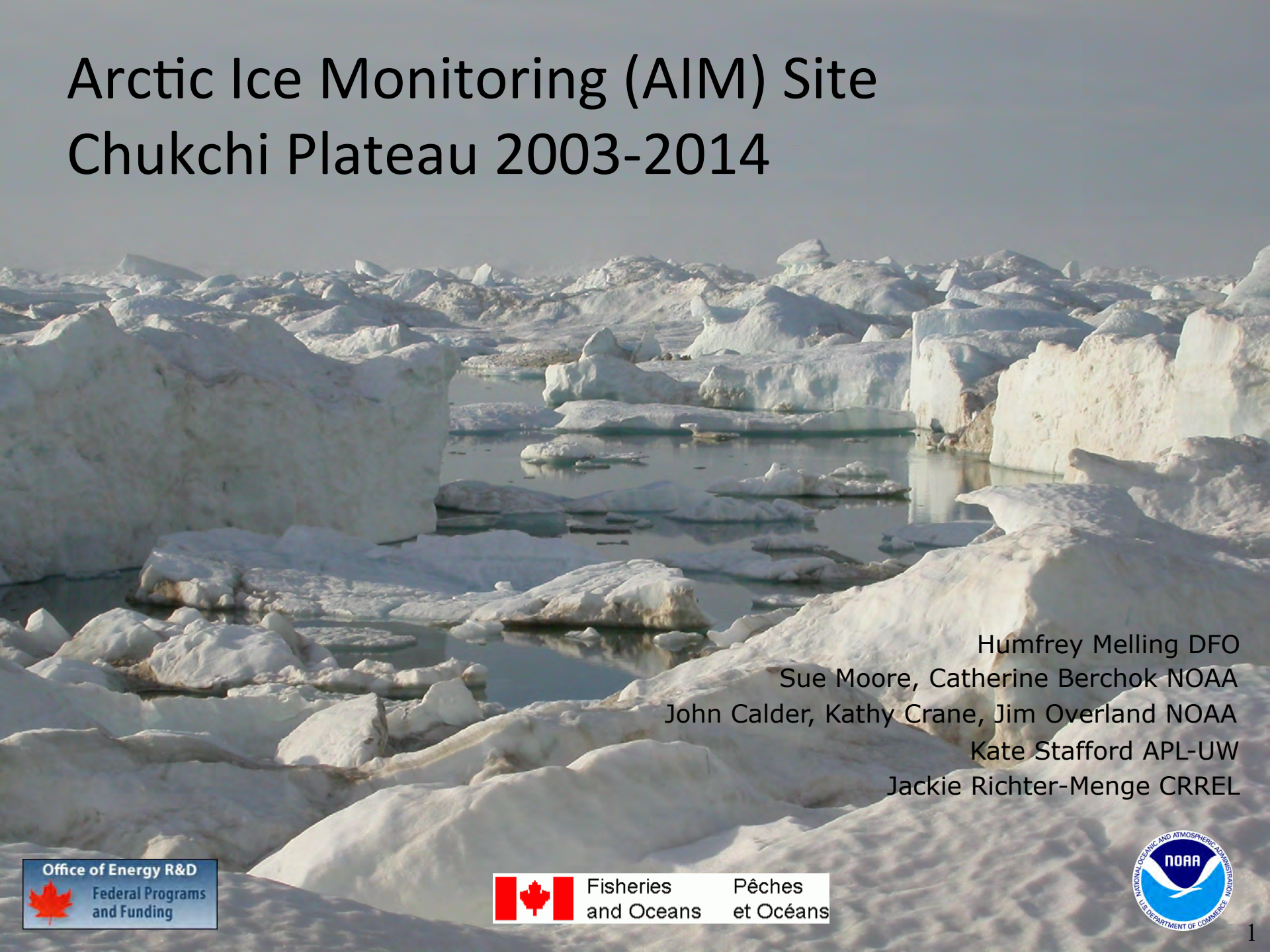
Arctic Ice Monitoring (AIM) Site
Chukchi Plateau 2003-2014



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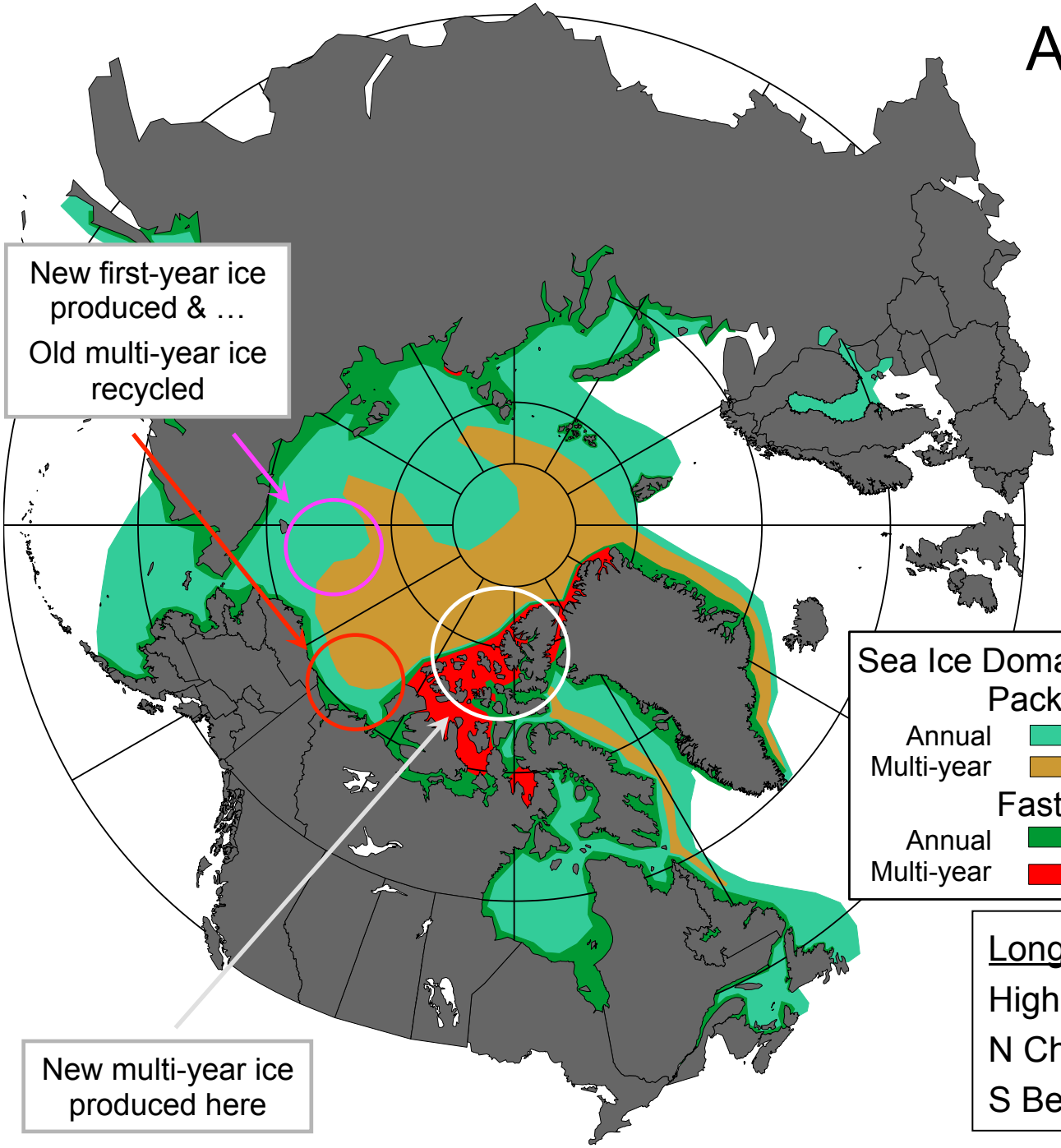
Office of Energy R&D
Federal Programs and Funding

