PAG joint research activity

PACEO (Pacific Arctic Climate Ecosystem Observatory)

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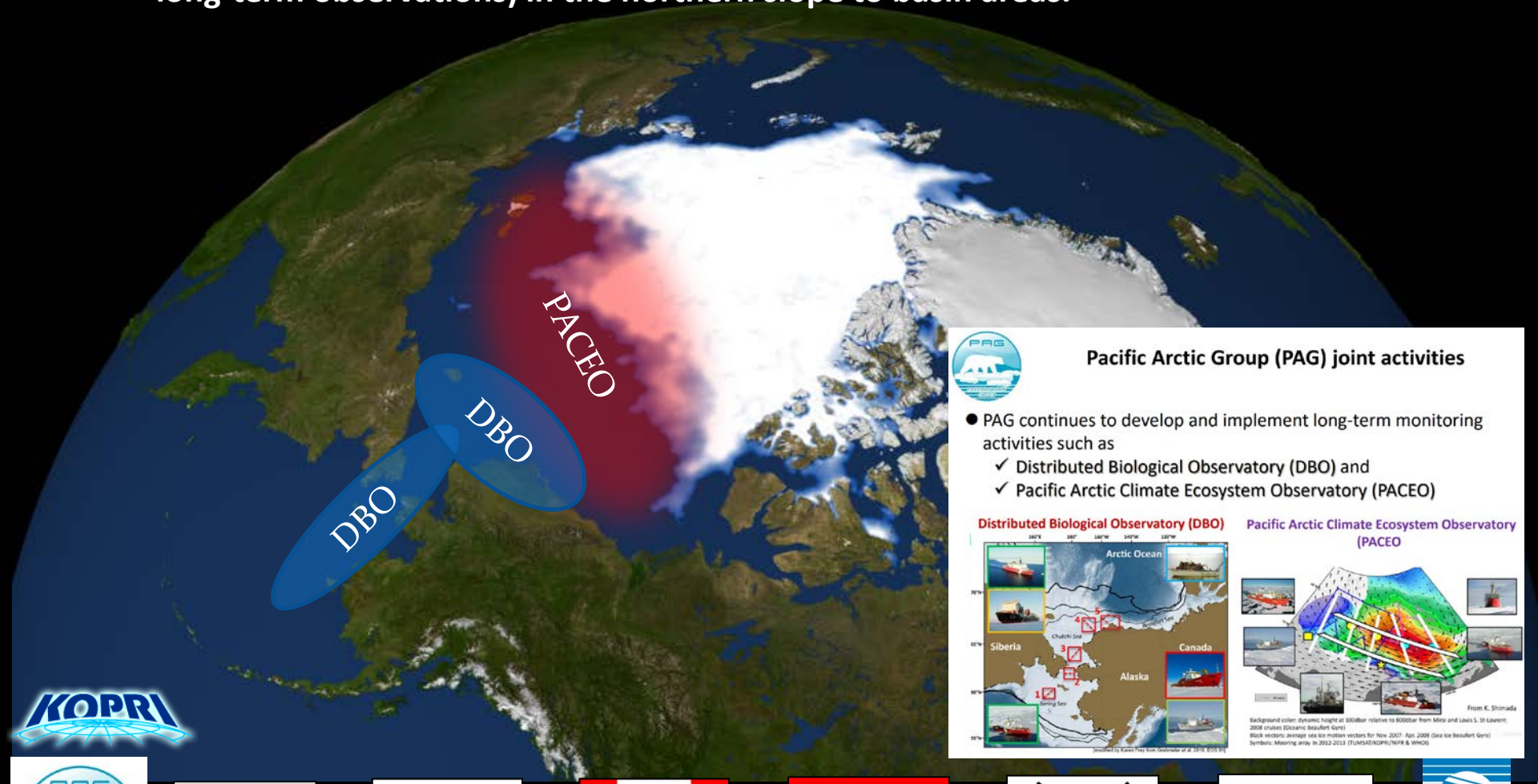
Korea Polar Research Institute

http://pag.arcticportal.org/

Pacific Arctic Climate Ecosystem Observatory (PACEO)

- A joint effort from the PAG countries to gather synoptic observations in the high Pacific Arctic (Central Arctic Ocean, CAO) where sea-ice loss has been a maximum.
- Collaborating internationally to design and implement repeat transects (integrated long-term observations) in the northern slope to basin areas.



Rapid "atlantification" of Pacific Arctic Ocean, resulting in changes of sea ice concentration and sea surface current?

