Satellite Measurements across the DBO

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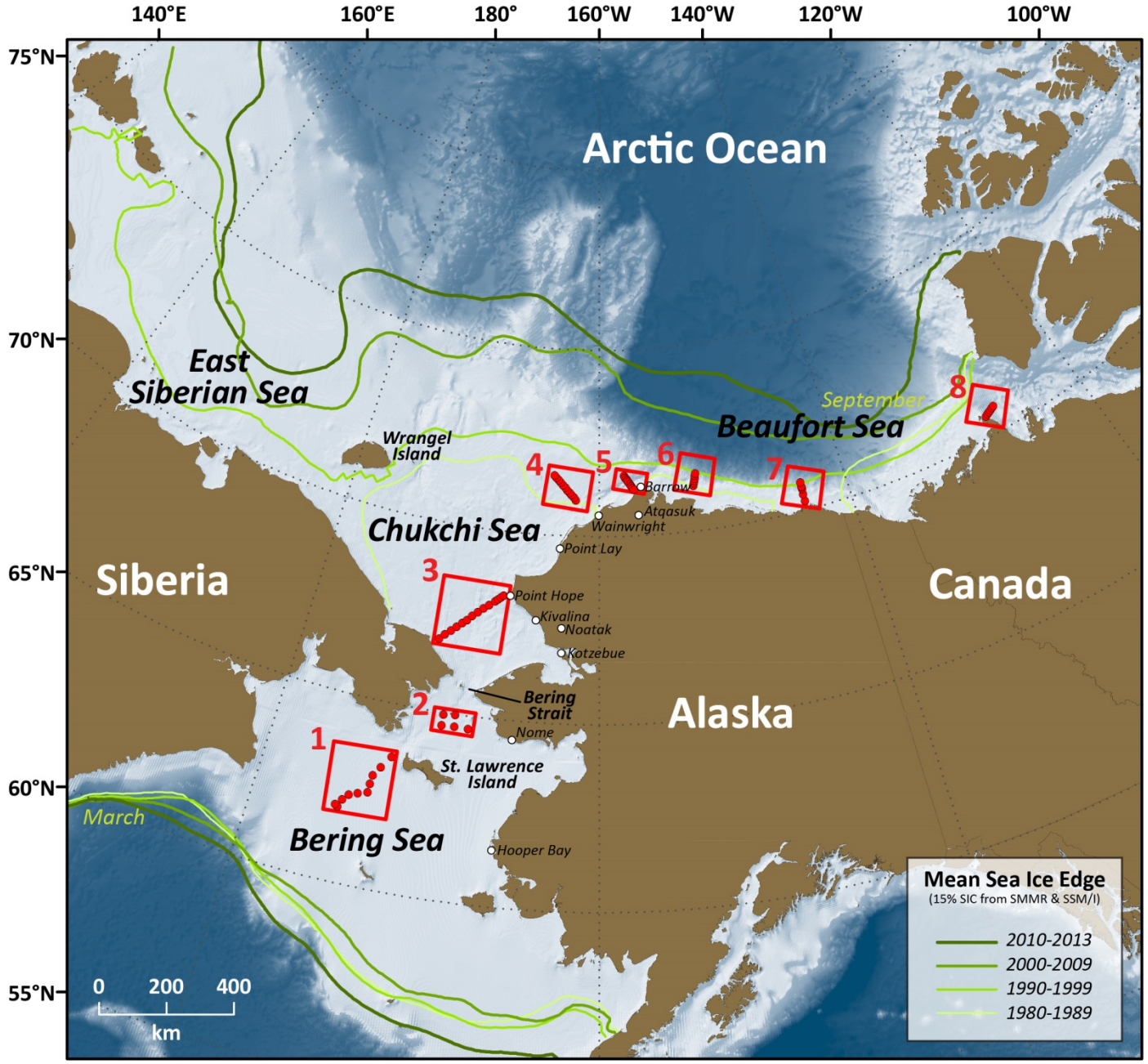
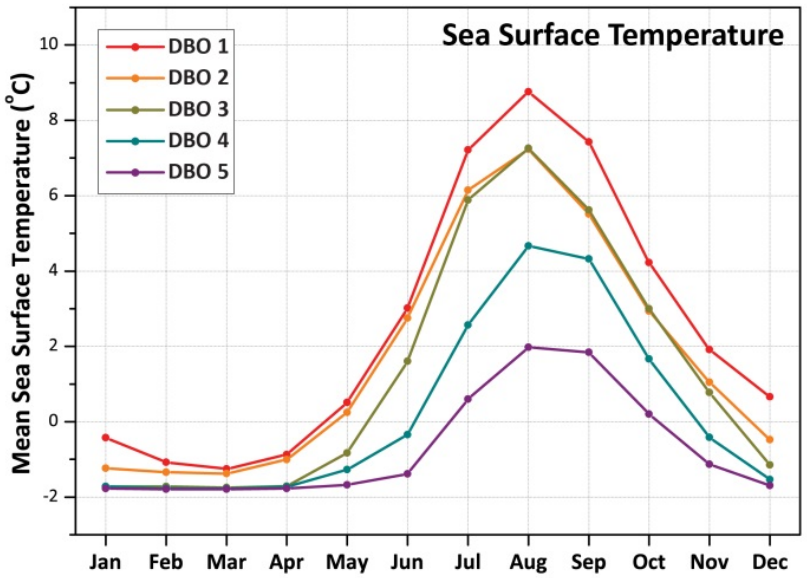
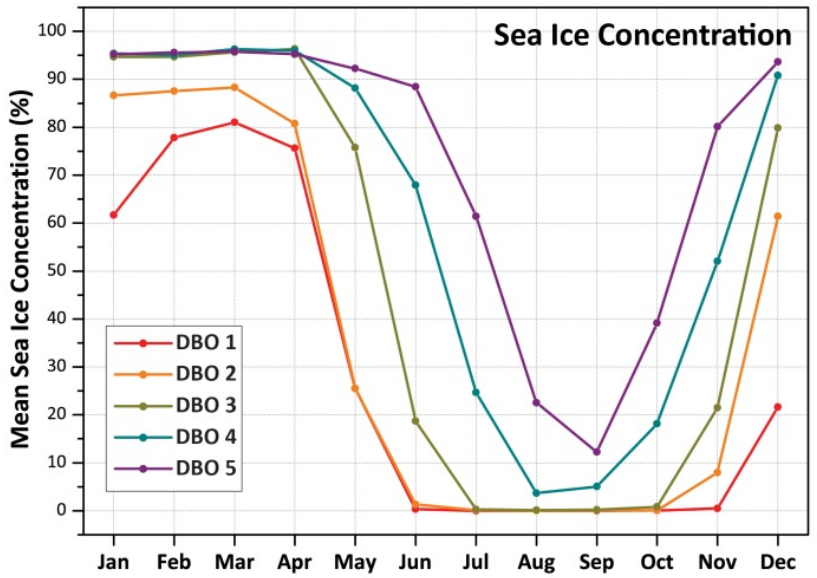
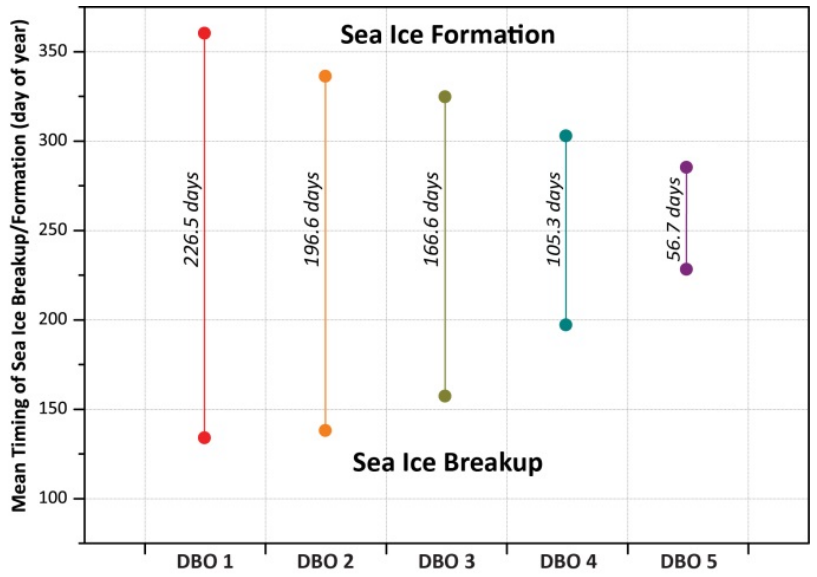
DBO Workshop
NOAA/PMEL, Seattle WA
8 November 2017