Fisheries and Oceans | Pêches et Océans

NOAA

AIM observatories Canada-USA



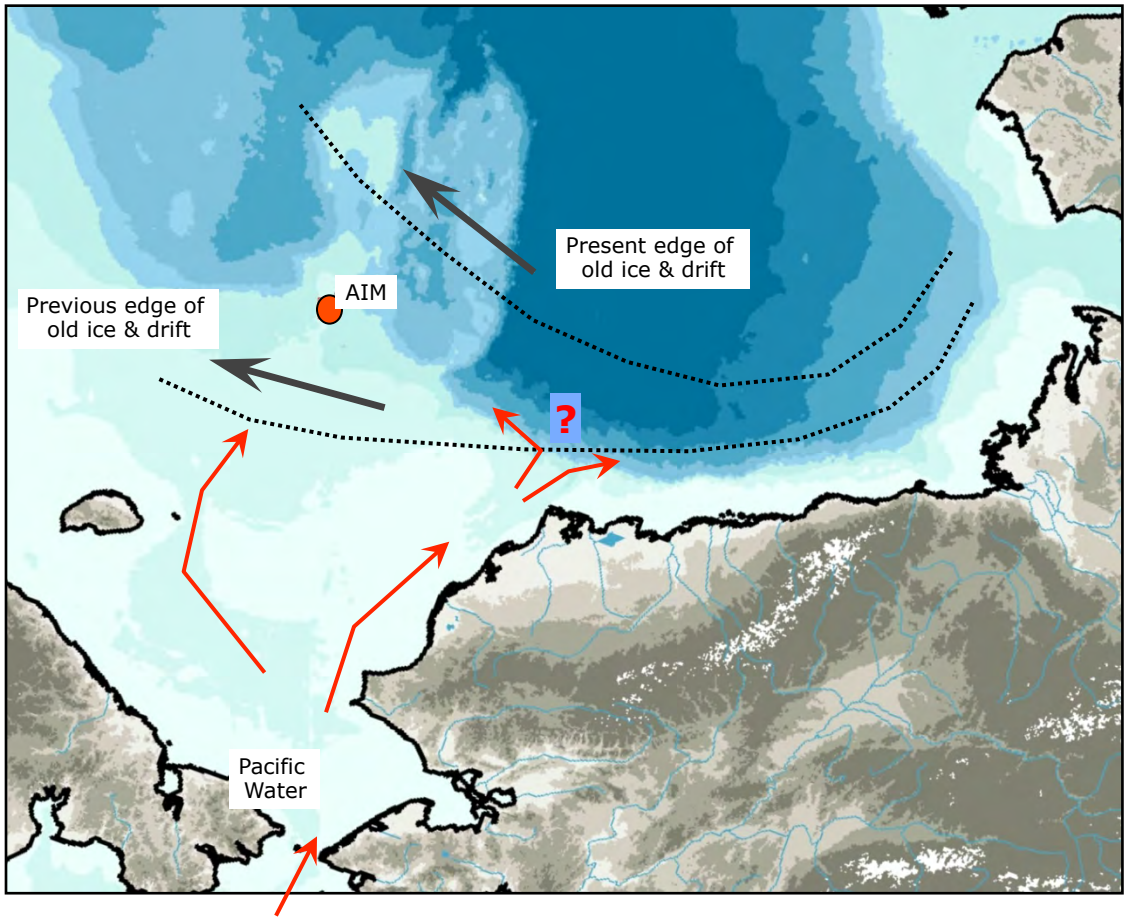
Year-round installations
<u>to monitor the creation & deterioration of sea ice</u>
within 2 distinct domains

Partners are:
NOAA / CRREL
Shell
Conoco-Phillips
Govt of Nunavut

<u>Longevity of AIM sites</u>
High Arctic: 11 years at 1-2 sites
N Chukchi: 11 years at 1 site
S Beaufort: 24 years 2-4 sites

Chukchi AIM observatory was established in 2003

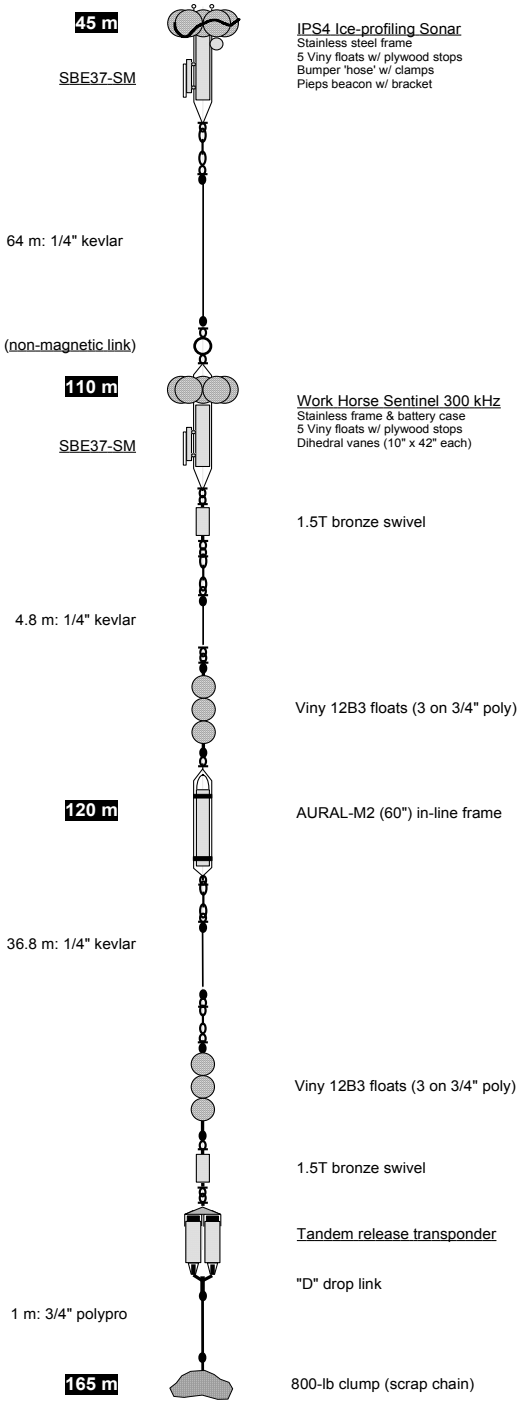
The Chukchi AIM site is located in an area in transition:
Before 1998 it was dominated by multi-year ice at 9 tenths coverage.
It is now within the domain of first-year ice.