Pacific Ocean

Increasing River Discharge

RUSSIA

ALASKA

CANADA BASIN

MAKAROV BASIN

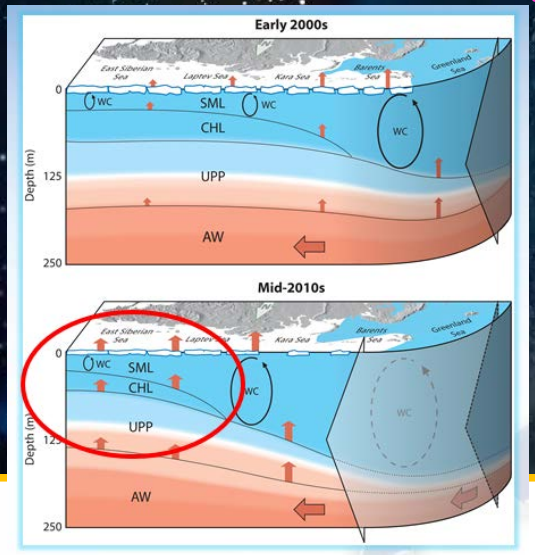
EURASIAN BASIN

GREENLAND

CANADA

Atlantic Ocean

http://www.jpl.nasa.gov/



Polyakov et al. (Science, 2017)

Conceptual model of "atlantification":

(1) increased penetration of signature of Atlantic Water?

(2) reduction in ice cover?

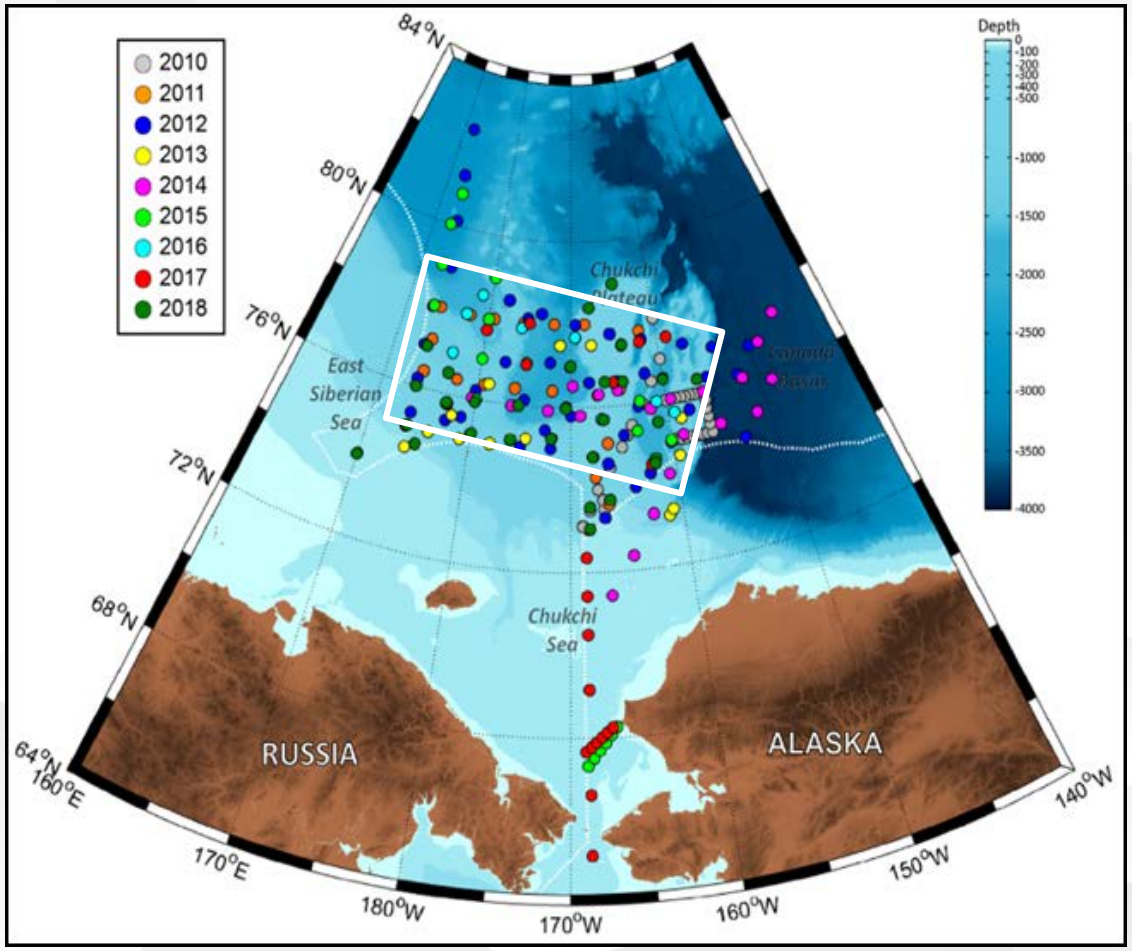
(3) greater surface heat and moisture flux?

(4) increased depth of winter penetrative convection?

(5) increased seasonality?

KOPRI

IBRV *Araon* PACEO Observations (2015~2018)



- ✓ We promote to facilitate a connected, collaborative, and comprehensive long-term Arctic Ocean observing system.
- ✓ Our observing system will be sustained in open cooperation.
- ✓ We promote contributions of all types of ocean observations including but not limited to in situ, remotely sensed, and the infrastructure such as IBRV Araon supporting them.