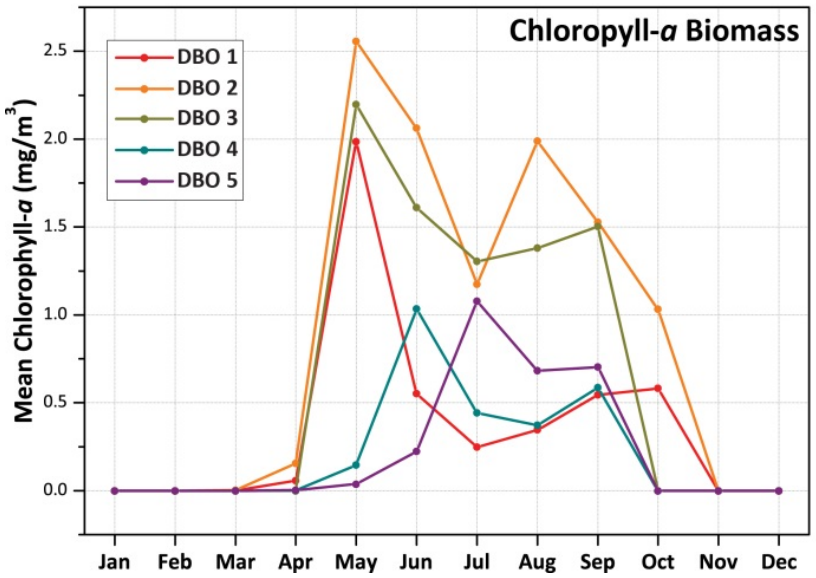

140°E
160°E
180°
160°W
140°W
120°W
100°W
75°N
70°N
65°N
60°N
55°N
Arctic Ocean
East Siberian Sea
Wrangel Island
Chukchi Sea
Siberia
Canada
Alaska
Beaufort Sea
September
March
Bering Sea
Bering Strait
St. Lawrence Island
Barrow
Atqasuk
Wainwright
Point Lay
Point Hope
Kivalina
Noatak
Kotzebue
Nome
Hooper Bay
1
2
3
4
5
6
7
8
0
200
400
km
Mean Sea Ice Edge
(15% SIC from SMMR & SSM/I)
2010-2013
2000-2009
1990-1999
1980-1989

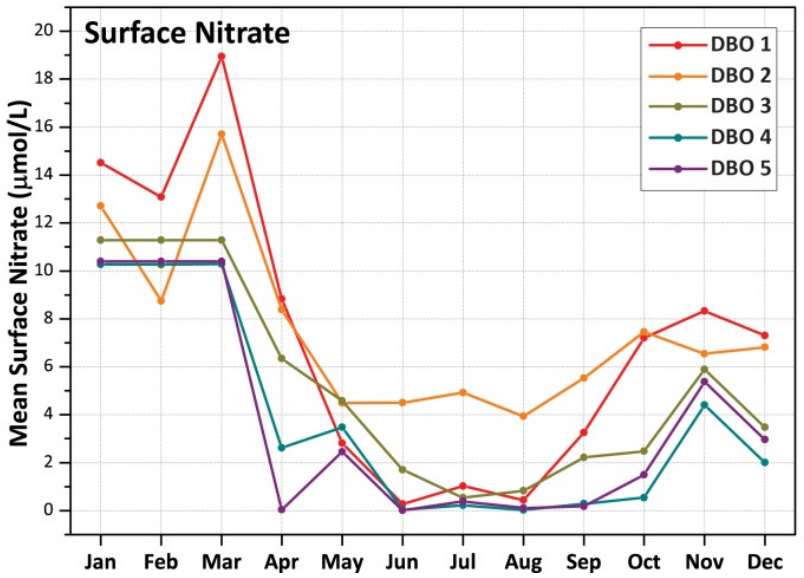
Monthly Mean DBO Climatologies (DBO 1–5)