The AIM site is also on a pathway of Pacific water inflow to the Arctic (red arrows)

AIM = Arctic Ice Monitoring

Submerged sonar (IPS & ADCP) do most of the work at AIM sites



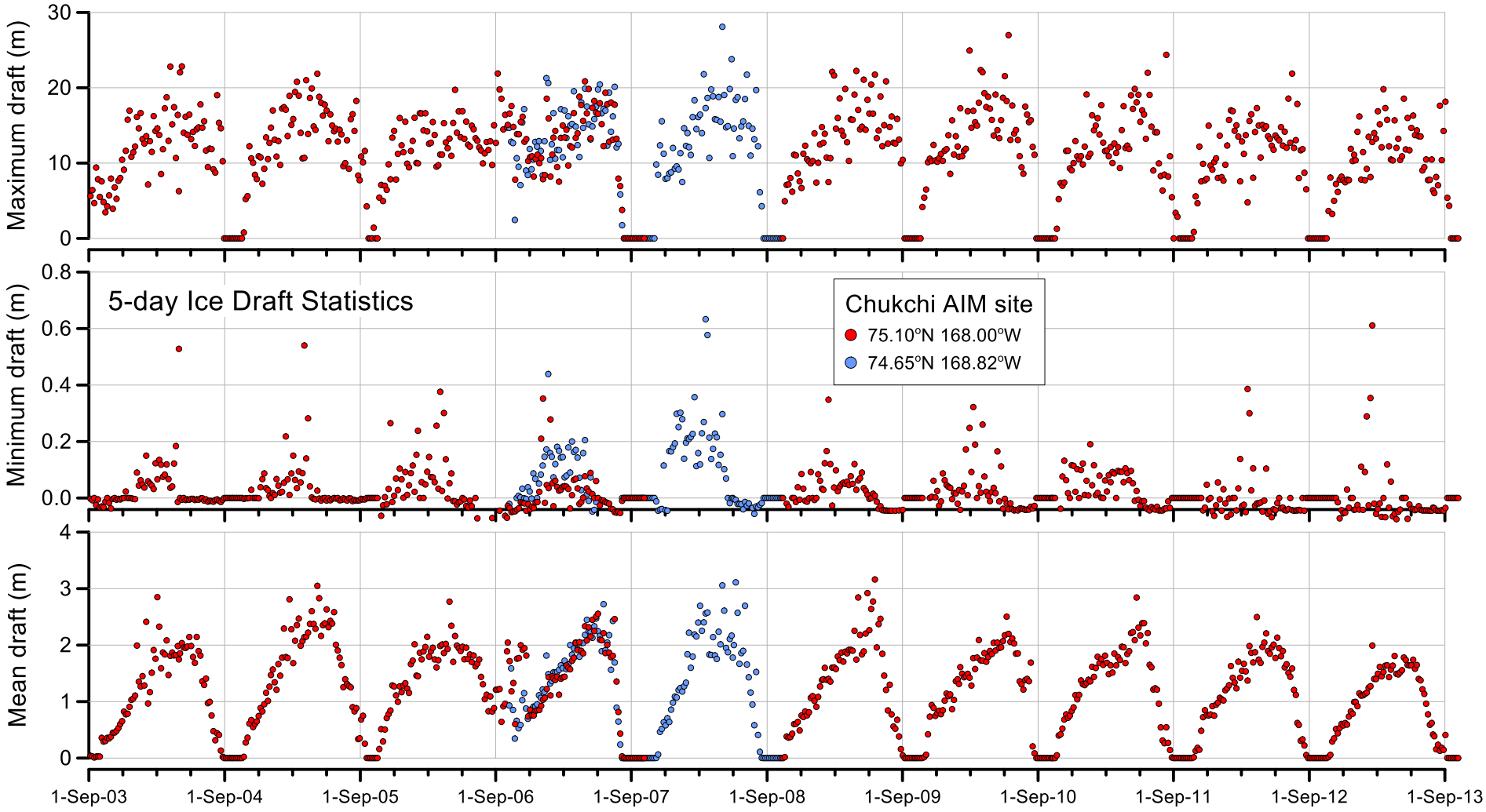
Sonar provide ice draft, drift, ocean current, plankton echoes.

Other sensors for T & S, ambient sound, etc.…

Autonomous with …
3-yr endurance
1 m scale ice relief at
±5 cm accuracy

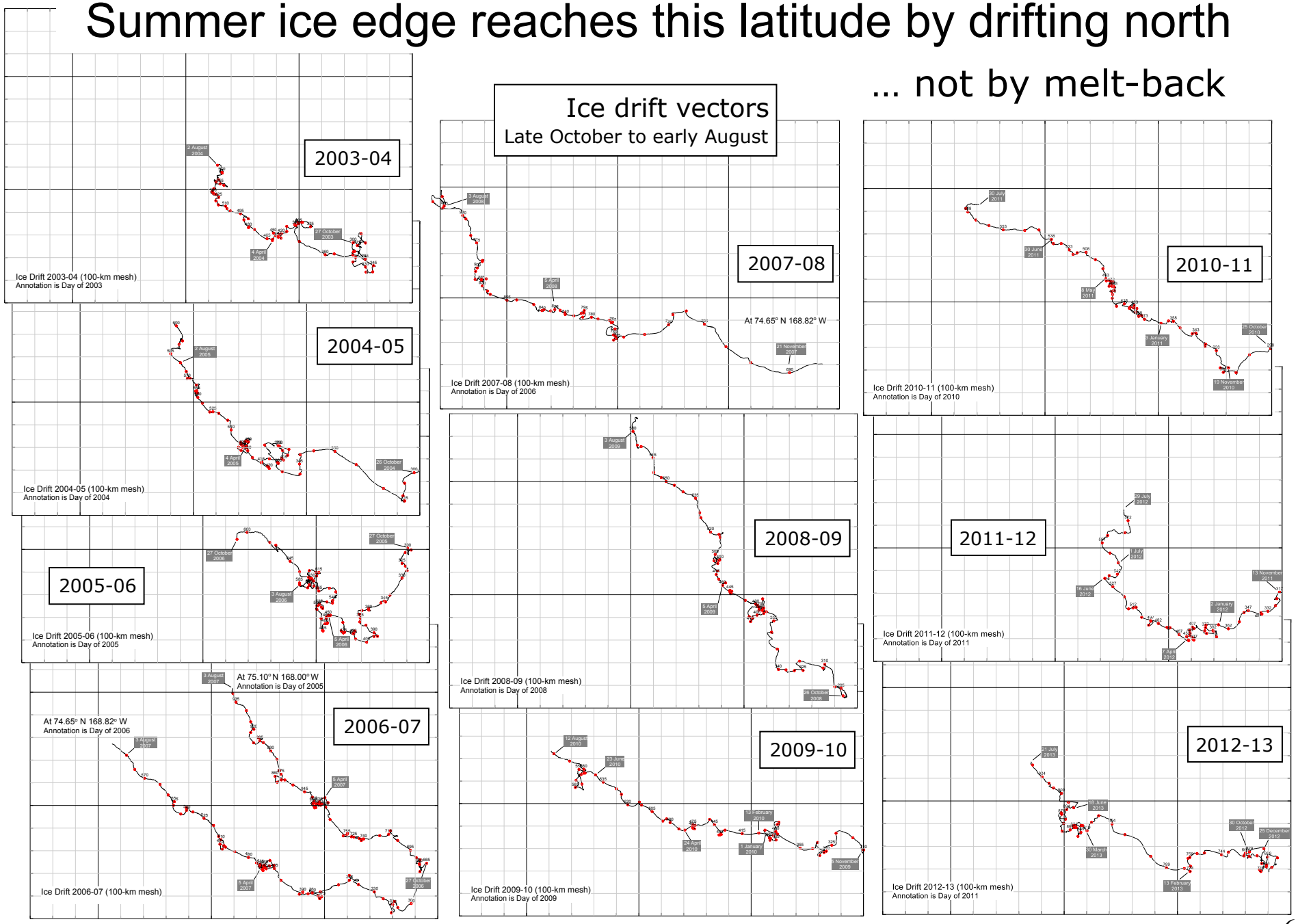
First-year ice now prevalent on the Chukchi Plateau appears stable over the last decade

