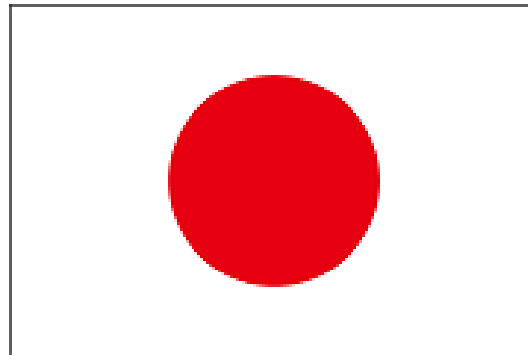


# Brief update of recent activities and results for DBO:

## Japan DBO results



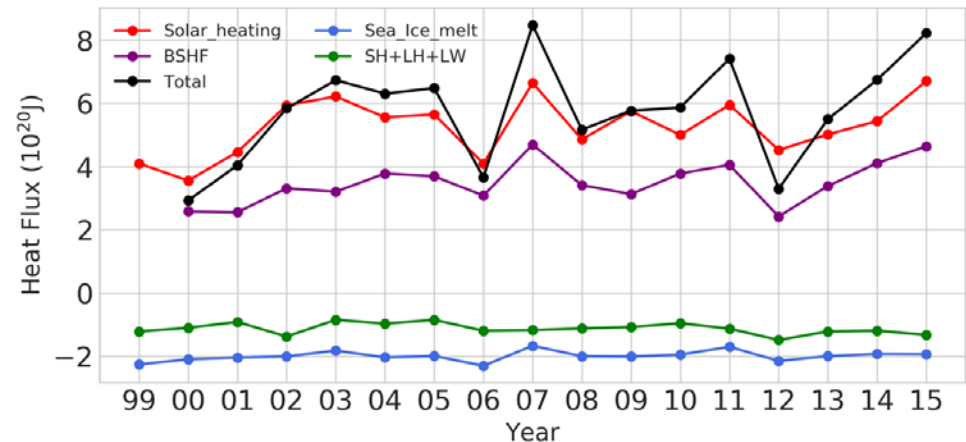
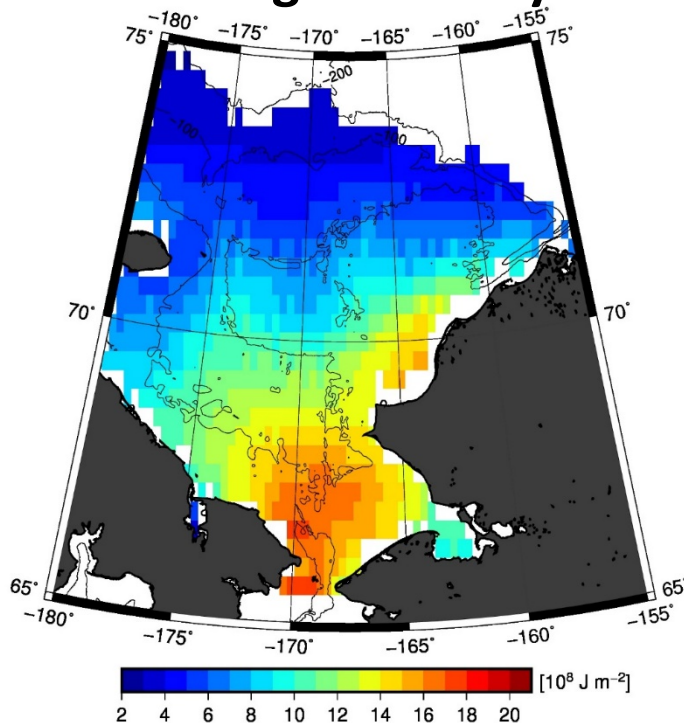
Shigeto Nishino

# Interannual variation in solar heating in the Chukchi Sea

Tsukada *et al.* [2018; Polar Science]

- ✓ Interannual variation in solar heating was examined by **satellite** derived sea ice concentration and **reanalysis** shortwave radiation.
- ✓ Short wave radiation was validated by in-situ data by the **R/V Mirai**. NCEP-CFSR/CFSv2 reproduce most accurate values.
- ✓ **Solar heating** during summer in the Chukchi Sea varied from 3.6 to 6.7  $\times 10^{20}$  J and **up to twice** the northward heat flux through the Bering Strait.