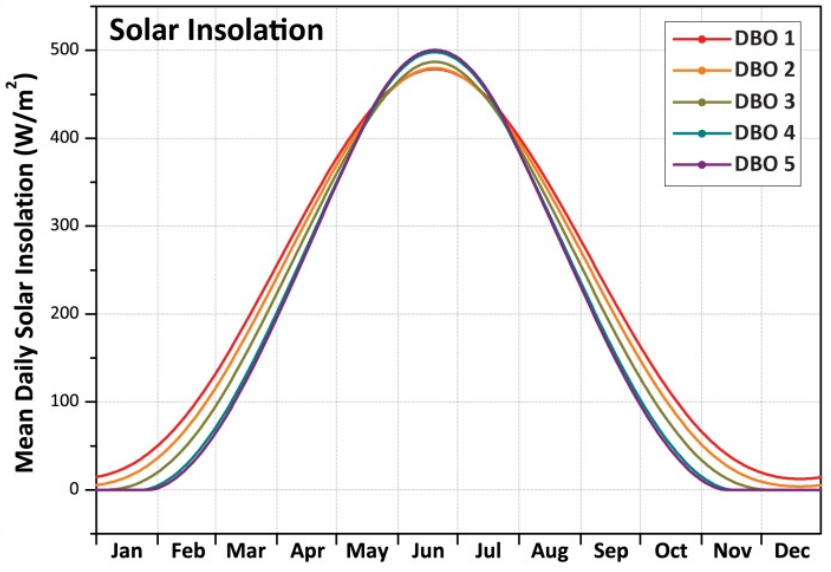


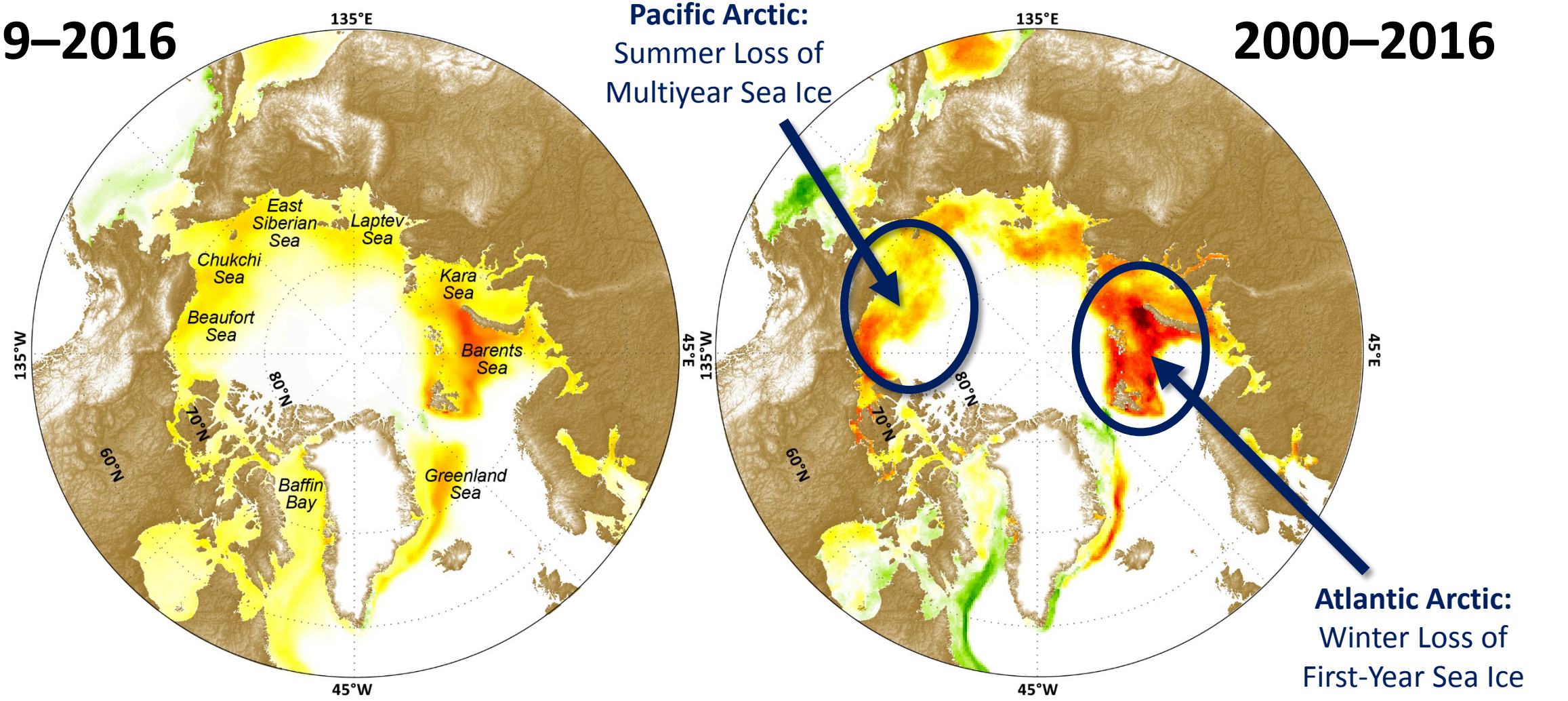








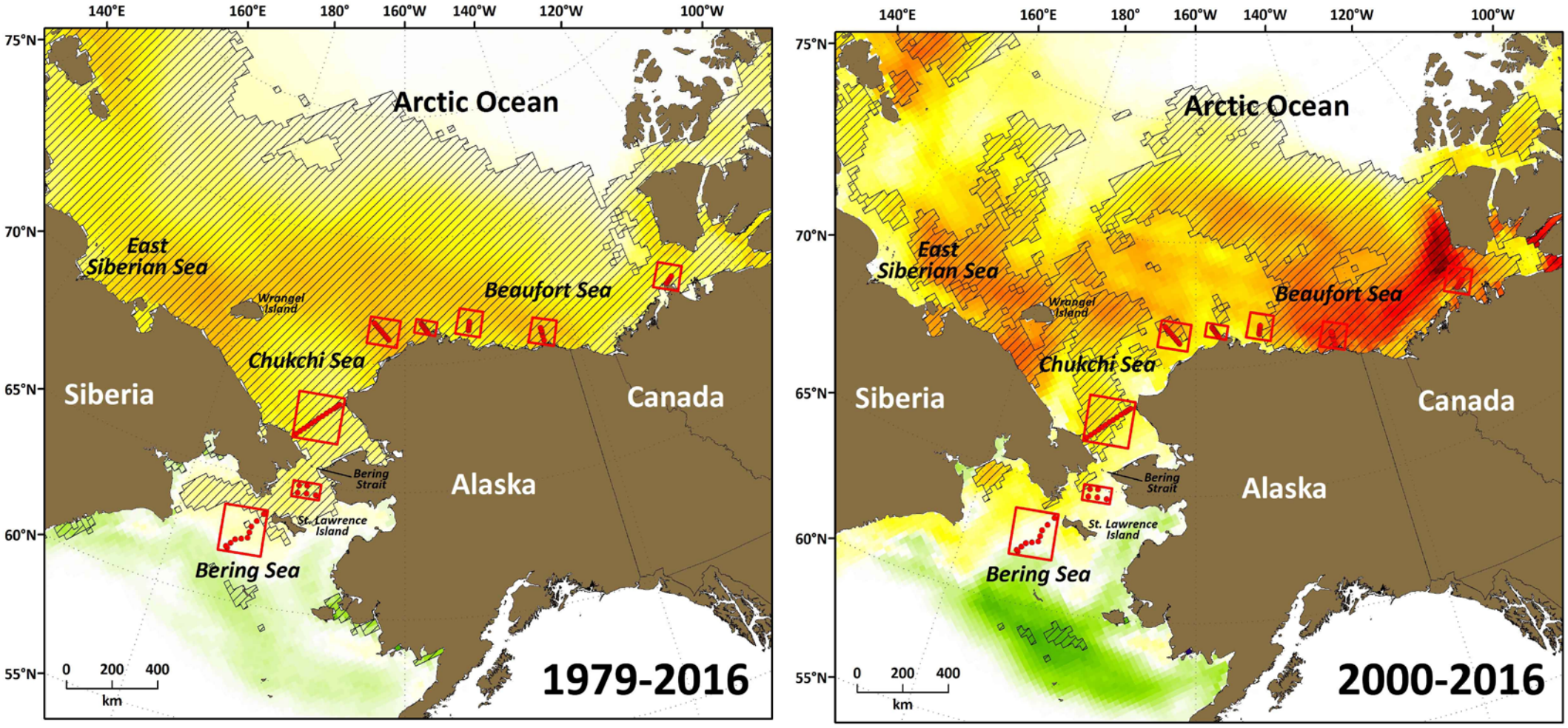



1979–2016
2000–2016
Pacific Arctic:
Summer Loss of
Multiyear Sea Ice
Atlantic Arctic:
Winter Loss of
First-Year Sea Ice
135°E
135°W
45°E
45°W
80°N
70°N
60°N
East Siberian Sea
Laptev Sea
Chukchi Sea
Kara Sea
Beaufort Sea
Barents Sea
Baffin Bay
Greenland Sea
Trends in Annual Sea Ice Persistence (days/year)
≤-10 -8 -6 -4 -2 0 2 4 6 8 ≥10
Based on SSMR and SSM/I satellite data

Trends in Annual Sea Ice Persistence (DBO 1–8)

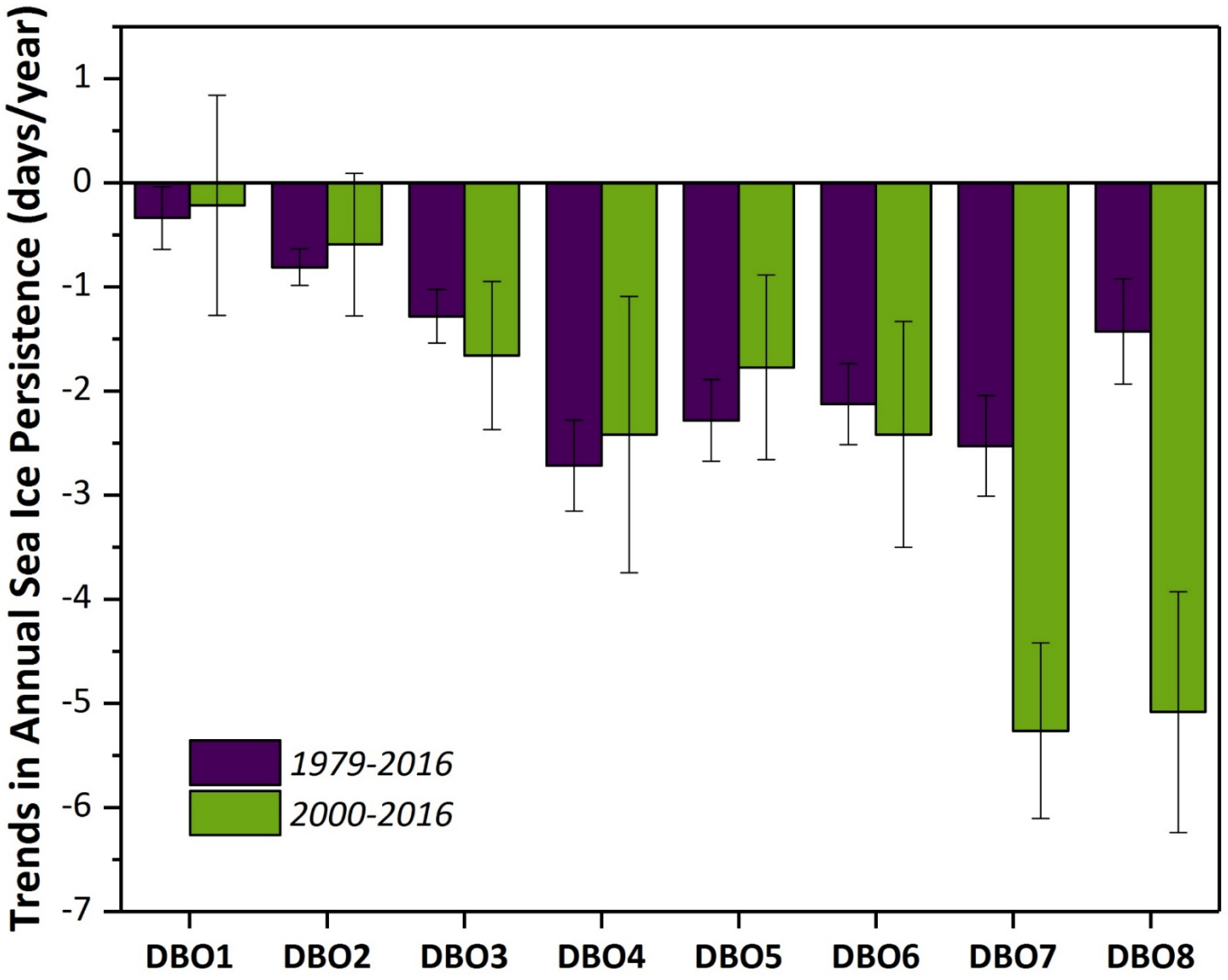
Hatching indicates statistically significant trends (Mann-Kendall p<0.1)

Trends in annual sea ice persistence have accelerated since 2000



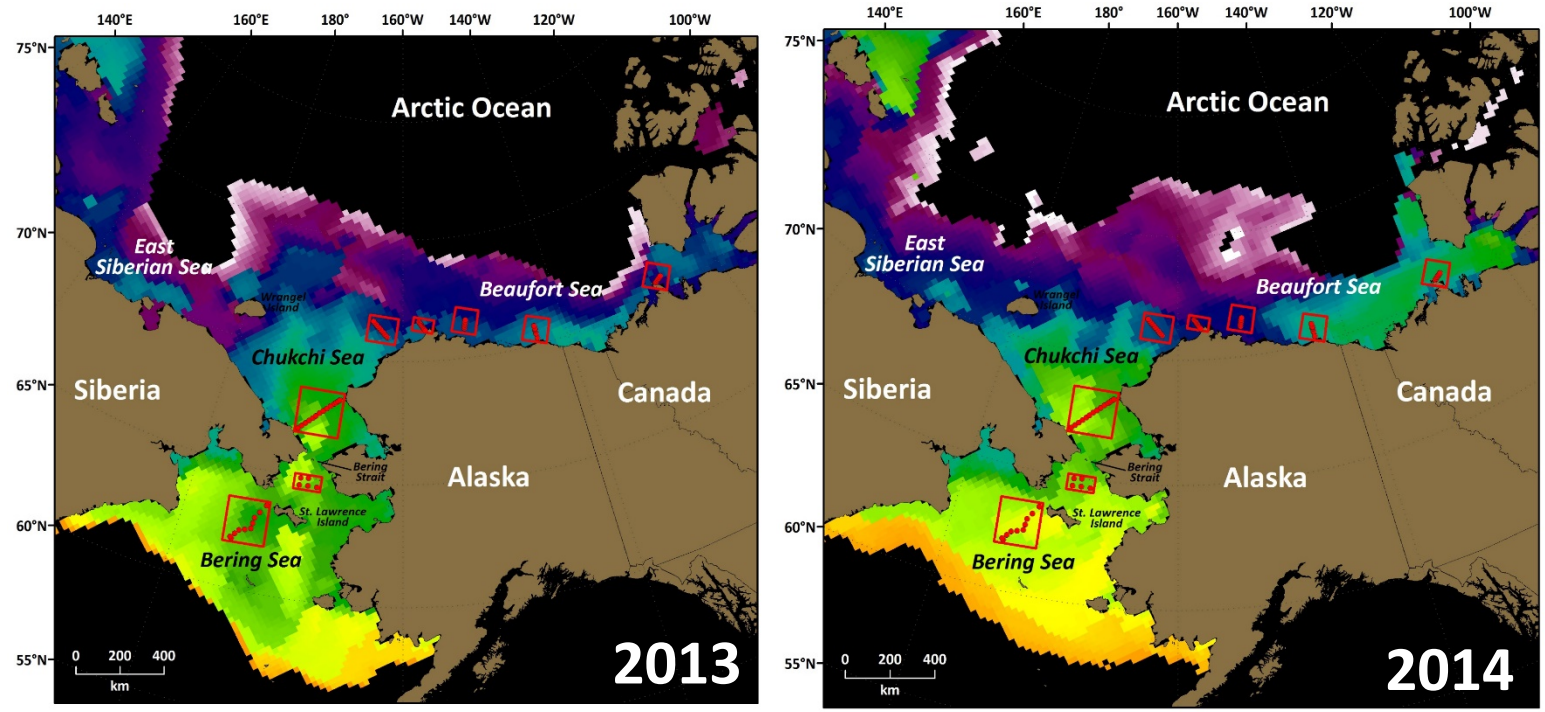
Trends in Annual Sea Ice Persistence (DBO 1–8)