	2010	2011	2012	2013	2014	2015	2016	2017	2018
CTD	38	18	44	16	32	42	34	35	25
XCTD	*	33	48	36	51	61	38	30	30
Period	07/20~08/10	08/02-08/16	08/04-09/06	08/24-09/01	08/01-08/23	08/01-08/21	08/05-08/21	08/06-08/24	08/04-08/25

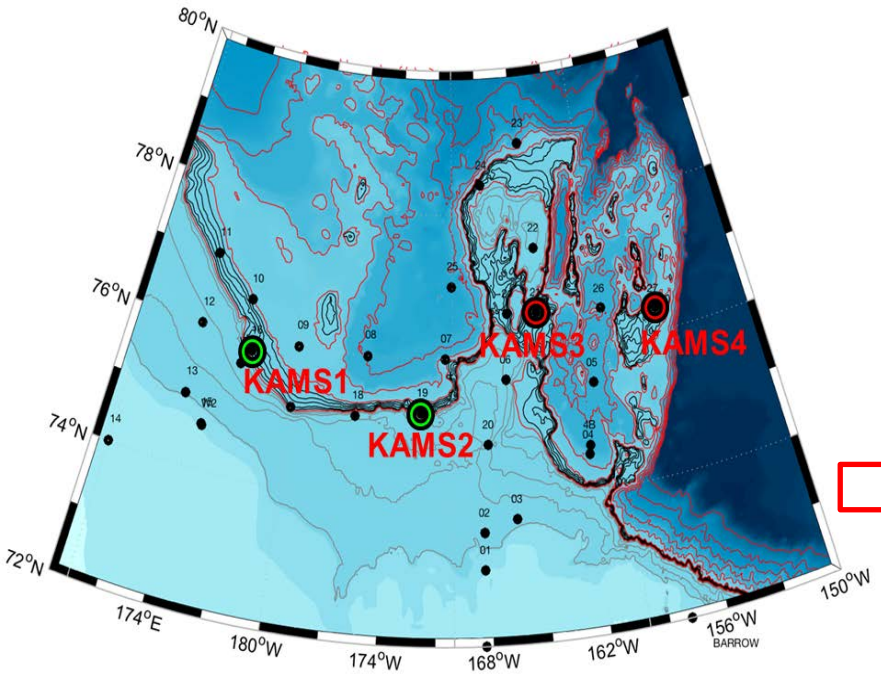
KOPRI Ocean Mooring system (2017-2018)

- **Equipment: ADCP (150, 300 kHz), microCAT CTD, temperature logger, sediment trap, AZFP, UV nitrate sensor (SUNA V2), Fluorescence & PAR sensors, etc.**

KAMS1 (East Siberian Sea)

KOPRI Moorings

- Recovered/re-deployed
- Newly deployed

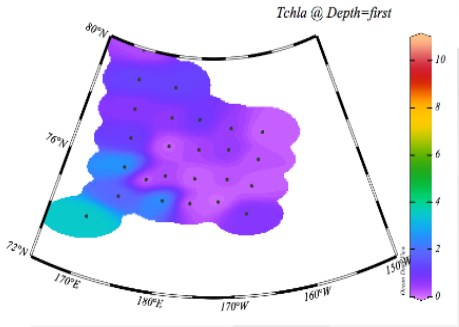


KAMS2 (Chukchi Sea)