## Solar heating from May to Sep

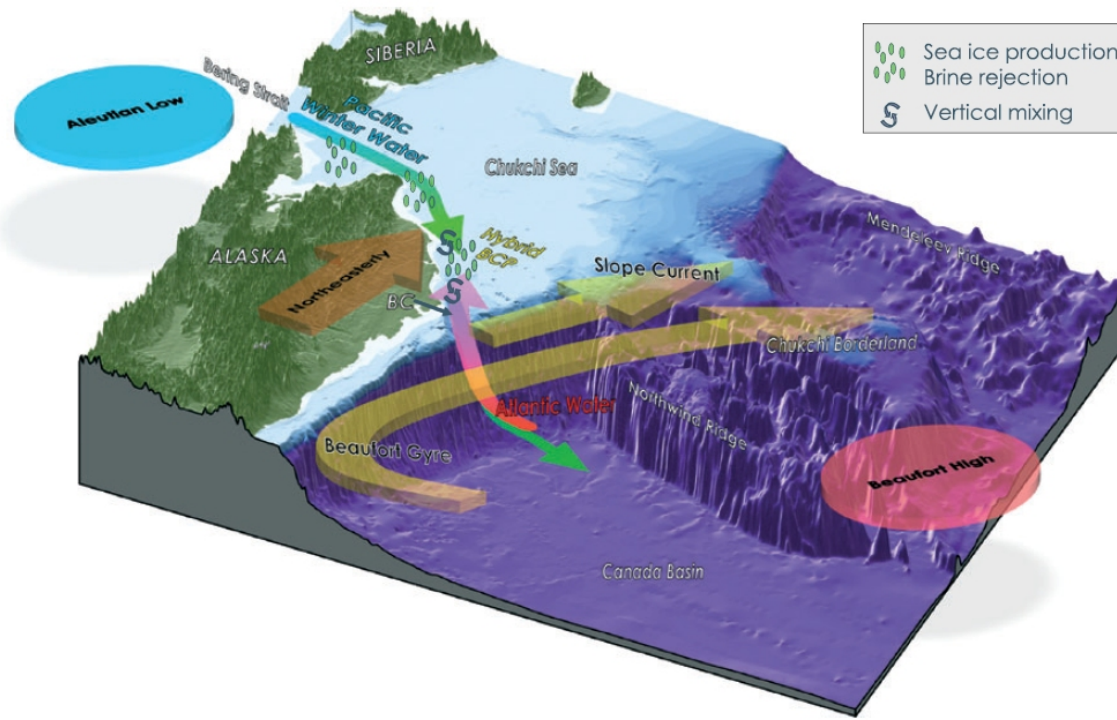


— Solar heating  
— Bering Strait heat flux  
— Total heating

# Winter water formation in coastal polynyas of the eastern Chukchi shelf

Hirano *et al.* [2018; JGR]

- ✓ Water properties and formation processes of Alaskan Coastal Winter Water (**ACWW**) over the eastern Chukchi shelf were examined using data from moorings, atmospheric reanalysis, satellite-derived sea-ice production, and a numerical tracer experiment.
- ✓ The **northeasterly winds**, correlated with the north-south atmospheric pressure gradient between Beaufort High and Aleutian Low, are triggers of **polynya sea-ice production episodes** and **Atlantic water upwelling** in the Barrow Coastal Polynya.