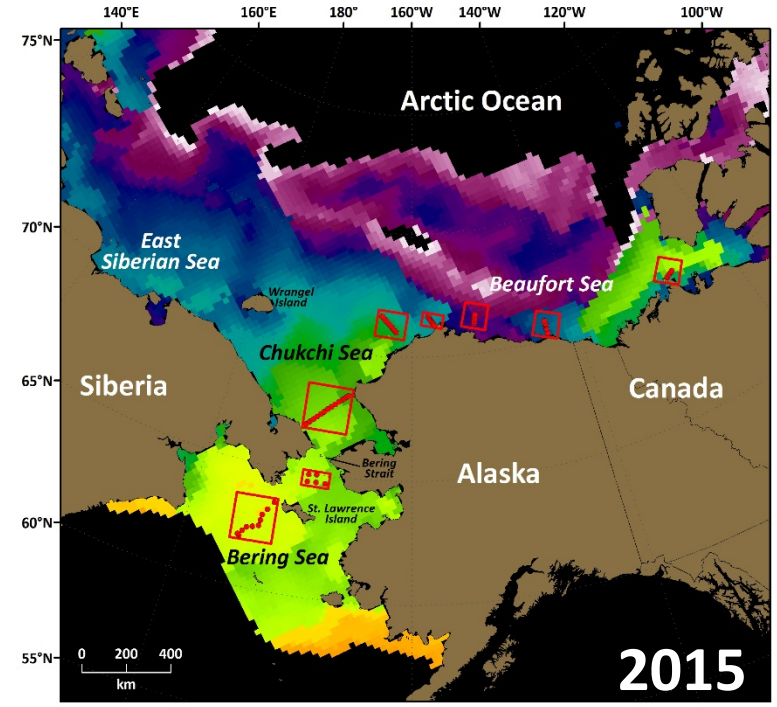
Trends in annual sea ice persistence have accelerated since 2000
Error bars represent standard errors of the linear trends