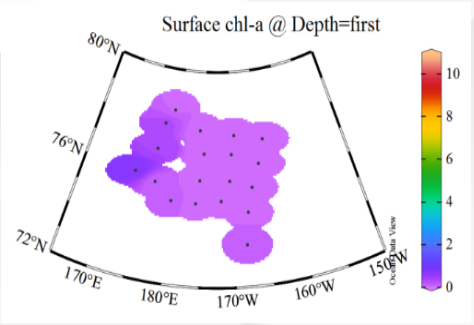
Chlorophyll-a and size fraction Chl-a

Surface chlorophyll-a concentration

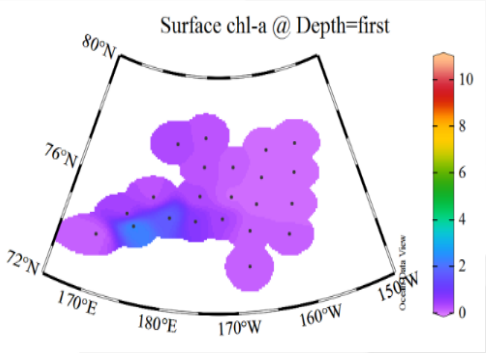
2015.08



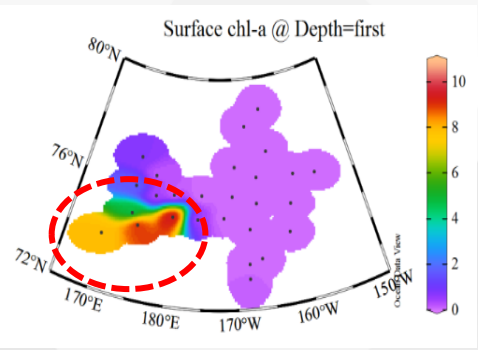
2016.08



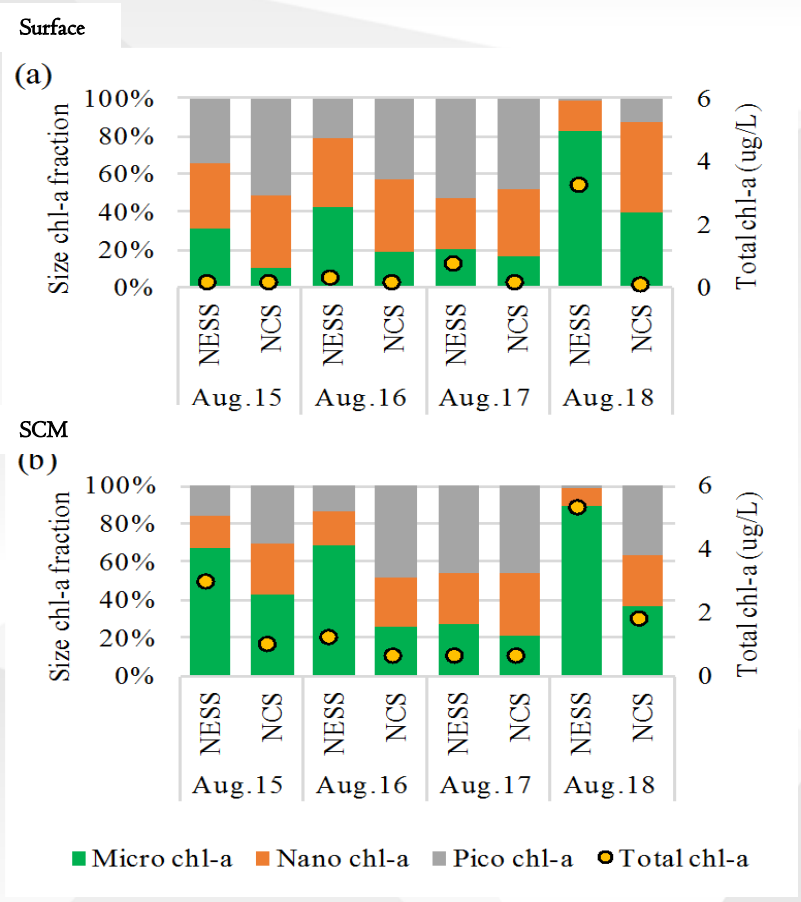
2017.08



2018.08



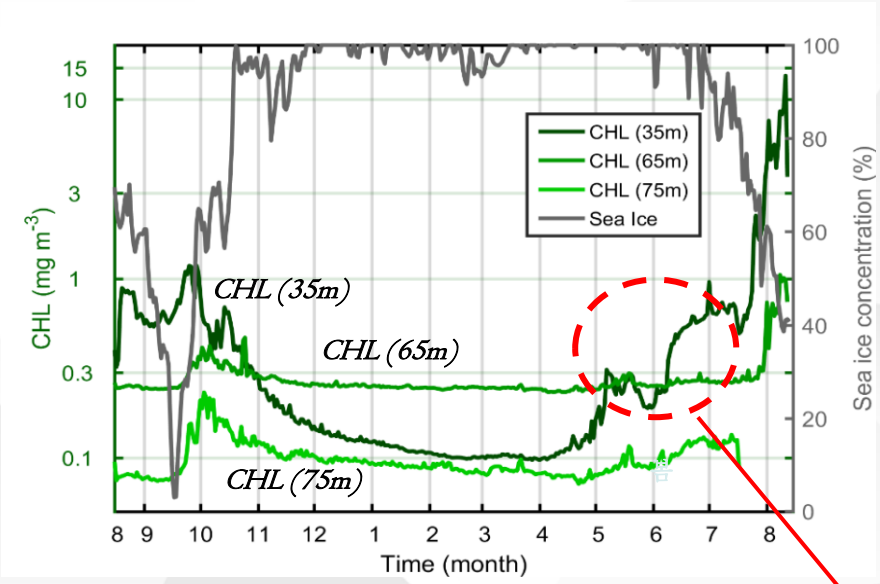
Size fraction chlorophyll-a