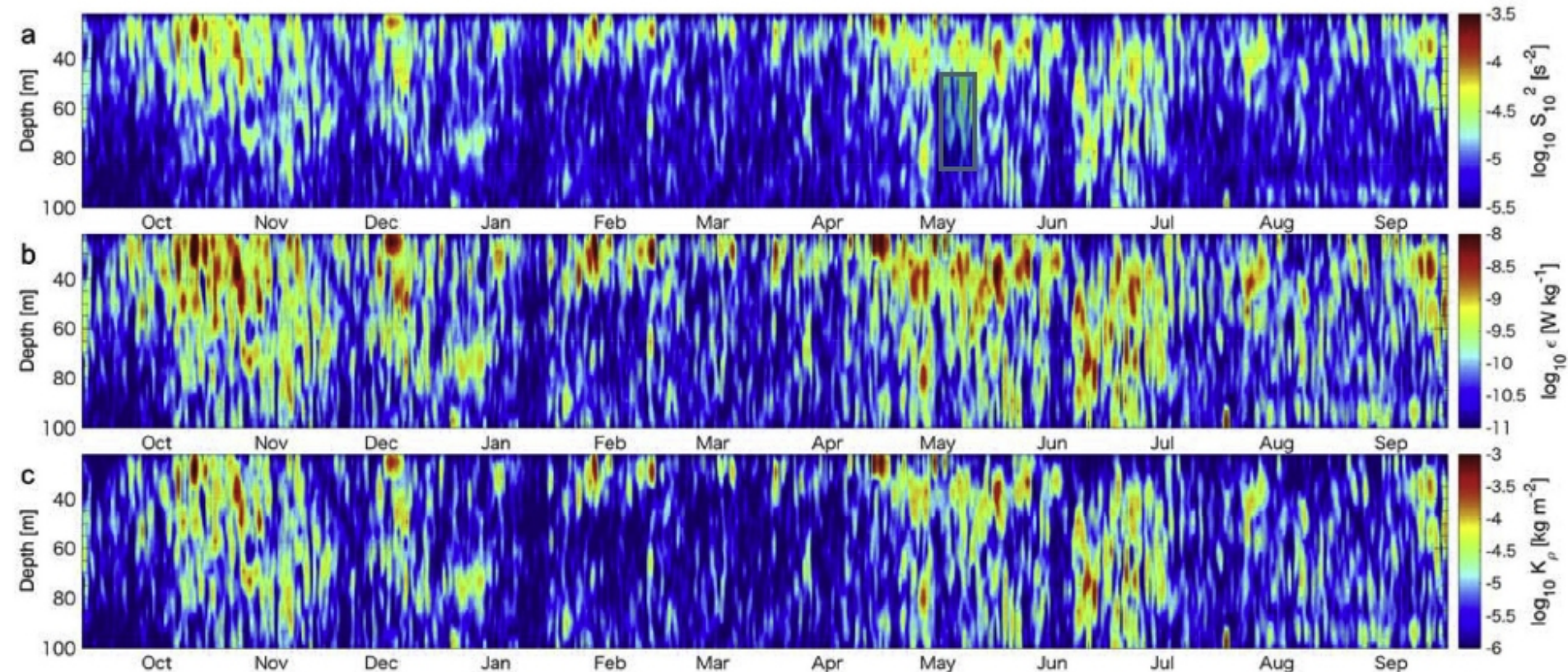
**ACWW** is transported northwestward with the Chukchi slope current and/or Beaufort Gyre, and contributes to maintenance of the **lower halocline layer** over the Chukchi Borderland.



# Ice drift is a driver of the upper ocean mixing in marginal ice zones

Kawaguchi *et al.* [2019; Polar Science]