Formerly, perennial ice here averaged 3-4 m year-round



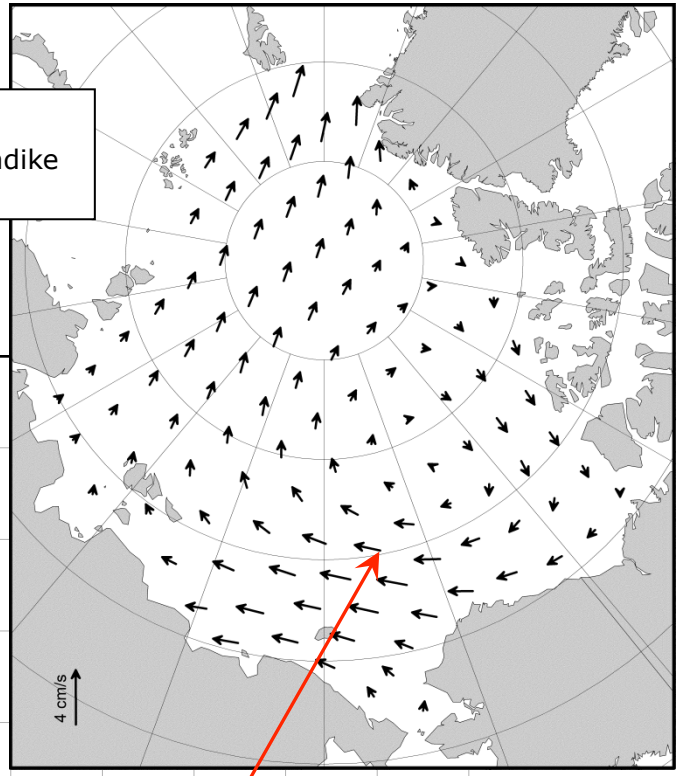
Summer ice edge reaches this latitude by drifting north

… not by melt-back

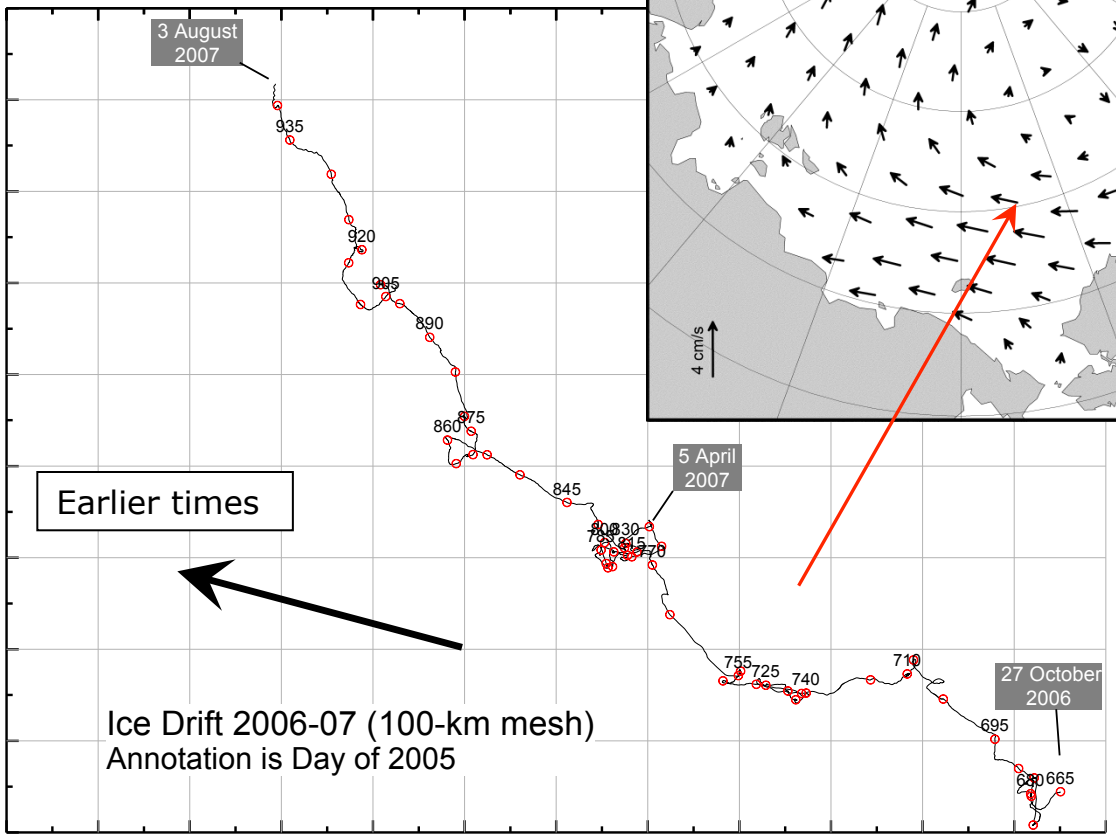


AIM data show that old-ice loss in the Alaskan sector is explained in part by change in ice drift

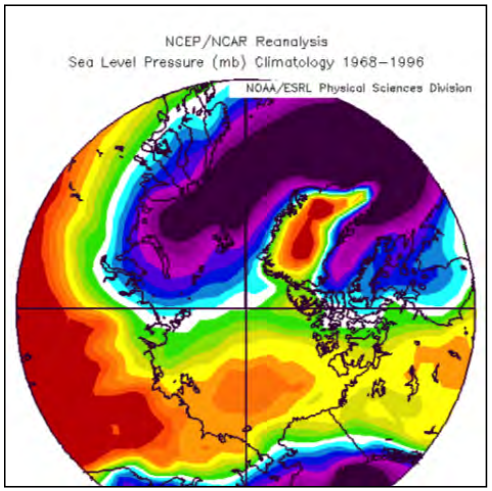
Earlier times
Colony & Thorndike
1984



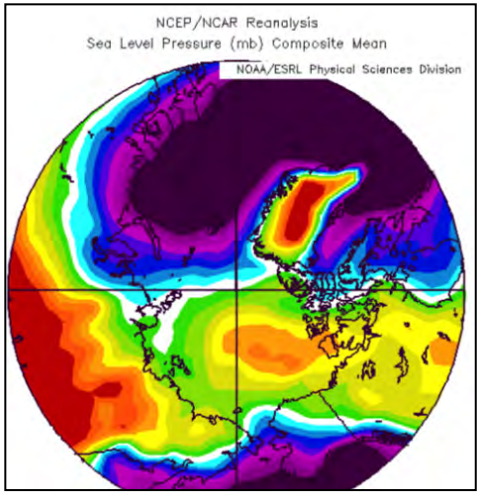
Data from the DFO-NOAA
Chukchi Plateau observatory