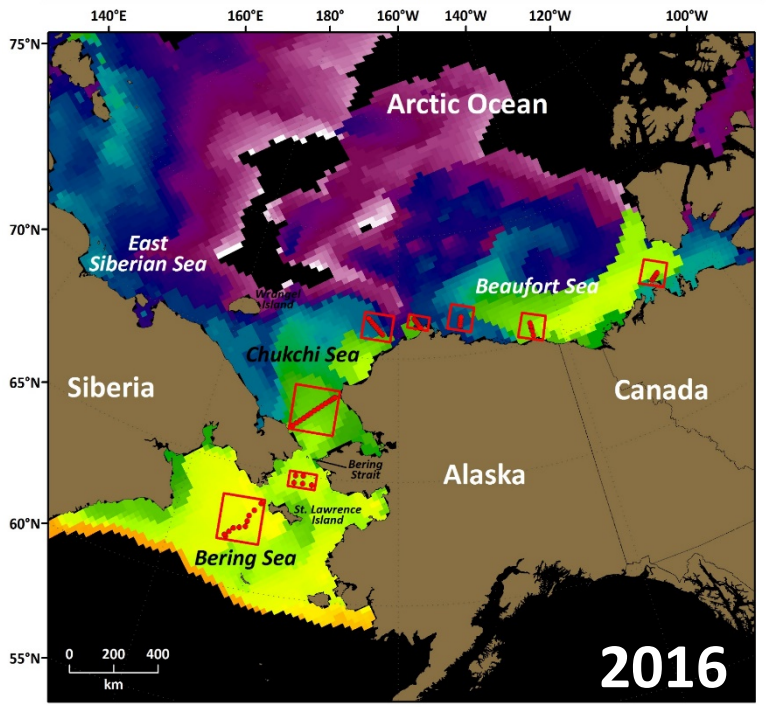


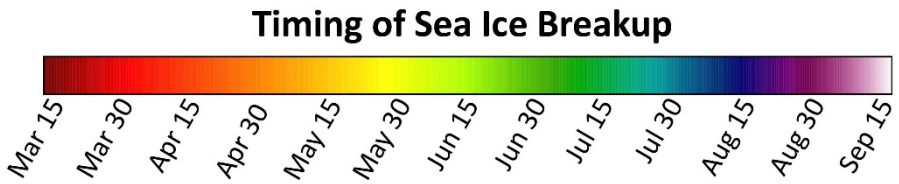
Timing of Sea Ice Breakup 2013–2016

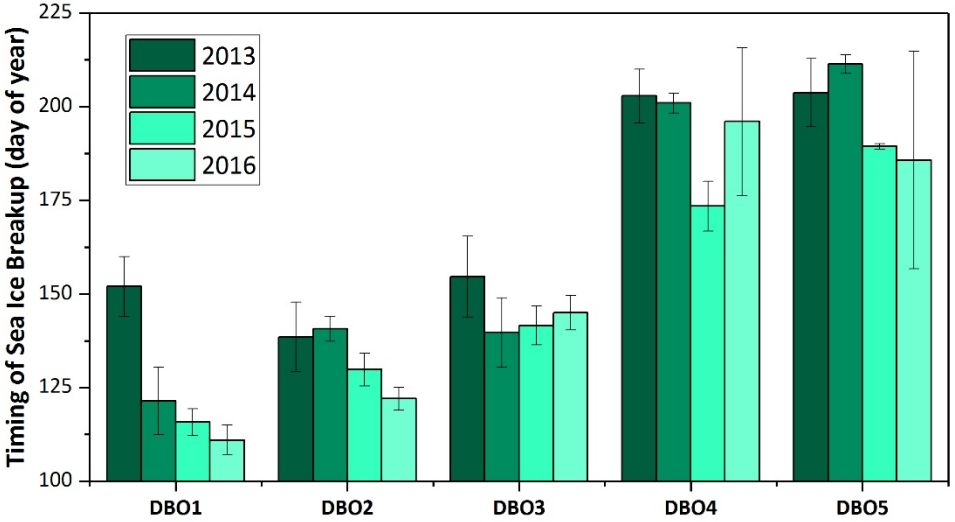
based on SSM/I satellite data

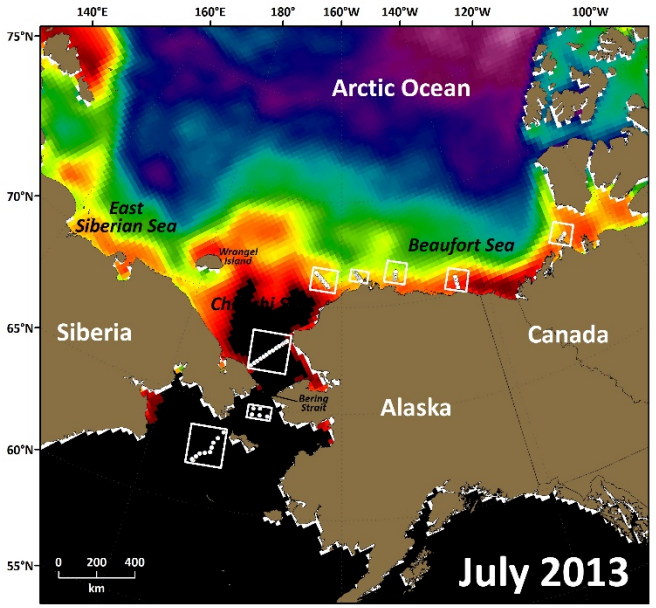


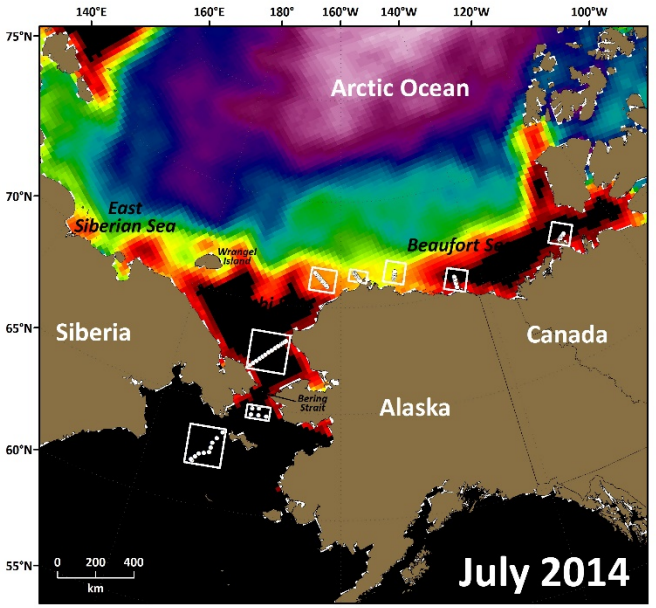


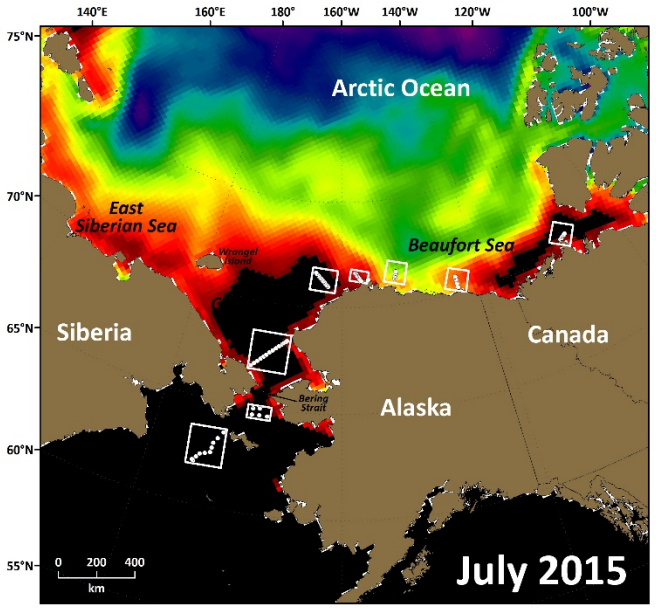


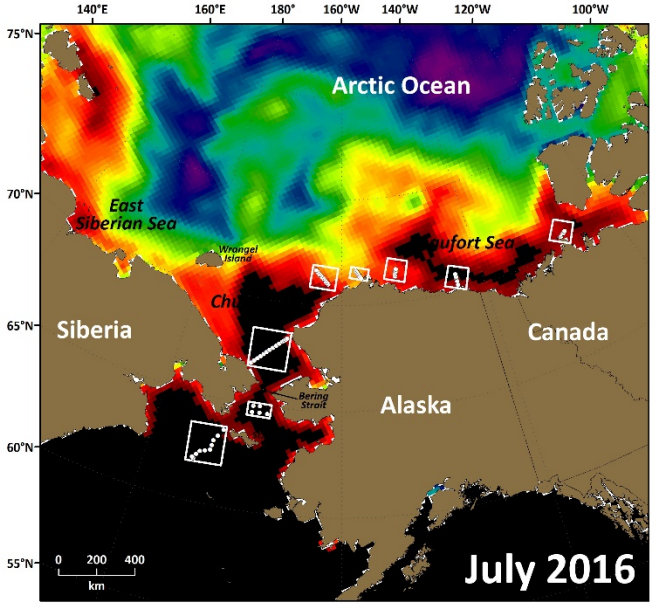


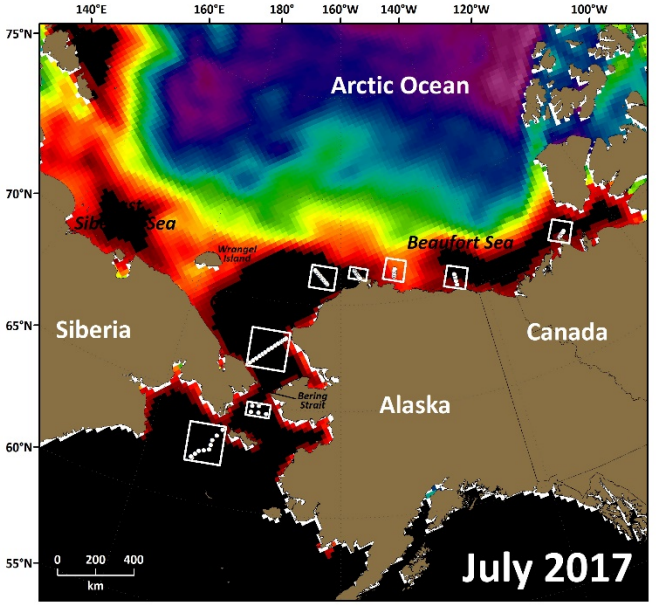


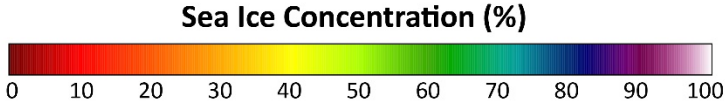








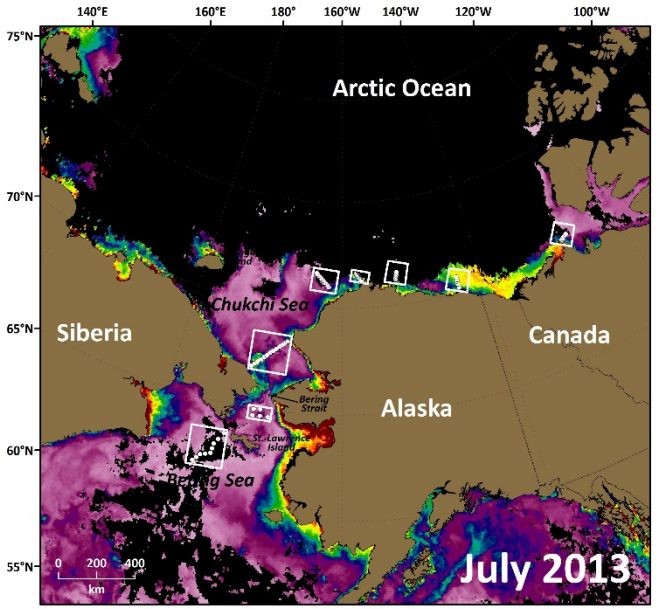


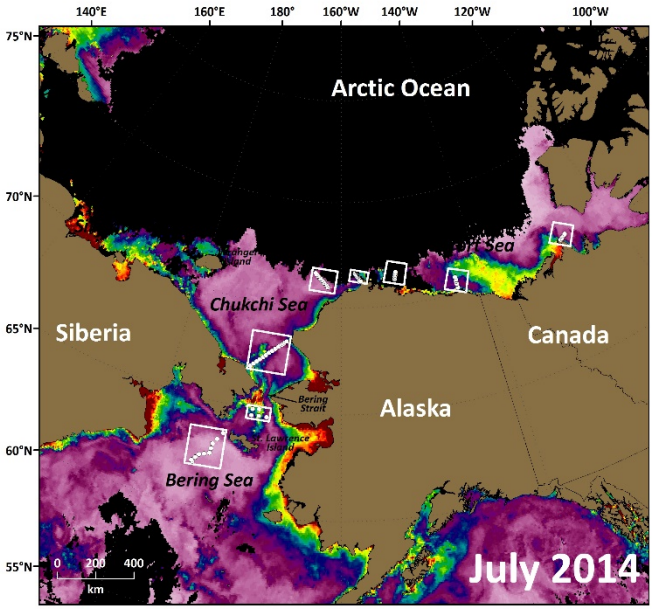


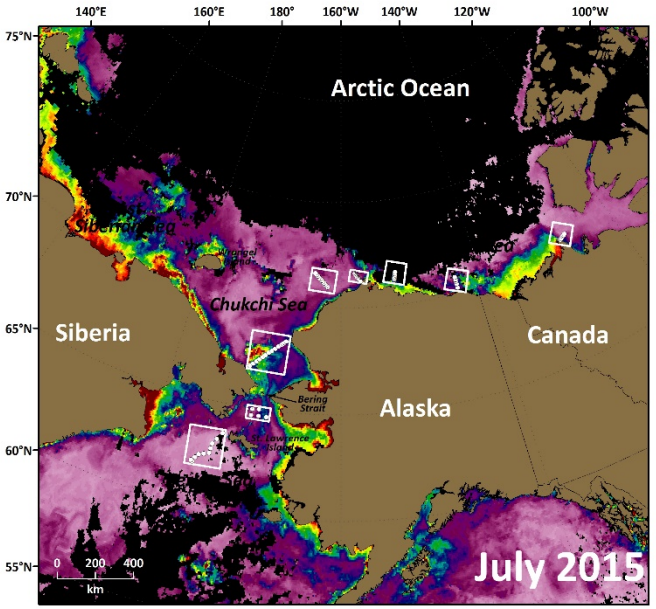
July Sea Ice Concentration (SSM/I)