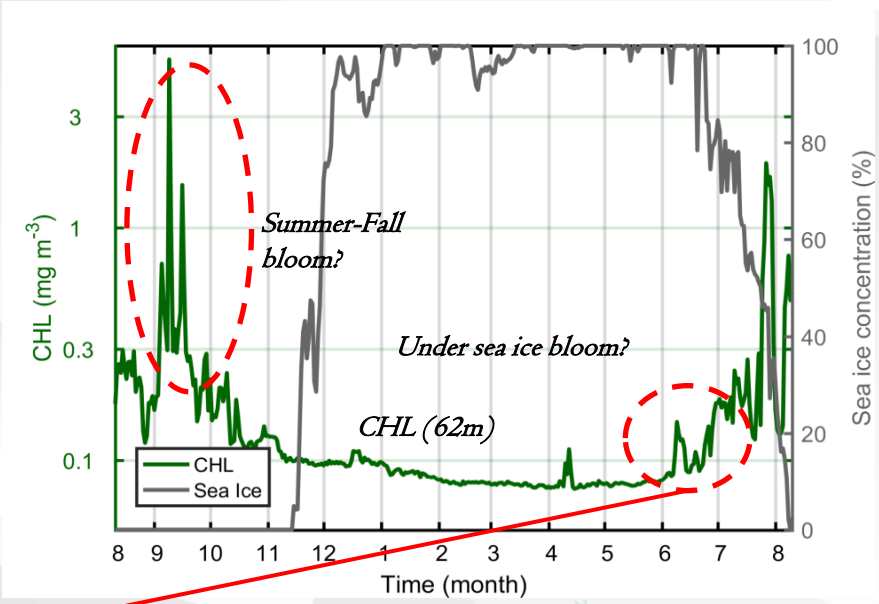
- Chukchi Sea : low chl-a, small size phytoplankton
- East Siberian Sea : high chl-a, large size phytoplankton

Seasonal variation of chlorophyll-a concentration (2017.08 ~ 2018.08)

East Siberian Sea



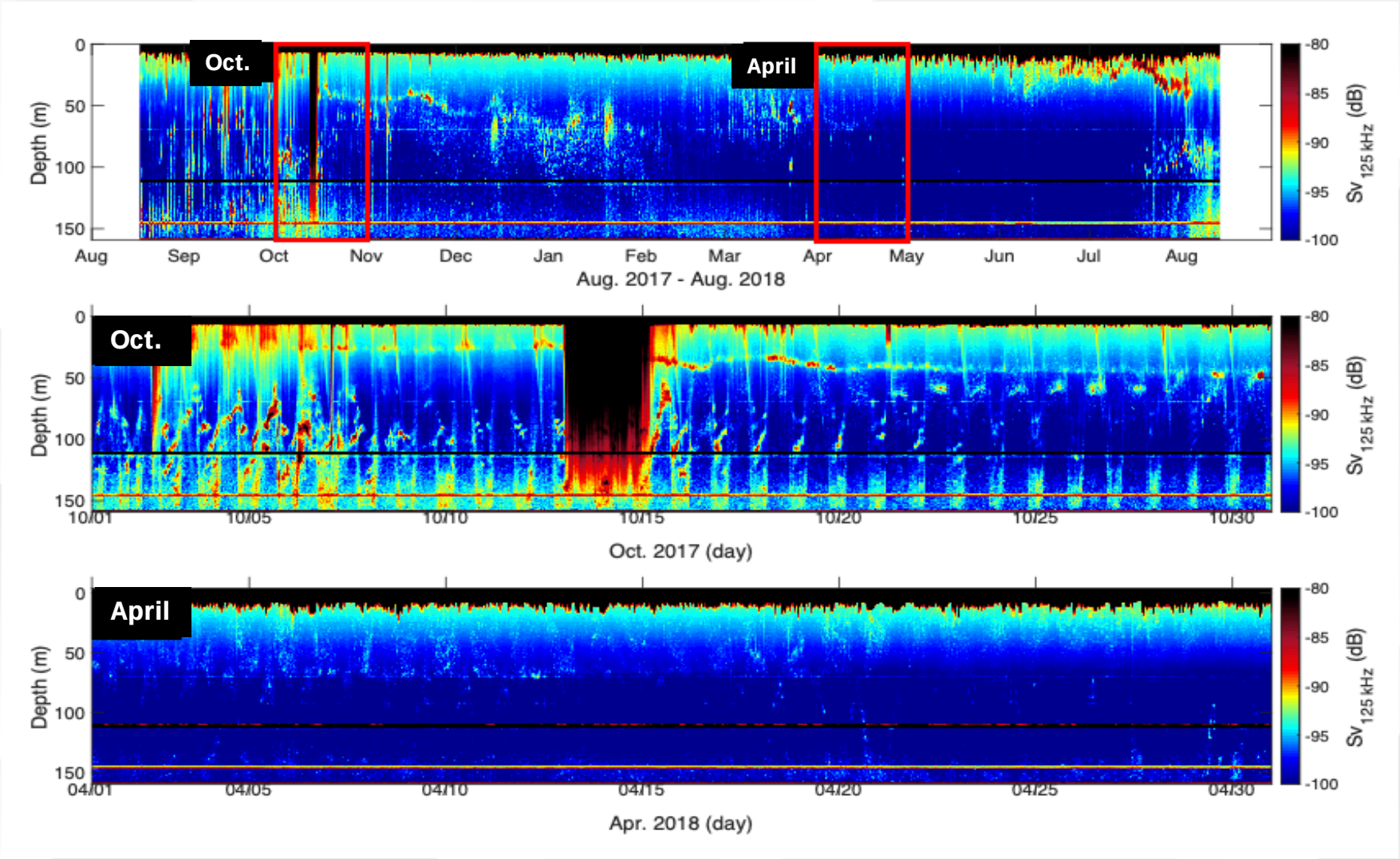
Chukchi Sea



(By ROV under sea ice, August 2018)