Sea level Pressure
Oct through Feb



Winter long-term mean



Winter 2006-07

Ultimately, varying ice-drift is a consequence of varying wind

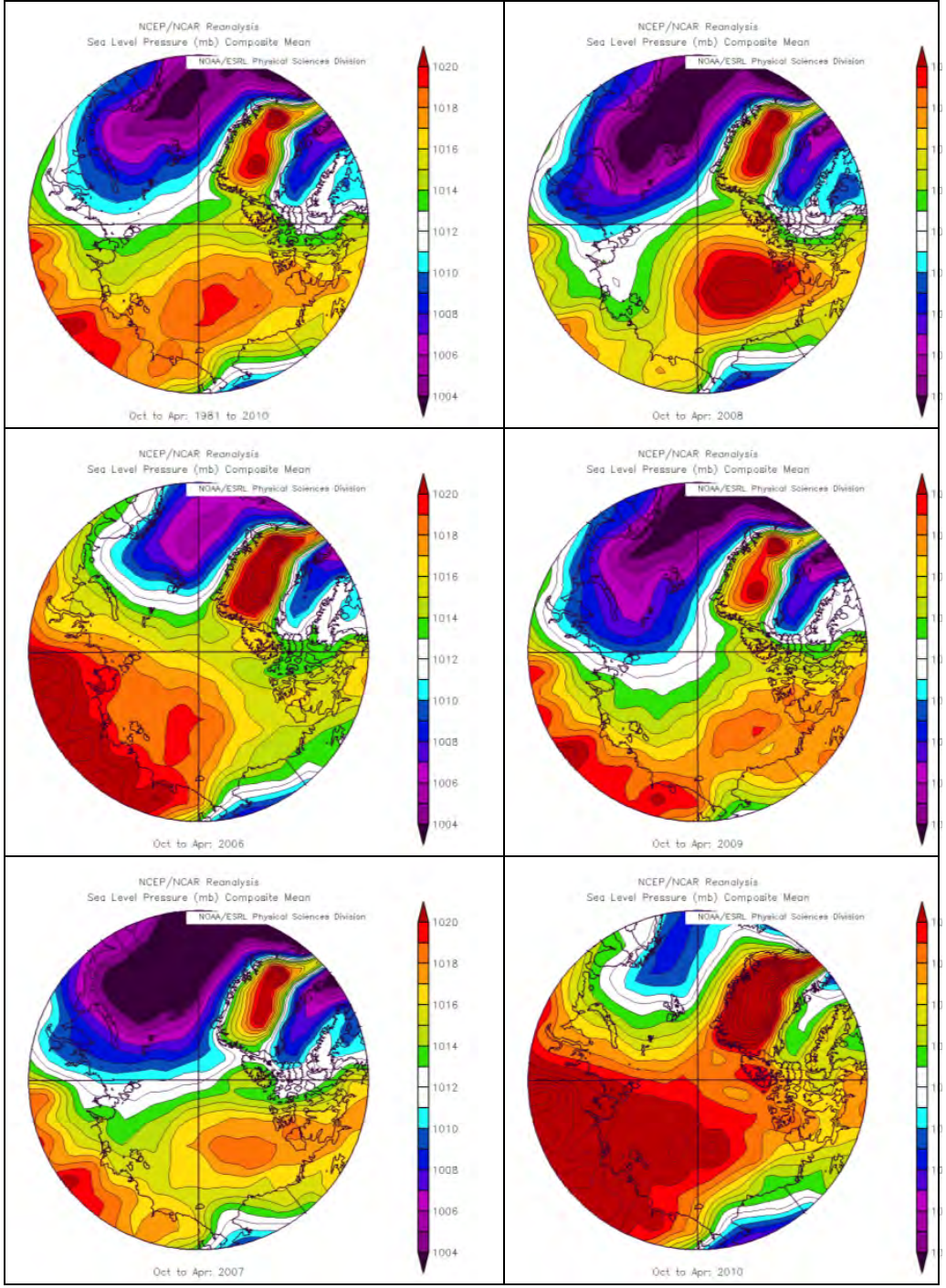
Mean sea-level pressure in **WINTER**:

October through April

30-y mean	2007-08
2005-06	2008-09
2006-07	2009-10

Red: High pressure

Winds circulate clockwise



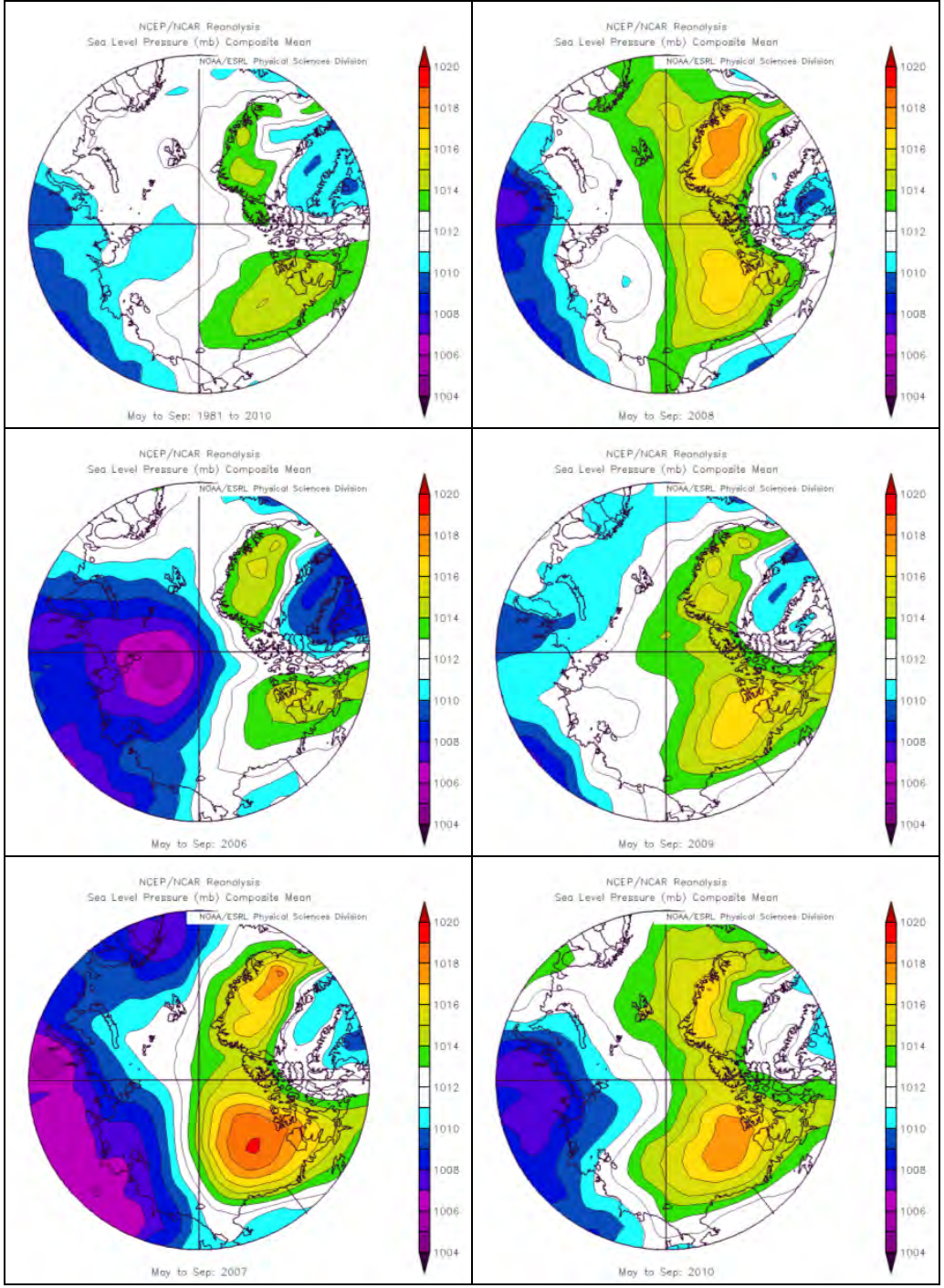
Mean sea-level pressure in **SUMMER**:

May through September

30-y mean	2008
2006	2009
2007	2010

Red: High pressure

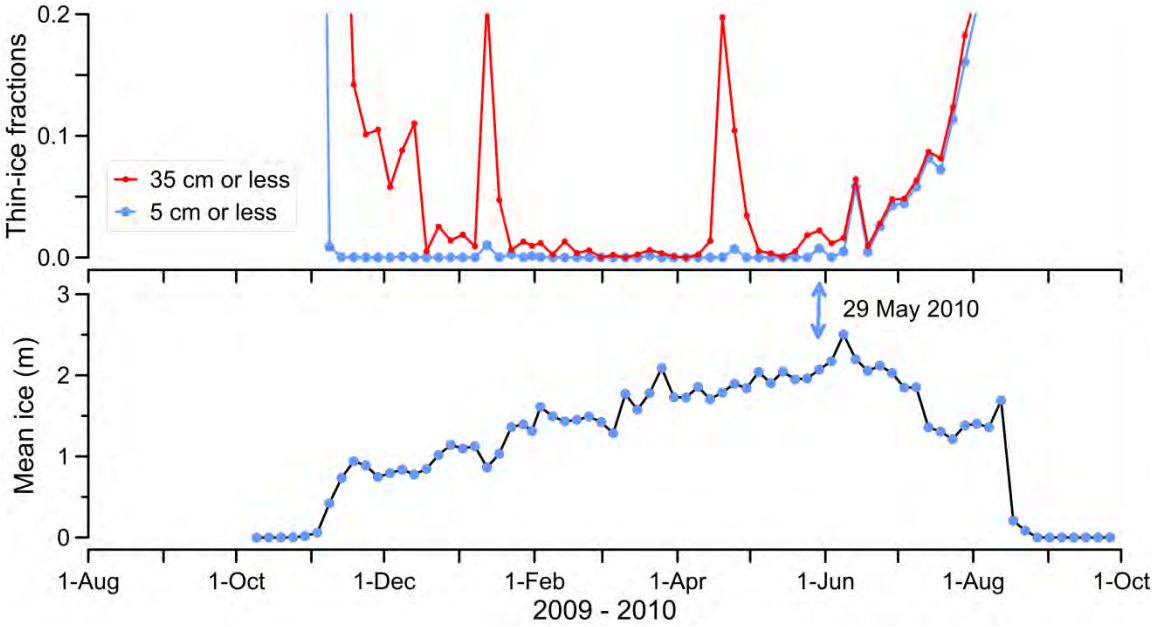
Winds circulate clockwise

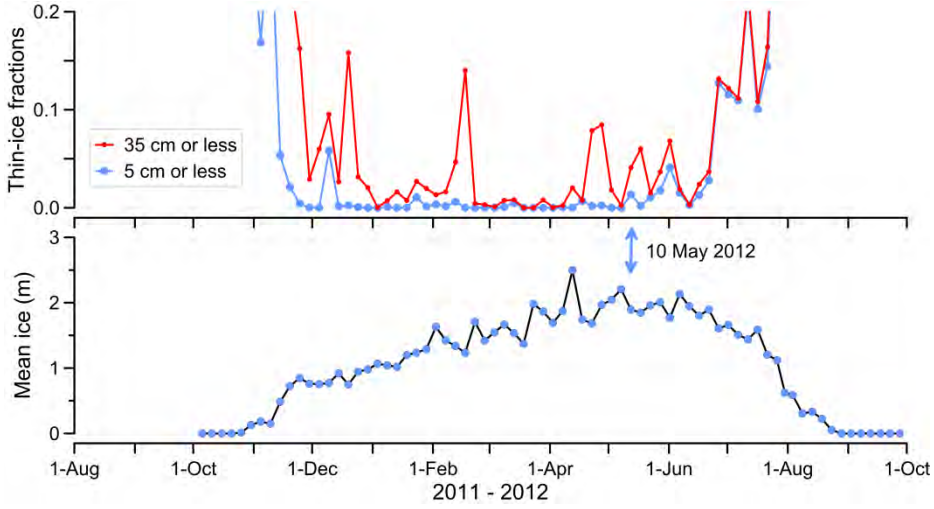


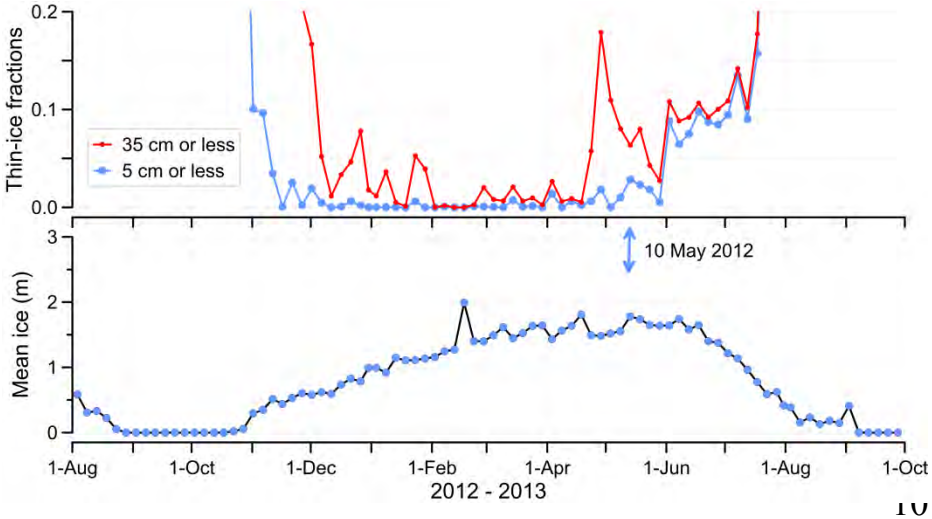
Precise ice-thickness data permit calculation of biological relevant ice-cover metrics have

Here shown:

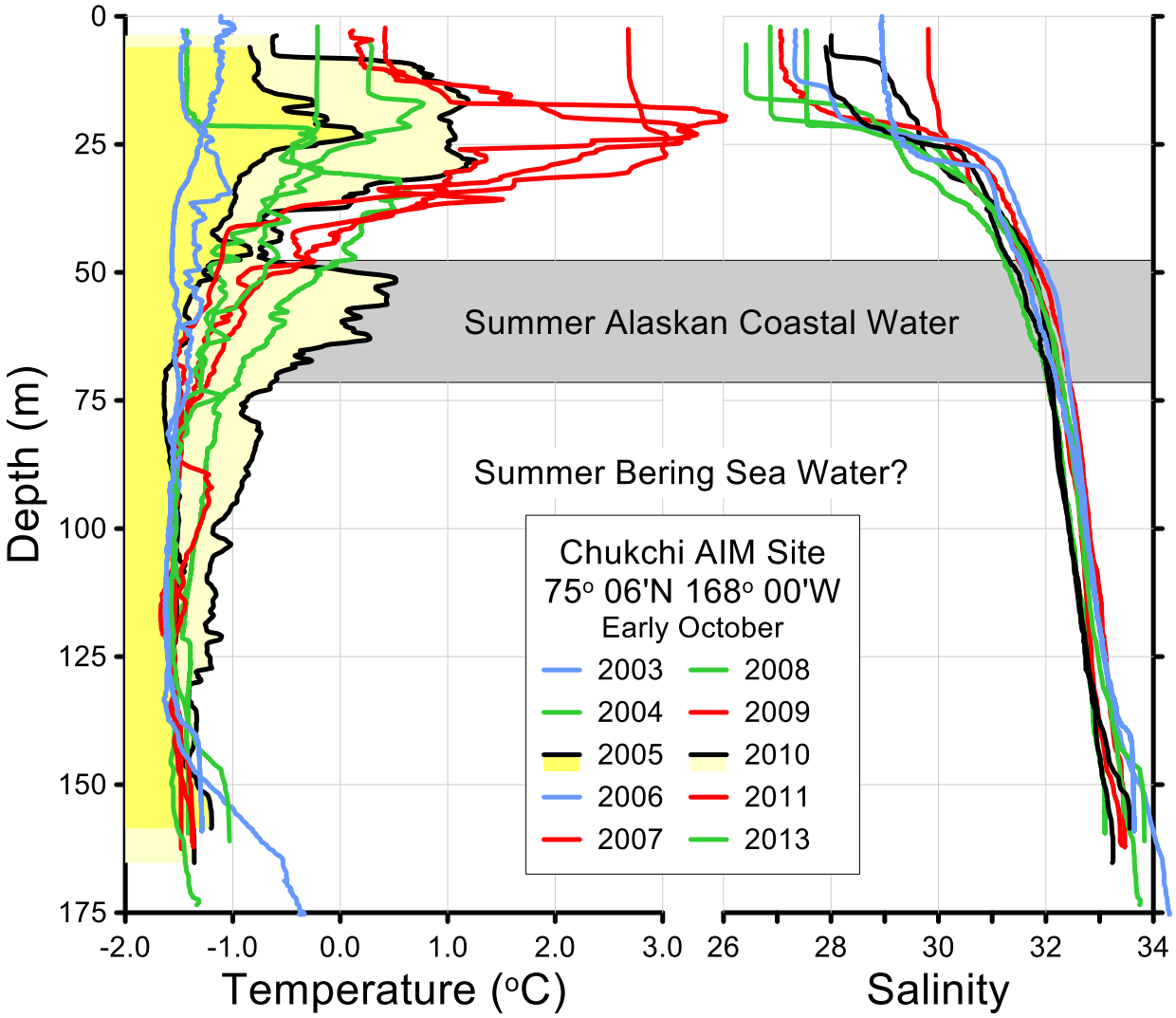
Coverage fractions of open water &of ice less than 1 foot thick







Summer Pacific Halocline Water at the Chukchi AIM site



Modified Pacific Water that flows to the Arctic Ocean in summer is identifiable via temperature maxima within the halocline

Steele et al (2004)

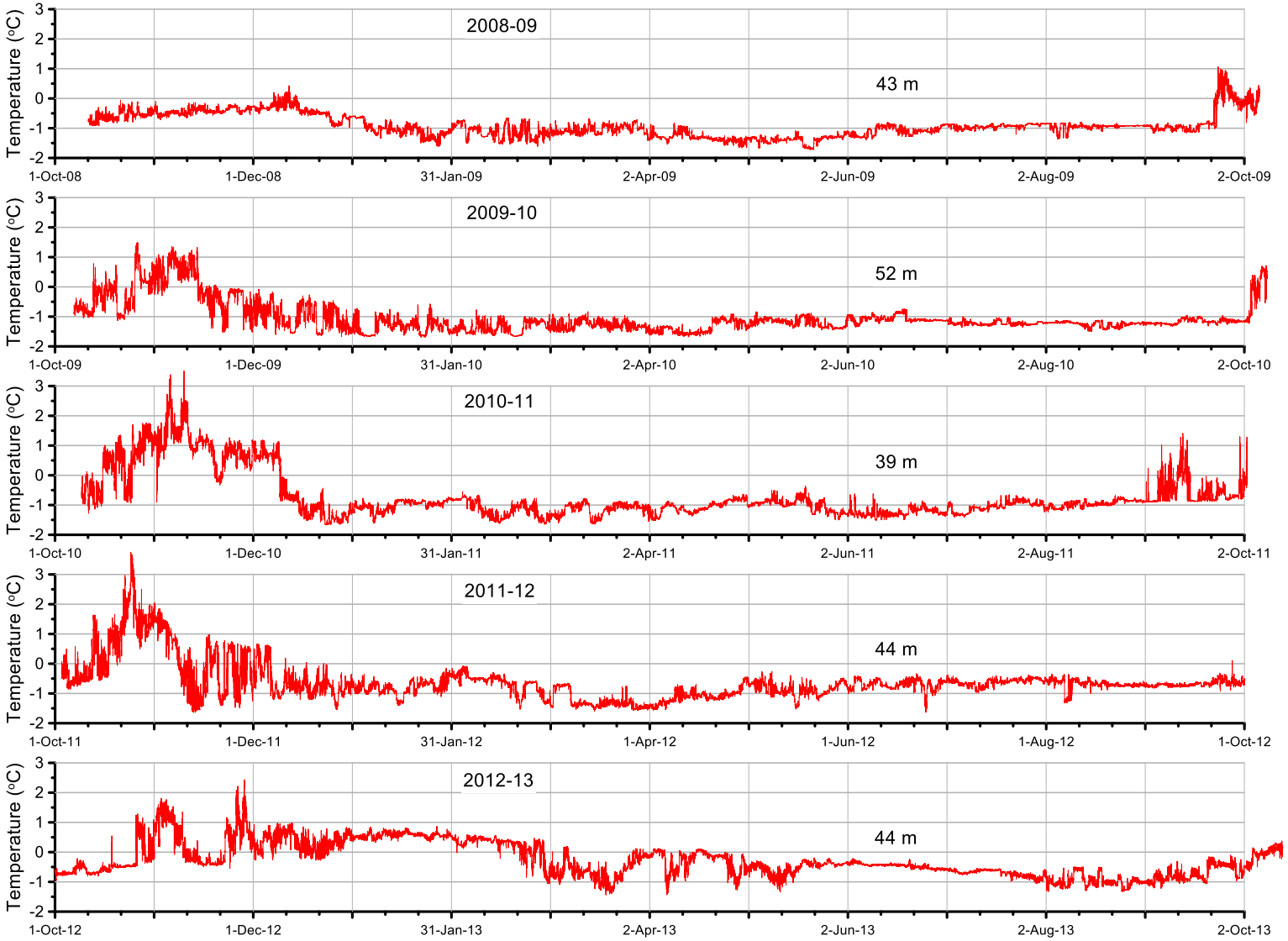
Warm Pacific inflow has been implicated in "melting back" perennial pack ice within the Pacific sector

However …

Annual CTD profiles in early October have revealed summer Pacific-origin water only once (in 2010) since 2003