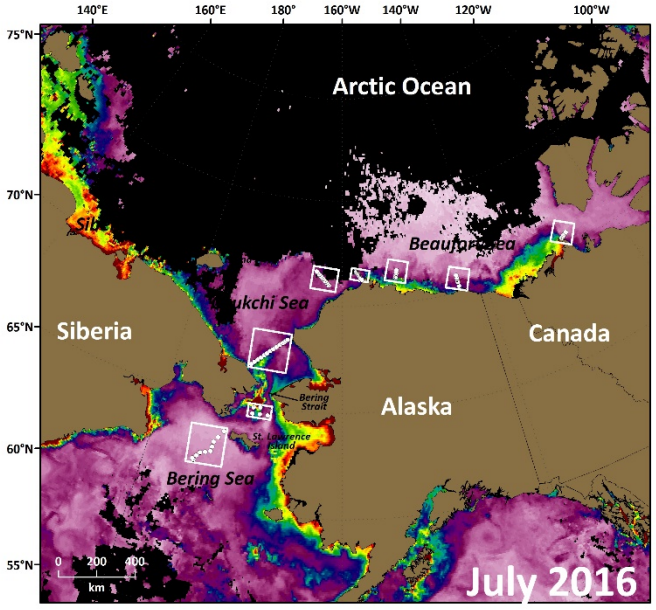
2013-2017 (corresponding to the NSF/AON Laurier cruises)

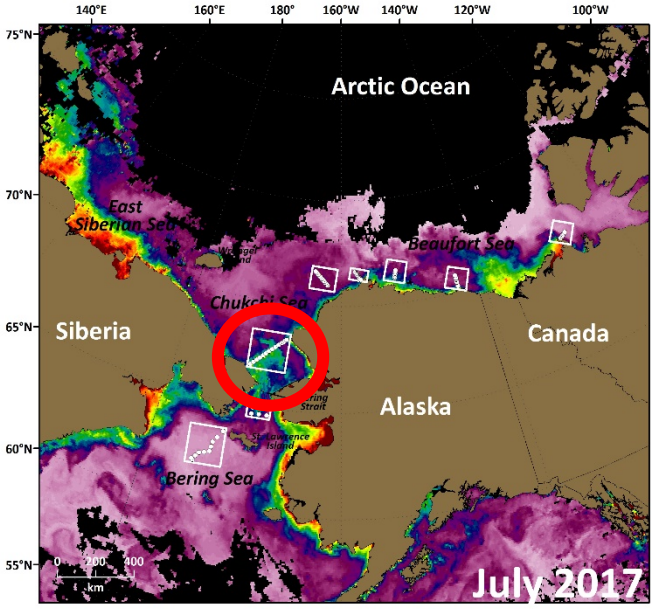
High interannual variability, but less ice in 2015 and 2016

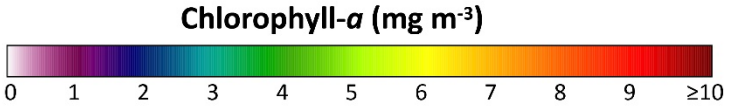












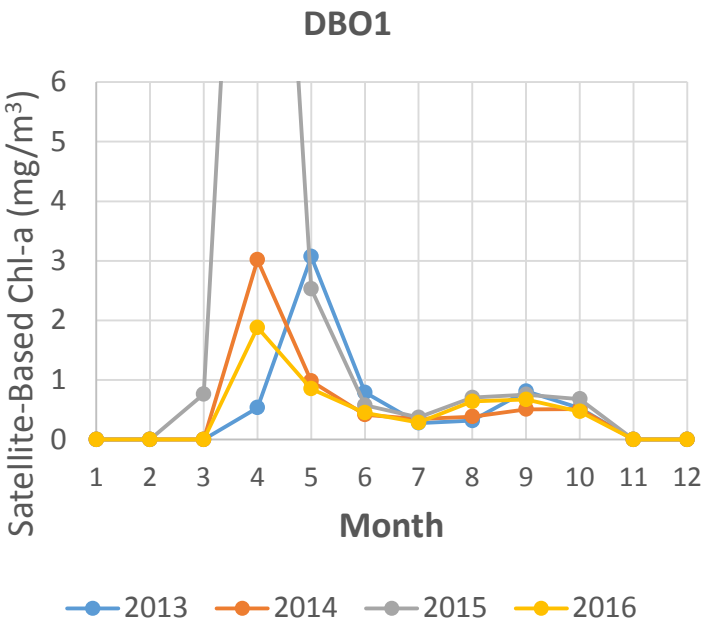
Chlorophyll-*a* Concentrations (MODIS-Aqua)

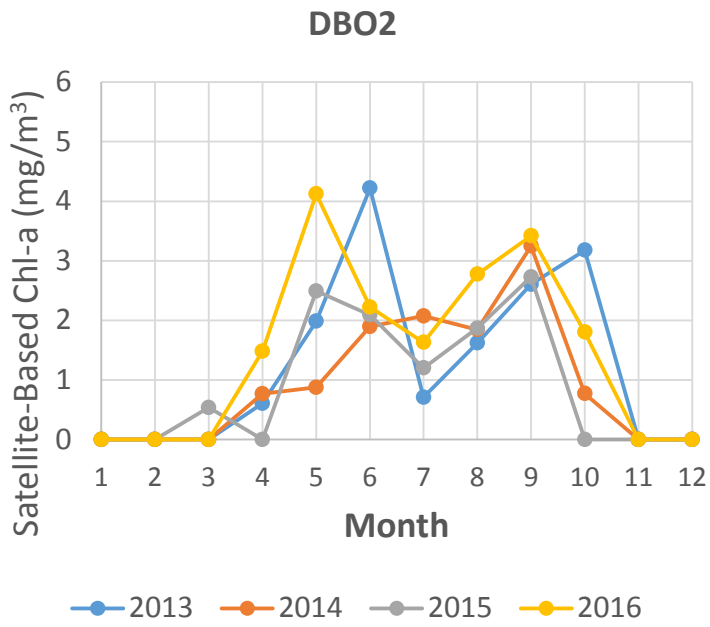
2013-2017 (corresponding to the NSF/AON Laurier cruises)

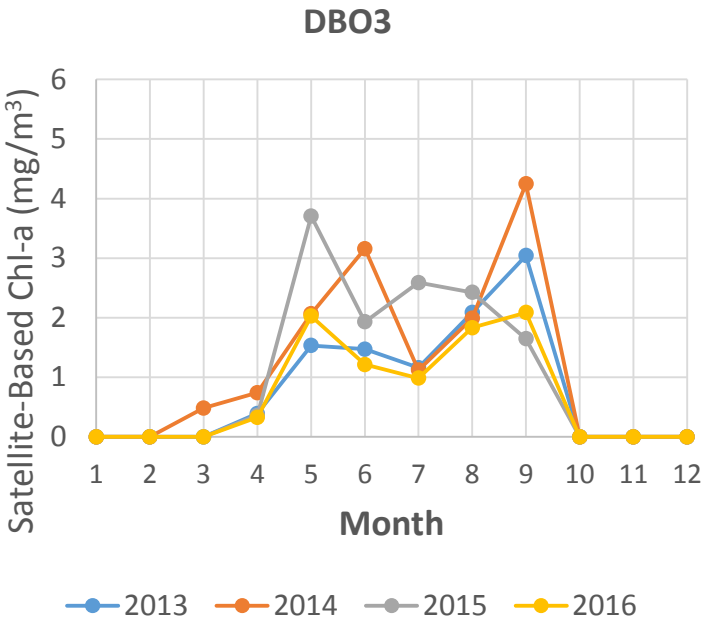
Most extensive bloom for DBO3 was in 2017

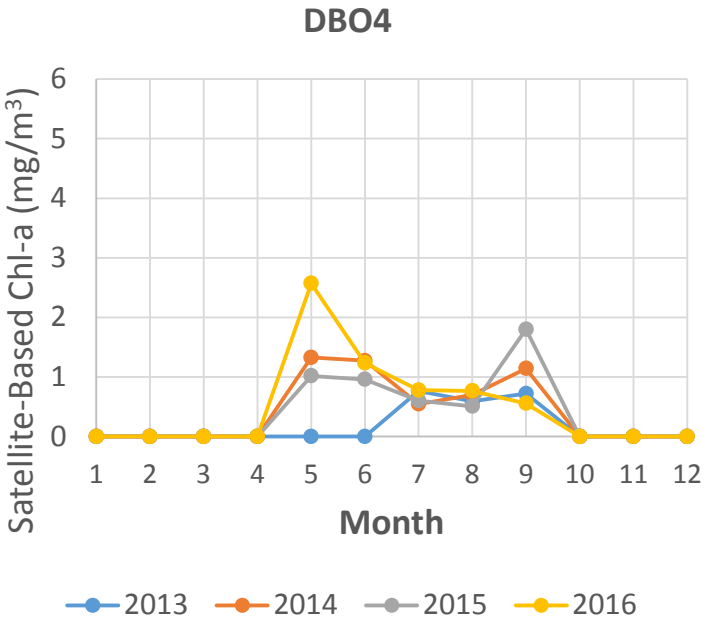
Monthly and Interannual Variability of Chl-a