- ✓ **Summer phytoplankton bloom during sea ice melting seasons in both regions.**
- ✓ **Under sea ice phytoplankton bloom before melting seasons.**

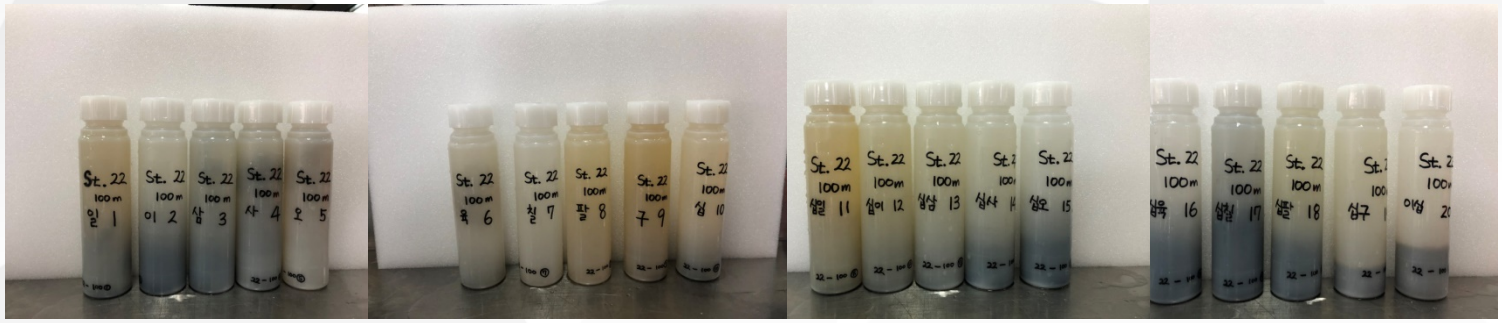
Seasonal variation of zooplankton using AZFP (East Siberian Sea)



Sediment trap for Particle flux study

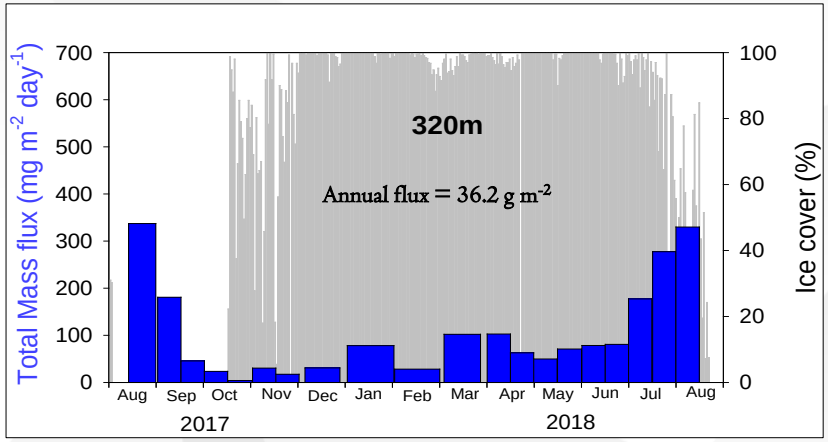
Sediment trap is the most powerful tool for investigating the carbon cycle changes in the Arctic Ocean

- ✓ East Siberian Sea
  -100m & 320m
- ✓ Chukchi Sea
  -300m

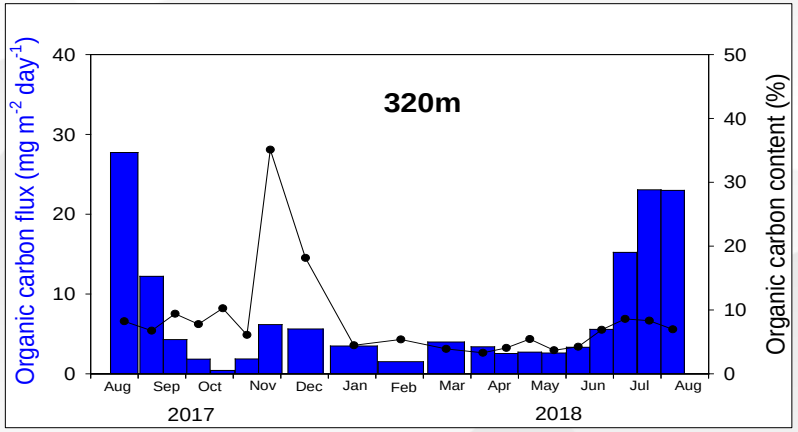


Seasonal variation of Particle mass flux (CS)