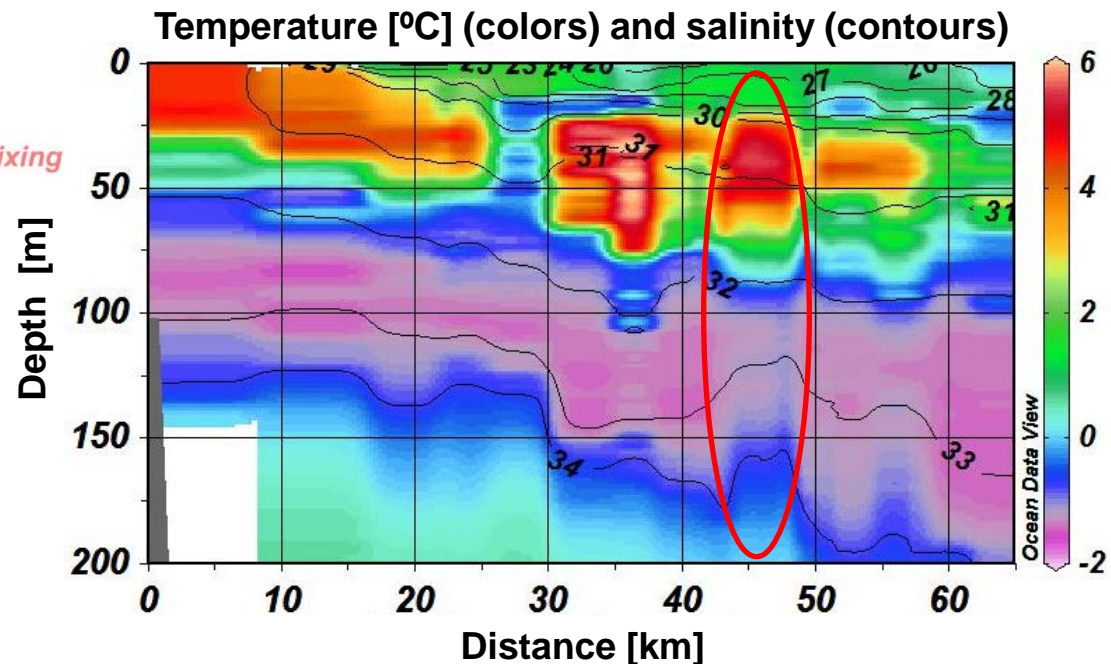
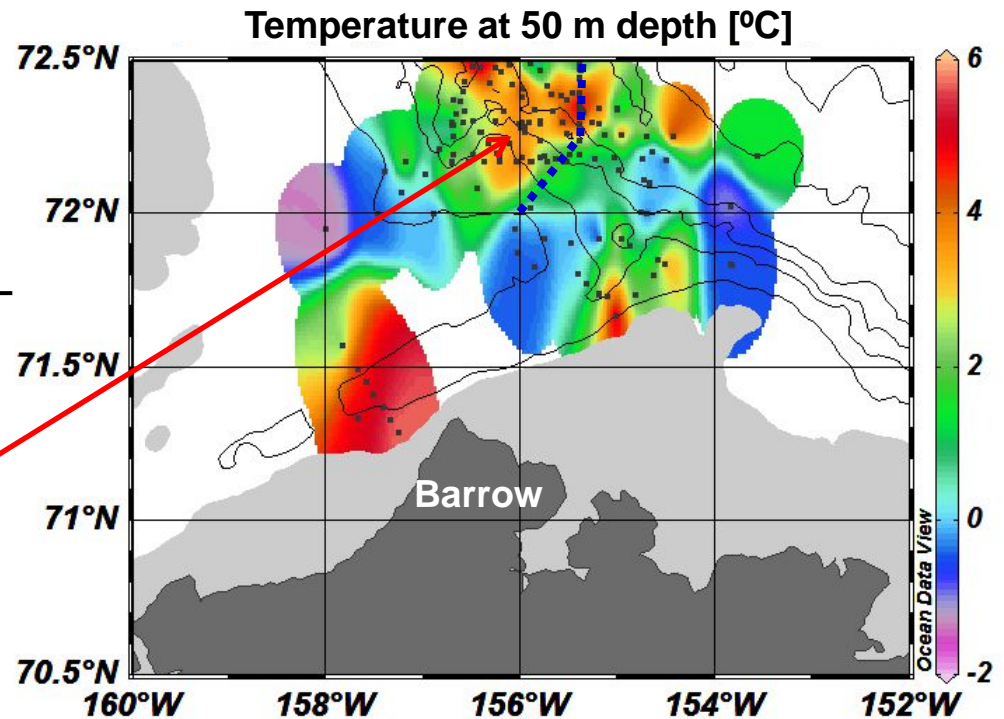
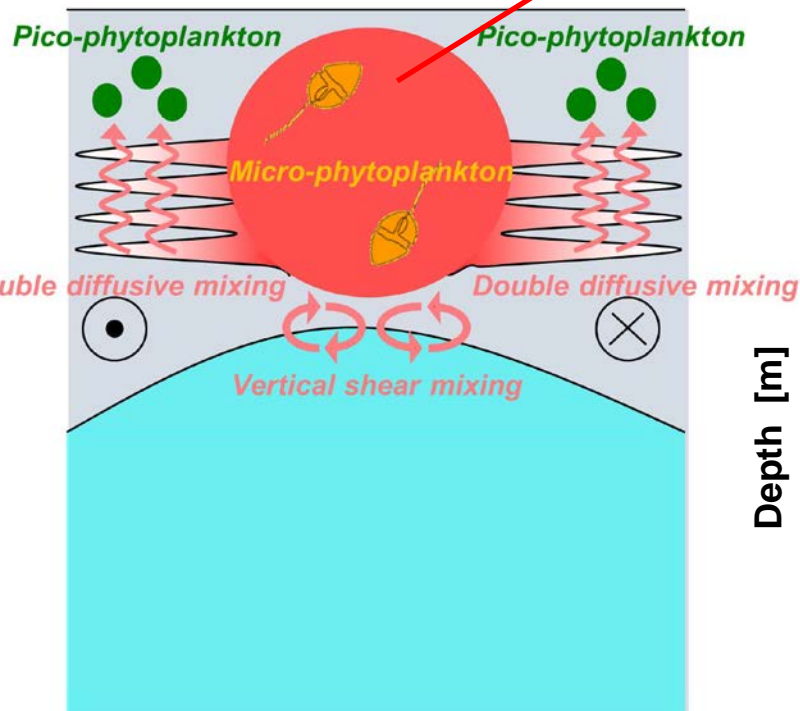
- ✓ Intra-annual variation of near-inertial internal wave (**NIW**) was examined using a year-round mooring (**IPS&ADCP**) in the Northwind Abyssal Plain.
- ✓ The turbulent variables associated with NIW are high in **early-summer** and **late-autumn**, and low in the mid-winter.
- ✓ The mixed-layer inertial current driven by **ice drift** is the primary driver of the enhanced **NIW** generation.