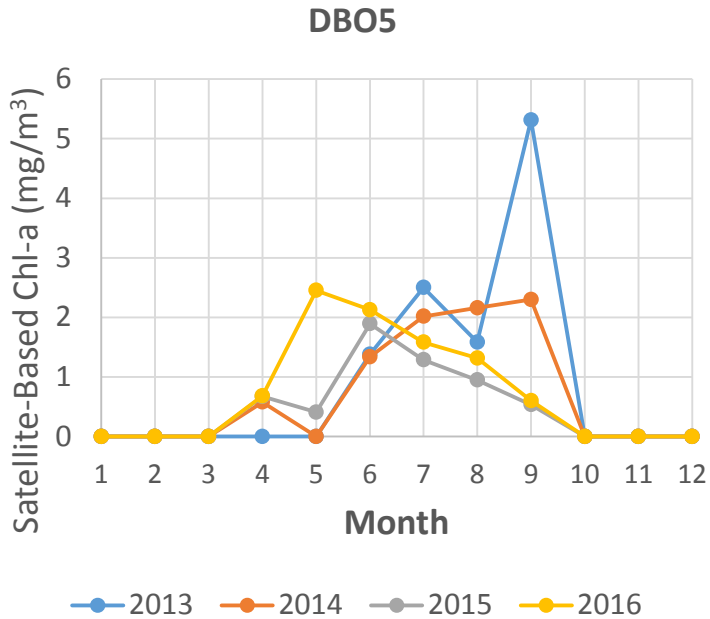
based on MODIS-Aqua satellite data

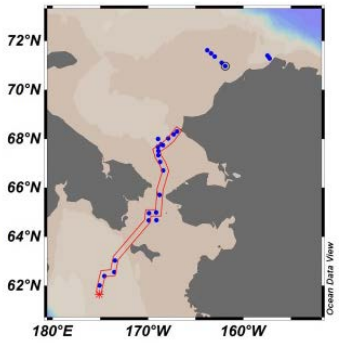










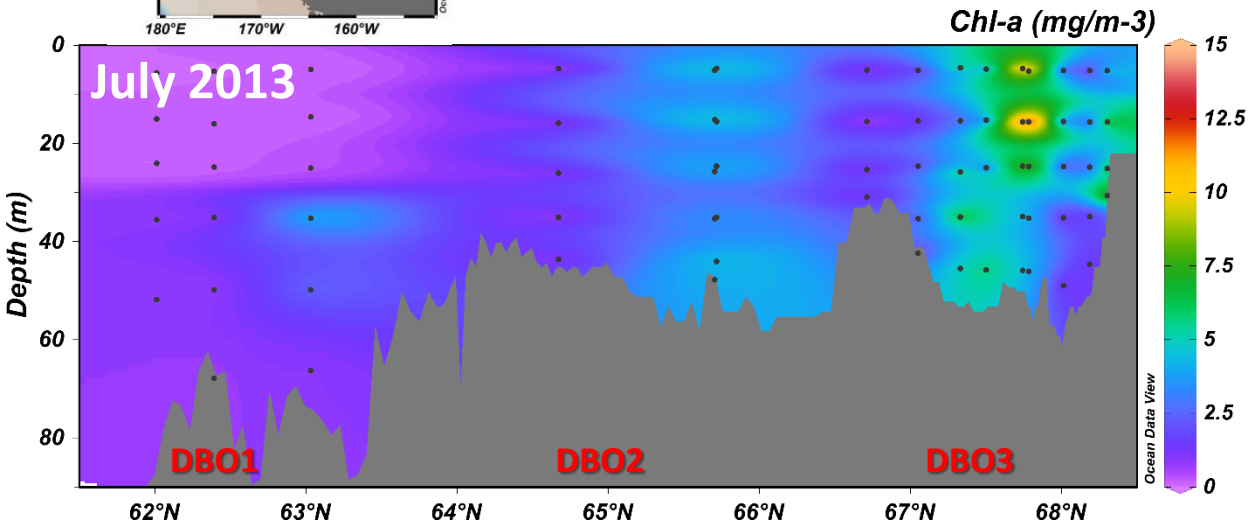


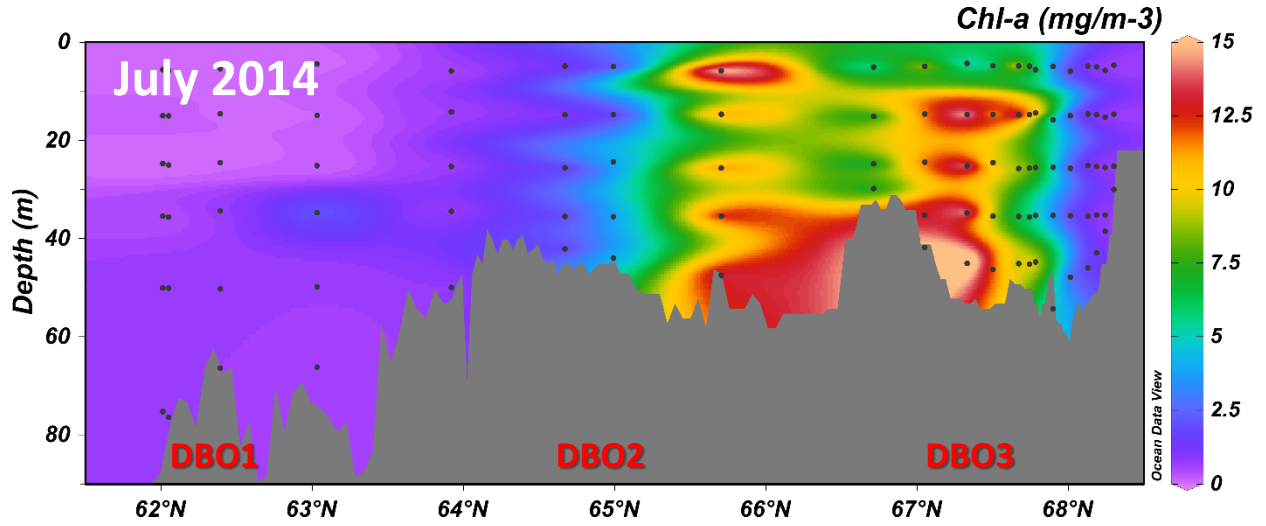
Field Observations of Chl-a *(DBO1, DBO2, DBO3)*

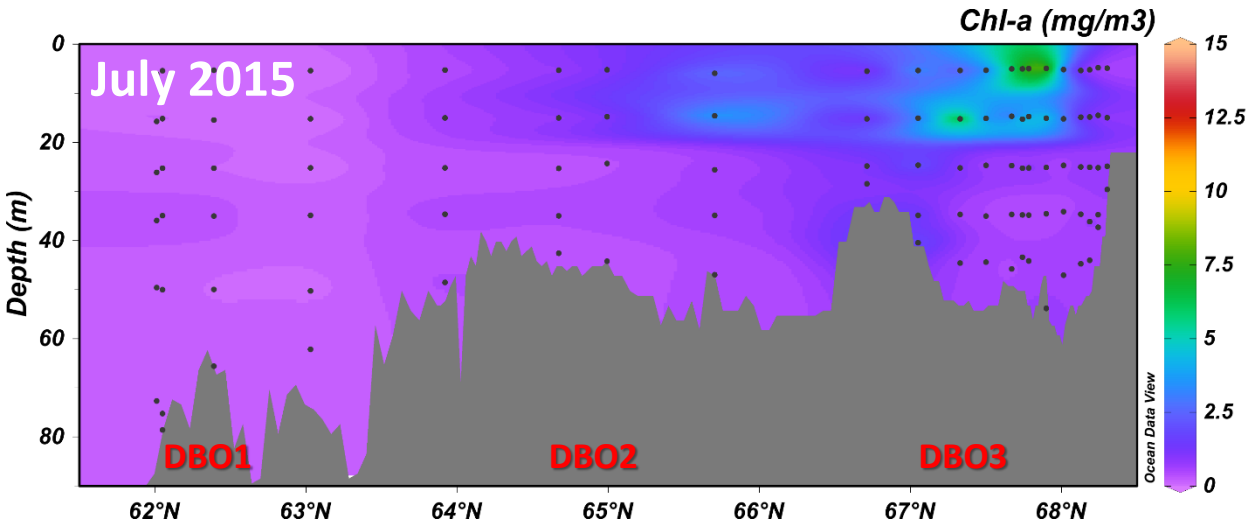
Large interannual variability:

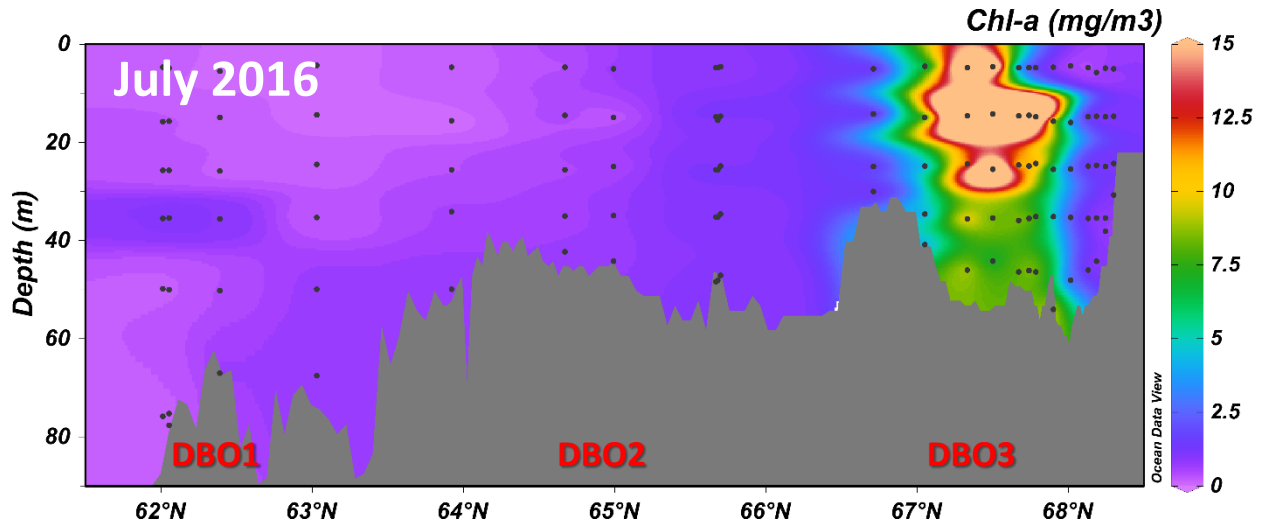
2013 and 2015 chl-a concentrations indicate <u>lower</u> production near DBO3 in July