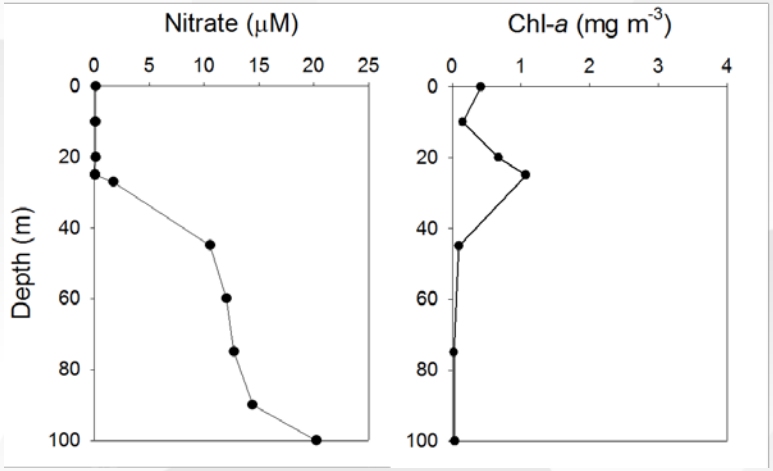
Total mass flux & Sea-Ice cover



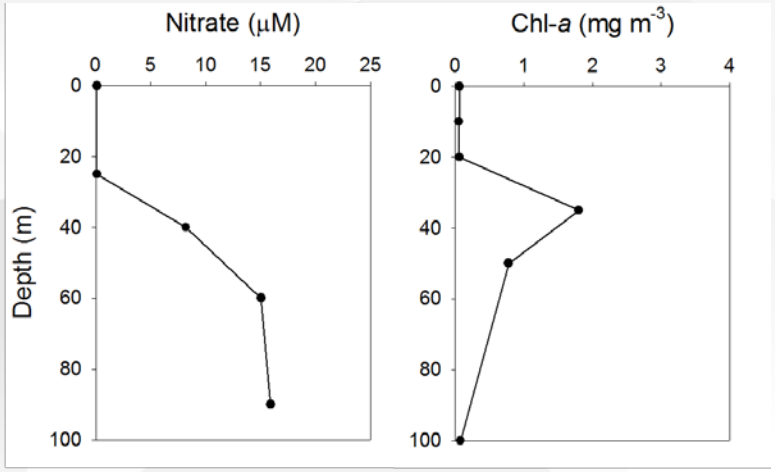
Organic carbon flux & content



2017 August



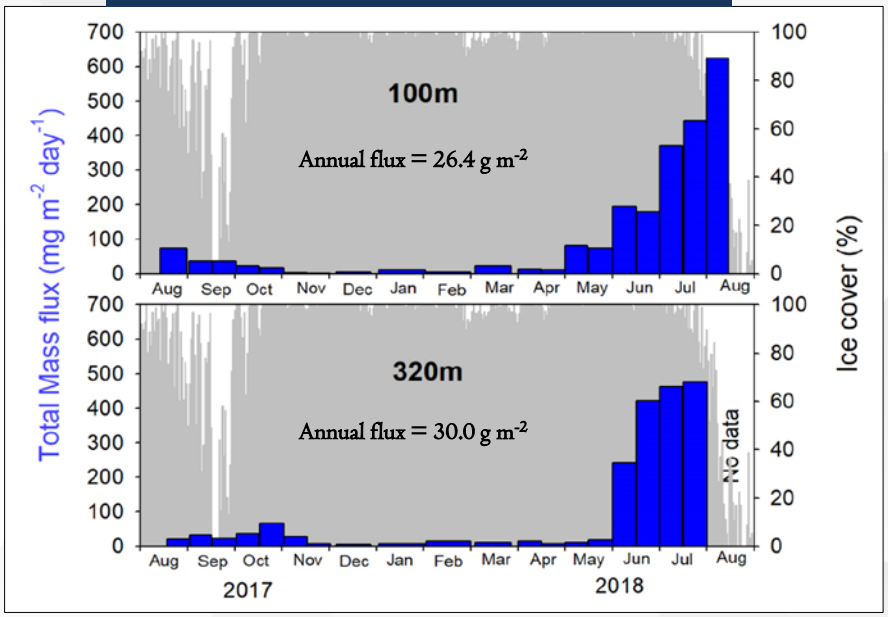
2018 August



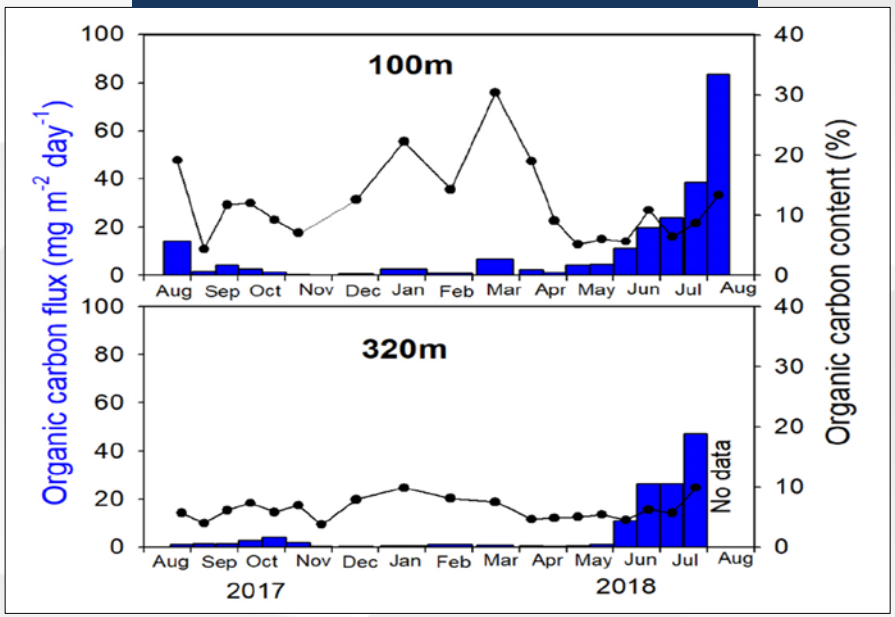
✓ **Particle fluxes showed a large increase both in the summer 2017 and 2018. Nitrate and chlorophyll-*a* concentrations did not show a significant difference between the August 2017 and 2018.**