# Cyclonic warm-core eddy and its impact on the Arctic marine ecosystem

Nishino *et al.* [2018; GRL]

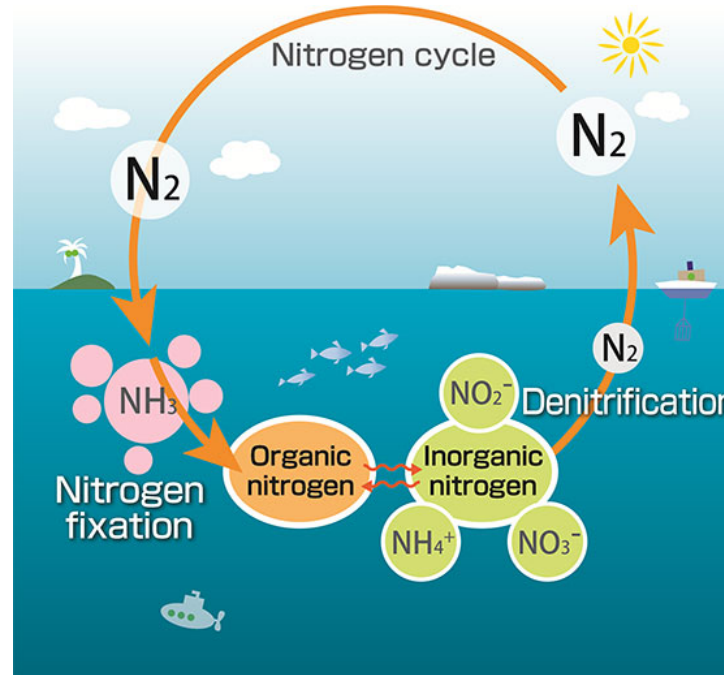
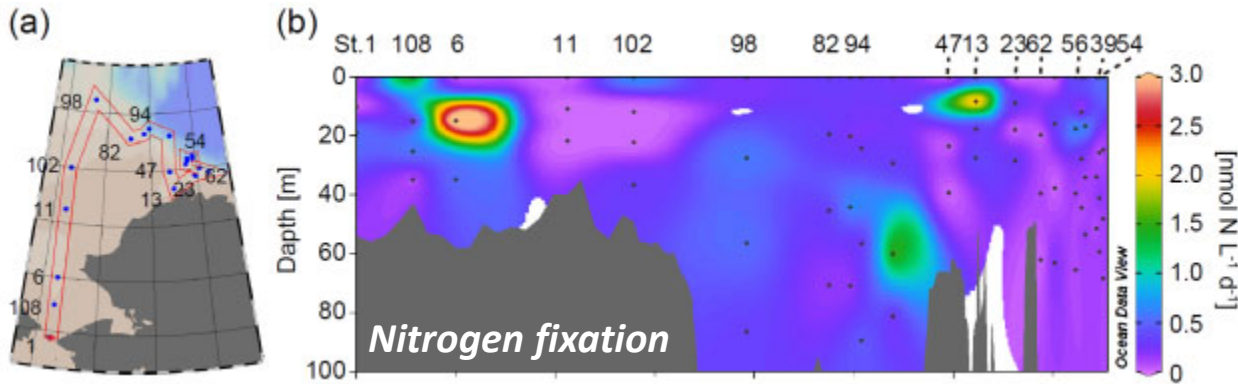
Cyclonic warm-core eddy





# Extensive nitrogen fixation occurs in the Chukchi Sea without a clear correlation to depth (light intensity) or nitrate concentration

Shiozaki *et al.* [2018, *Limnol. Oceanogr.*] (Press released)



**Tropical/subtropical oceans:**

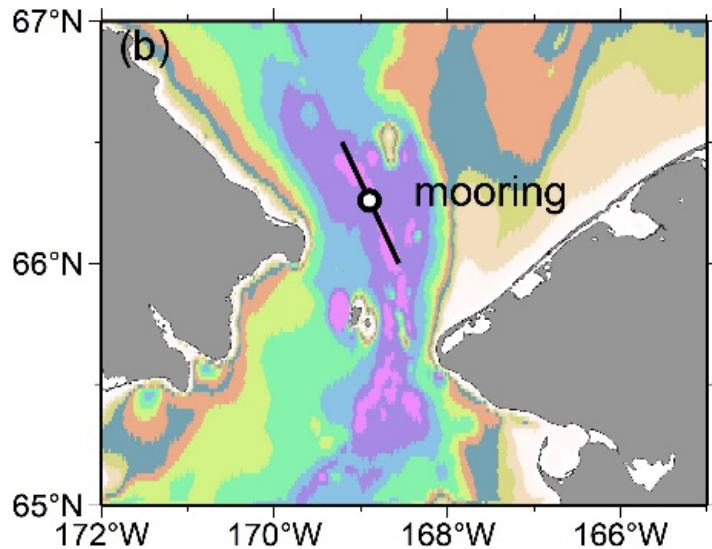
- Oligotrophic water
- N fix is high in the surface
- Diazotrophs:  
Photosynthetic cyanobacteria