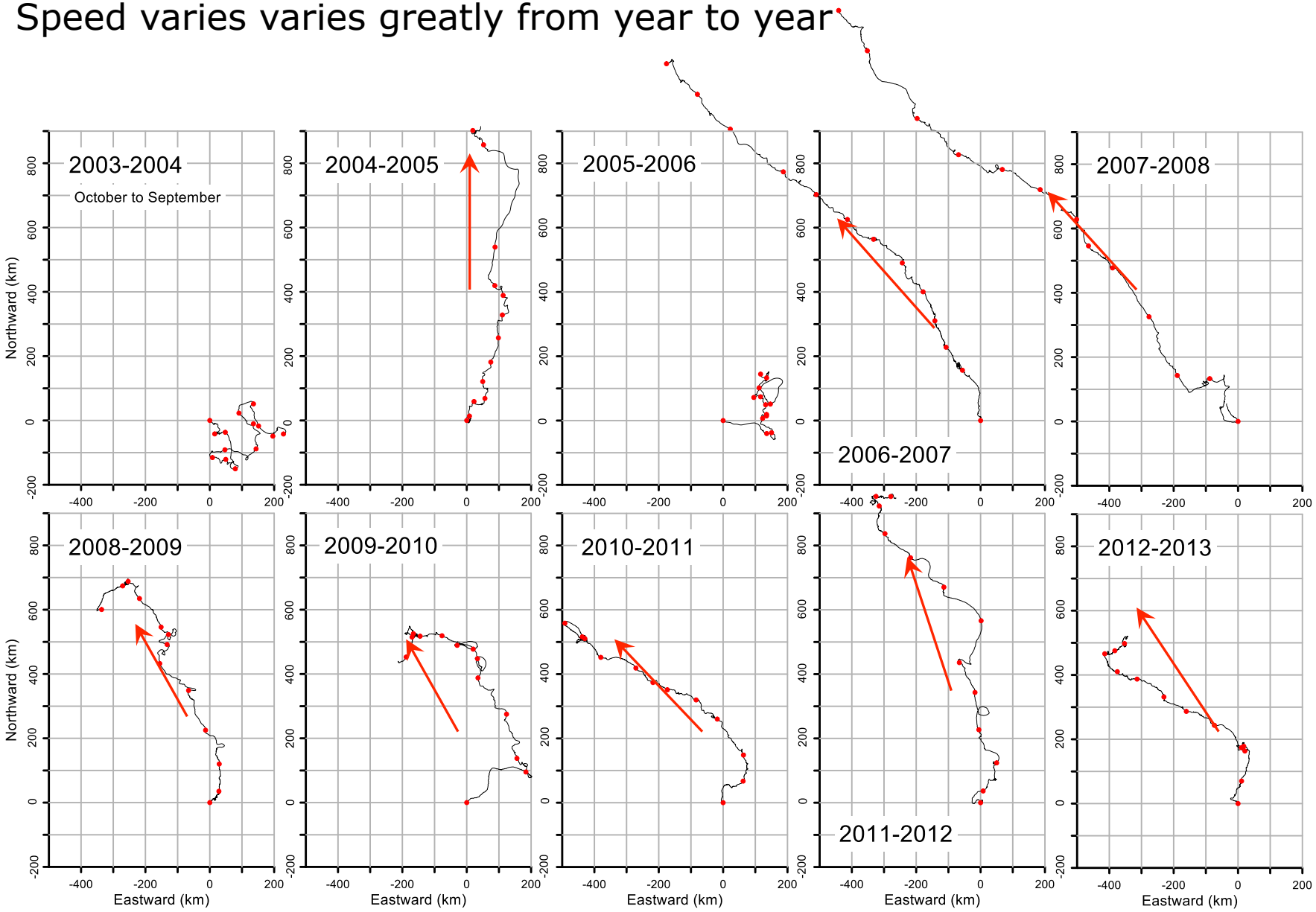
Summer Pacific Water at 40-50 m depth does reach Chukchi AIM in most years

… but it arrives in October, too late to influence summer ice extent

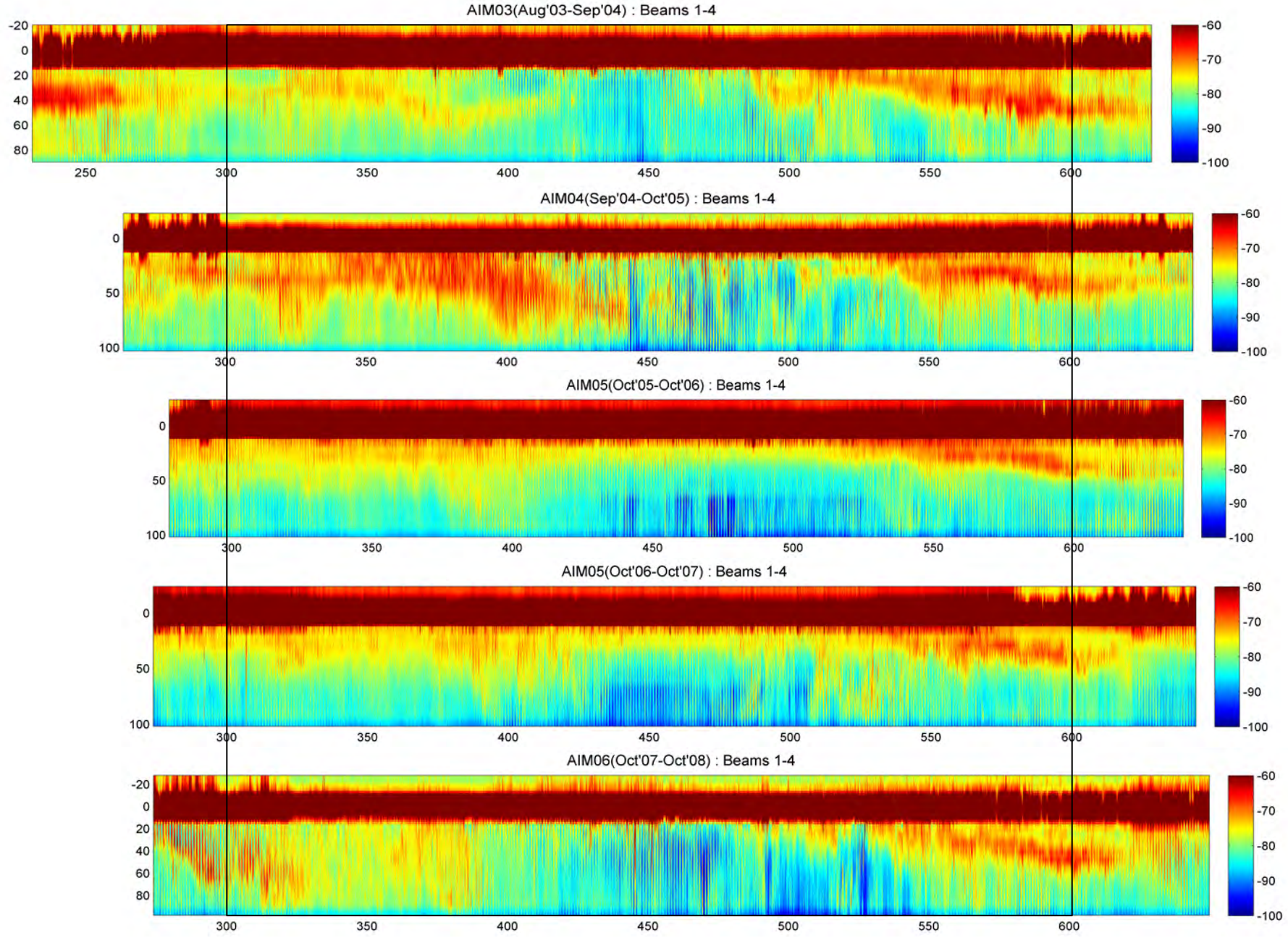


Pacific water approaches Chukchi AIM from the SSE

Speed varies varies greatly from year to year



Zooplankton back-scatter, 2003-2008



Zooplankton back-scatter, 2008-2013