Seasonal variation of Particle mass flux (ESS)

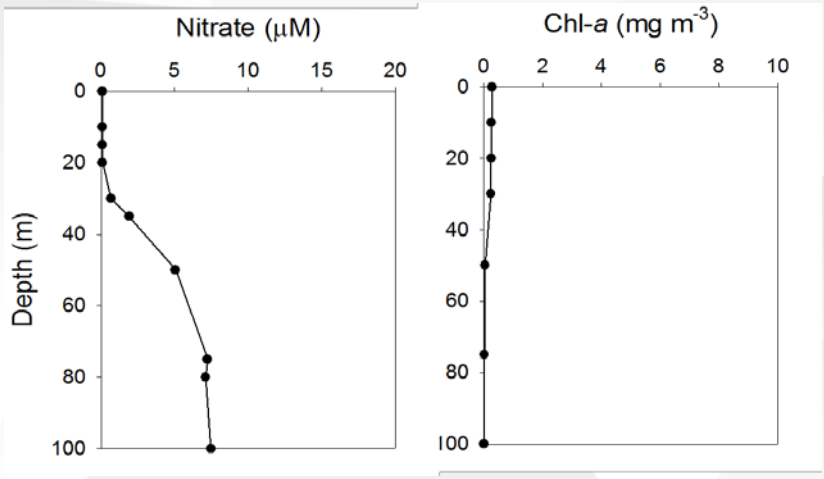
Total mass flux & Sea-Ice cover



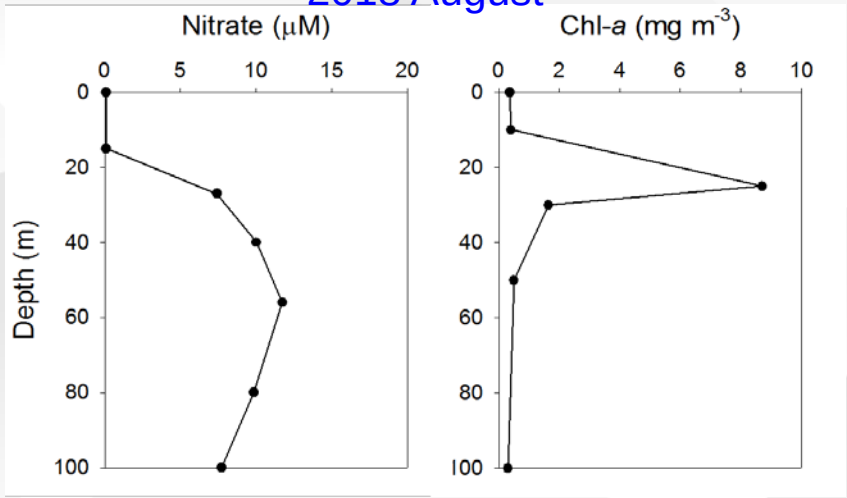
Organic carbon flux & content



2017 August



2018 August



✓ **Particle fluxes showed a large increase from June to August 2018, indicating the under-ice phytoplankton bloom during these periods.**


Thank you