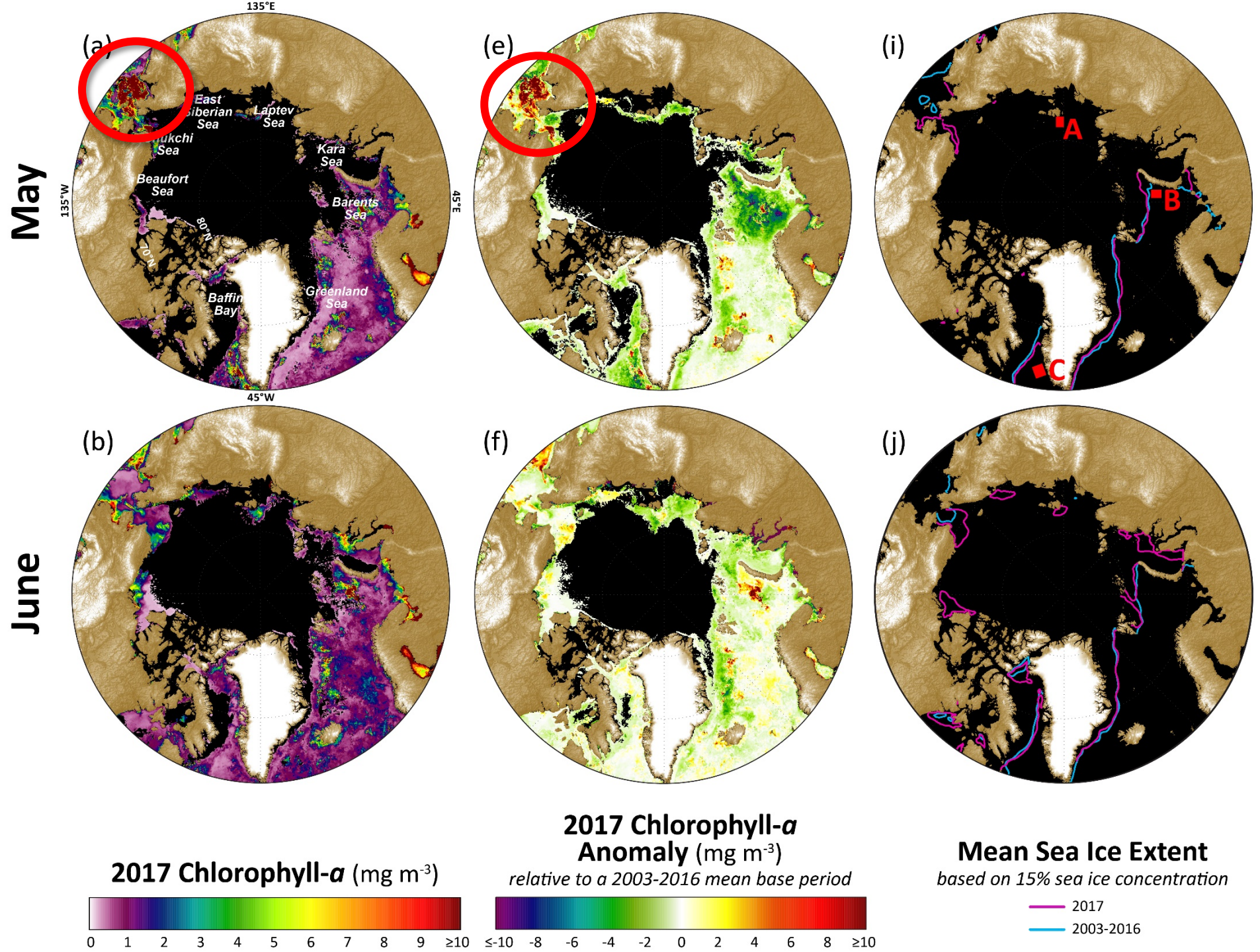
2014 and 2016 chl-a concentrations indicate <u>higher</u> production near DBO3 in July

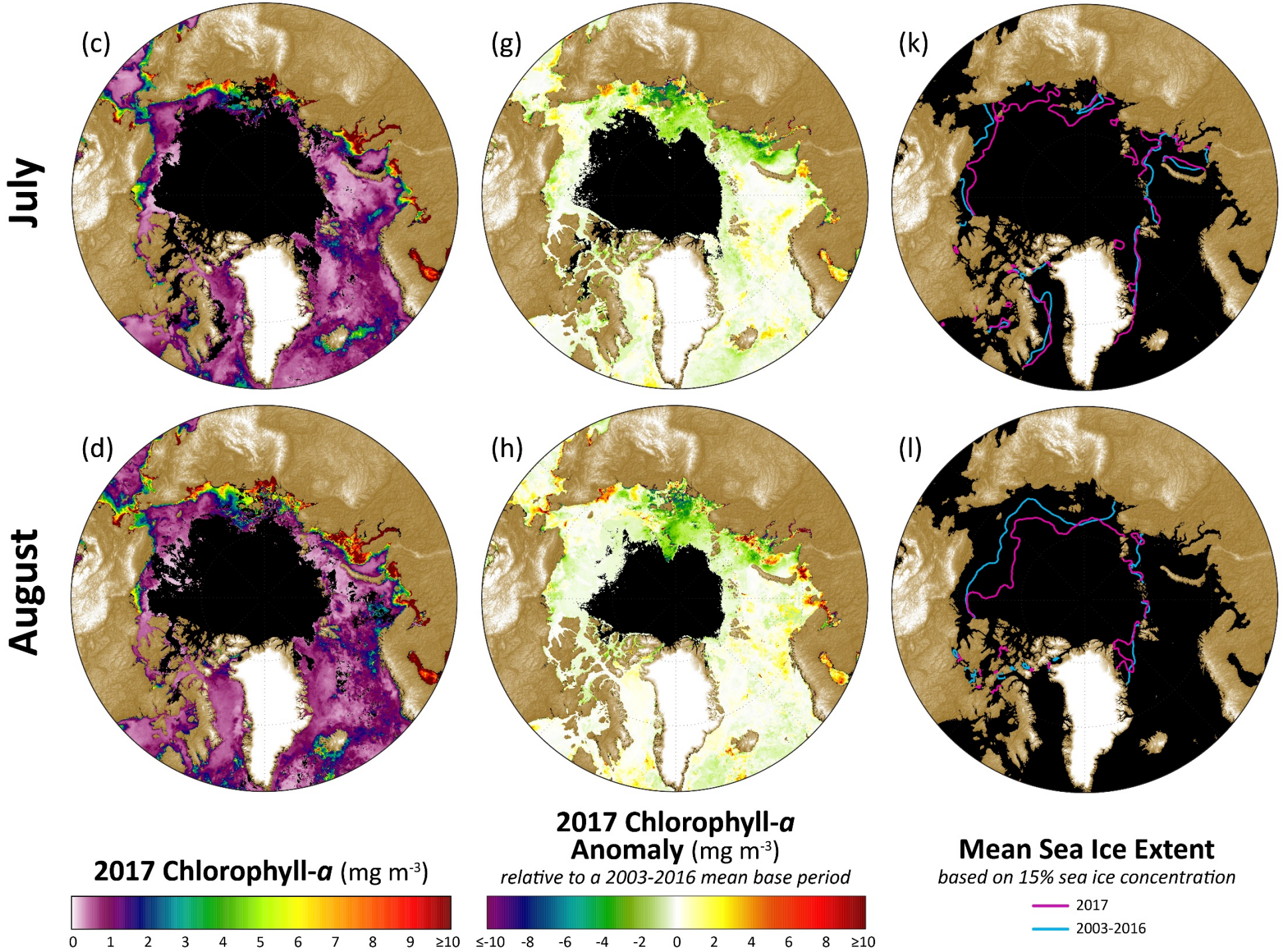









May
June
(a)
(b)
(e)
(f)
(i)
(j)
135°E
135°W
45°E
45°W
East Siberian Sea
Laptev Sea
Kara Sea
Beaufort Sea
Barents Sea
Baffin Bay
Greenland Sea
80°N
70°N
A
B
C
2017 Chlorophyll-a (mg m-3)
0 1 2 3 4 5 6 7 8 9 ≥10
2017 Chlorophyll-a Anomaly (mg m-3)
relative to a 2003-2016 mean base period
≤-10 -8 -6 -4 -2 0 2 4 6 8 ≥10
Mean Sea Ice Extent
based on 15% sea ice concentration
2017
2003-2016


July
August
(c)
(g)
(k)
(d)
(h)
(l)
2017 Chlorophyll-a (mg m-3)
0 1 2 3 4 5 6 7 8 9 ≥10
2017 Chlorophyll-a Anomaly (mg m-3)
relative to a 2003-2016 mean base period
≤-10 -8 -6 -4 -2 0 2 4 6 8 ≥10
Mean Sea Ice Extent
based on 15% sea ice concentration
2017
2003-2016