**Chukchi Sea:**

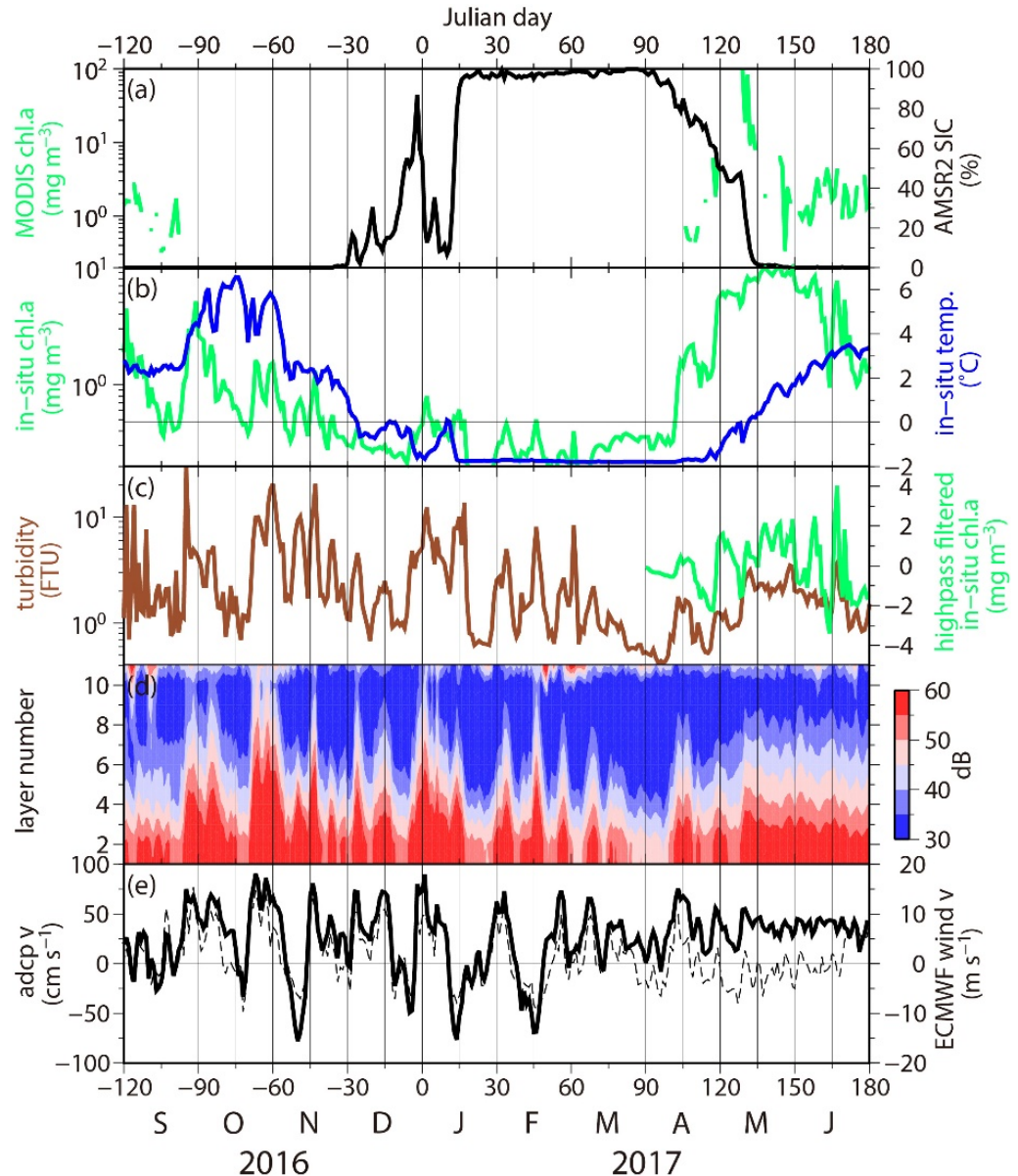
- Non-oligotrophic water
- N fix is widely detected
- Diazotrophs:  
Non-photosynthetic anaerobic bacteria

# Supplying mechanism of POM to biological hotspots

Abe et al. [2019, Frontiers Mar. Sci.]

