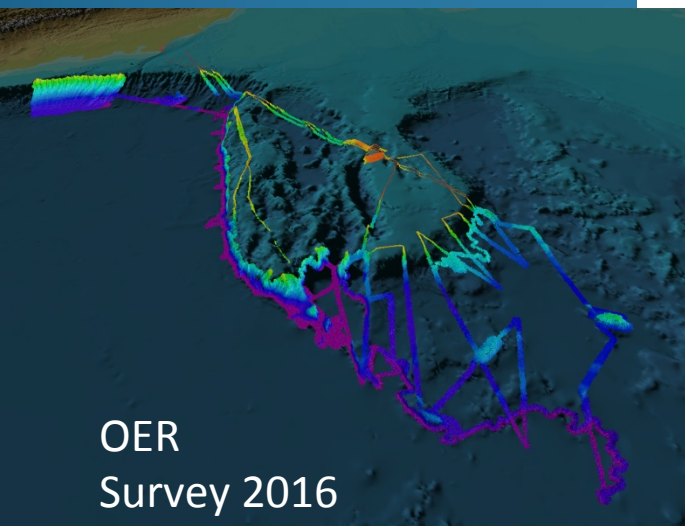


Loss of Sea Ice Impacts on Arctic Ocean Acidification

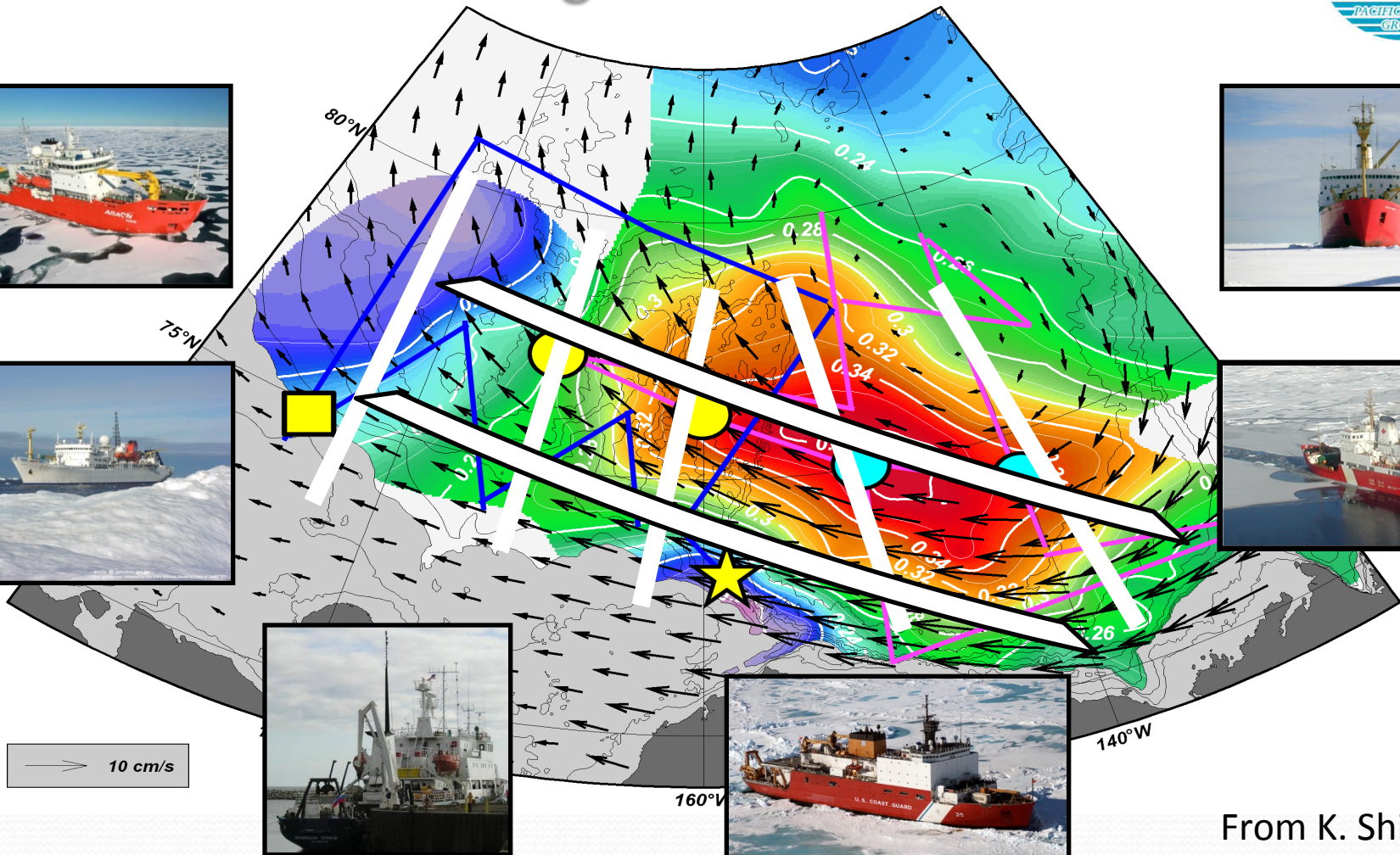


large ocean uptake of CO_2
in area of low seawater
 $p\text{CO}_2$

RUSALCA-PAG
Proposed survey
area 2016-2020



Proposed international Pacific Arctic climate observing sections



From K. Shimada

Background color: dynamic height at 100dbar relative to 800dbar from Mirai and Louis S. St-Laurent 2008 cruises (Oceanic Beaufort Gyre) Symbols: Mooring array in 2012-2013 (TUMSAT/KOPRI/NIPR & WHOI)



Pacific Arctic Group, PMEL, Seattle, October 28-29, 2014



Photo credit: Aleksey Ostrovskiy

THE PACIFIC ARCTIC GROUP (PAG) MEETING

October 28-29, 2014
Seattle, Washington

Citation: Grebmeier, J.M., A. Bayard, L.S. Guy, and J. Lee (eds). 2015. The Pacific Arctic Group (PAG) Fall 2014 Meeting Report. CBL/UMCES, 24 pp.

Meeting Minutes

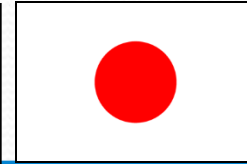
The goals are:

- To carry out **atmospheric, sea ice and upper ocean observations to determine the causes of rapid sea ice loss in the region and its impact on ecosystems and local and global climate.** This effort will also incorporate atmospheric observations to support the WMO's Polar Prediction Project (PPP).
- To study the **evolution, structure, and variability of Pacific Arctic upper ocean water masses, including heat transport of Atlantic Water and its interaction with northward flowing Pacific Water.**
- To carry out **repeat observations of the marine ecosystem, from lower to higher trophics,** documenting status and trends and identifying indicator species and their relationship to physical forcing and biogeochemical conditions.
- To carry out **time-series observations from long-term moorings** to reveal annual and inter-annual variability.
- To coordinate this work with the vessels of our respective countries from 2015-2020 and beyond, **to provide a unique suite of synoptically collected data made available for joint analysis and assessment** via the mechanisms already set up within the Pacific Arctic Group.

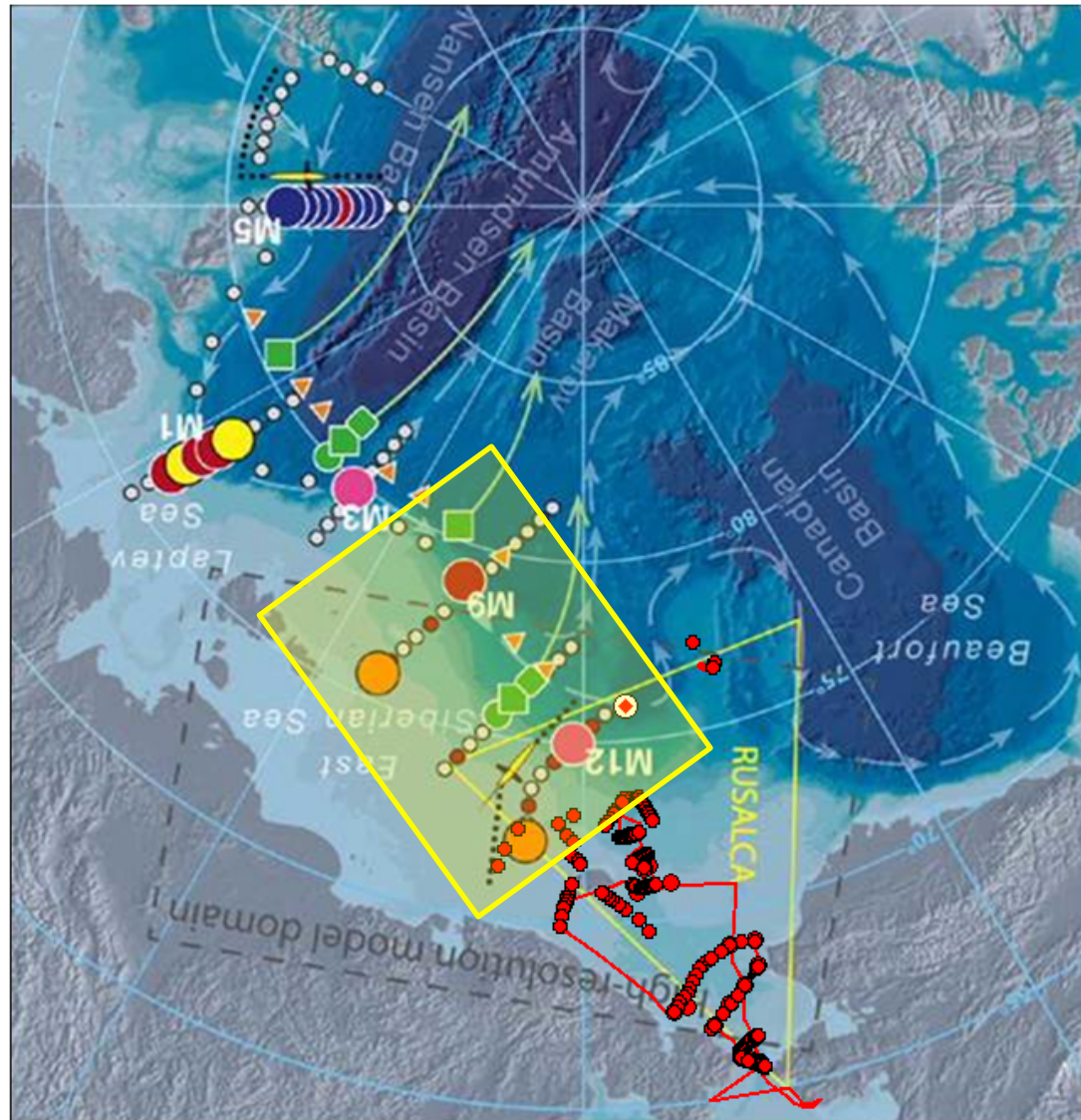
www.pag.arcticportal.org



Fisheries and Oceans Canada

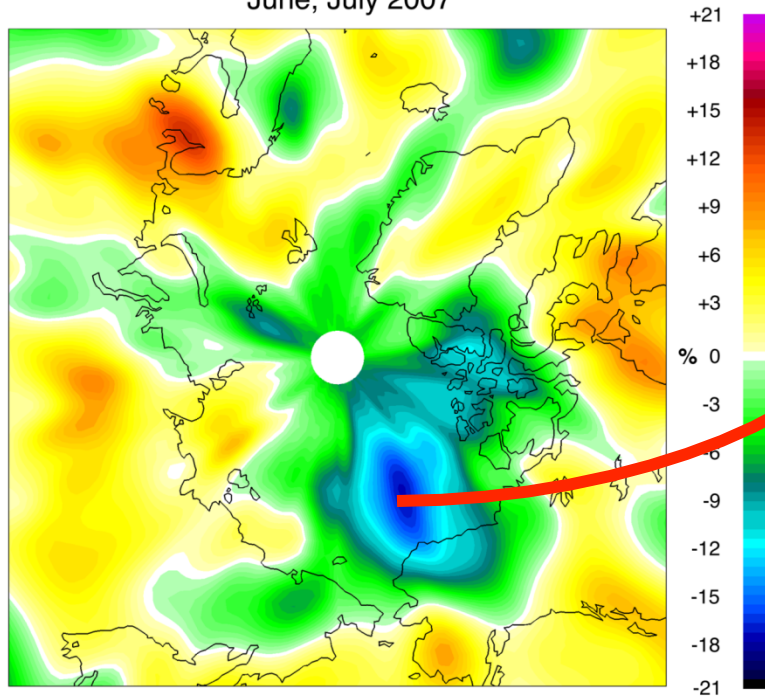


New W-E PAG Climate Observing Linkage in the Pacific Arctic Region



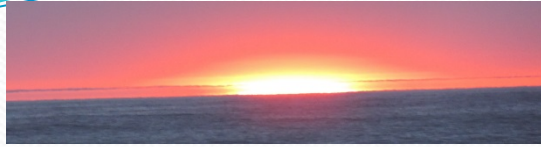
Cloud fraction anomaly (MODIS)

June, July 2007



Need new atmospheric measurements over
The Pacific Arctic Ocean

GOALS: 2015-2025 ARP



observations

1. Continue repeat sampling of three transects in the Chukchi Sea (Bering Strait, DBO 3 and westward extension of DBO 4)
2. Expand RUSALCA northwards; Include atmospheric obs
3. Design and implement Pacific Arctic ocean climate -ecosystem repeat transects with the Pacific Arctic Group
4. Provide data to the Alaska Ocean Observing System and as a U.S. contribution to the Arctic Council's Arctic Biodiversity Data Service for CBMP.