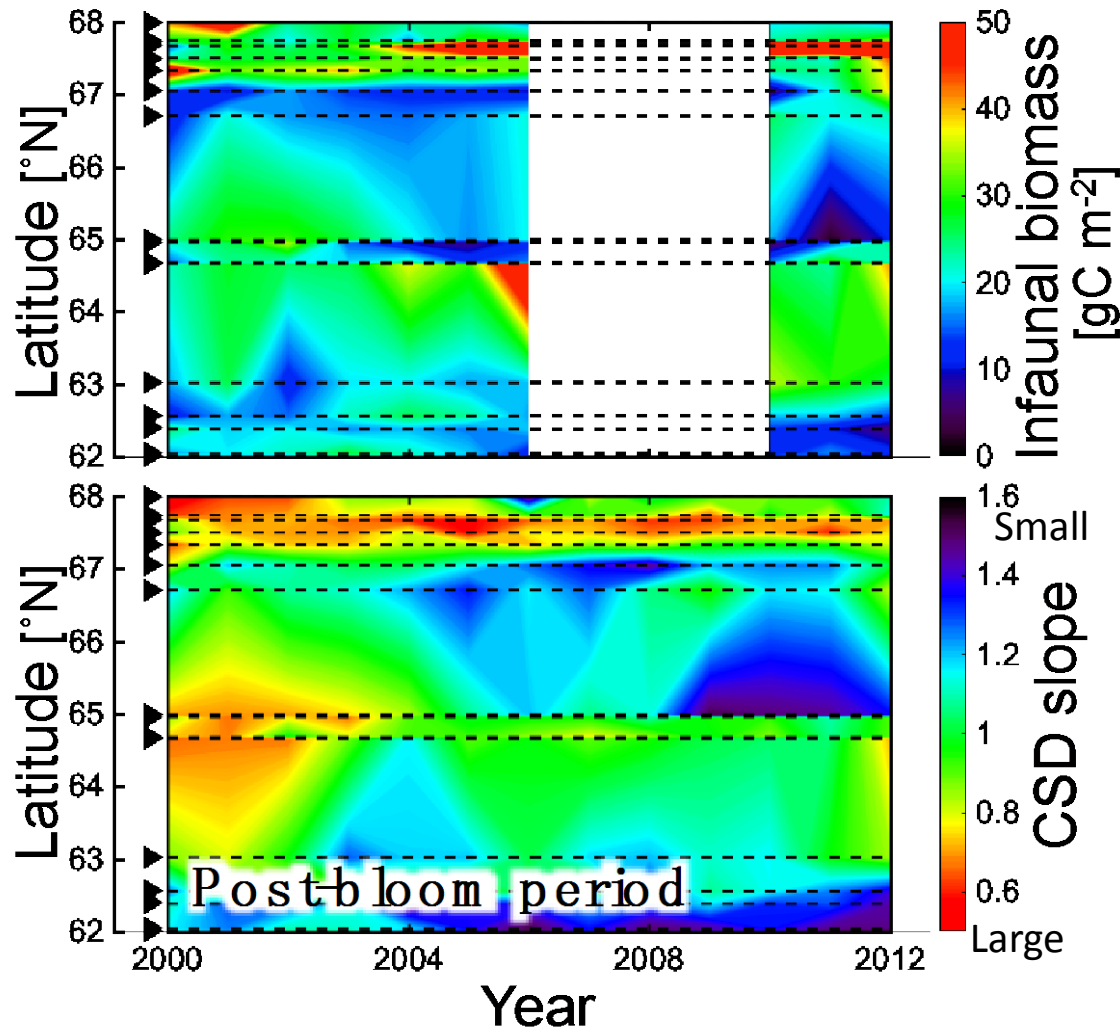


The locally strong barotropic current in the Bering Strait, driving the upward transport of sediment and the subsequent horizontal transport, may play a vital role in supplying particulate organic matter, phytoplankton, or nutrients to the downstream region of the southern Chukchi Sea where the formation of biological hotspots is reported.

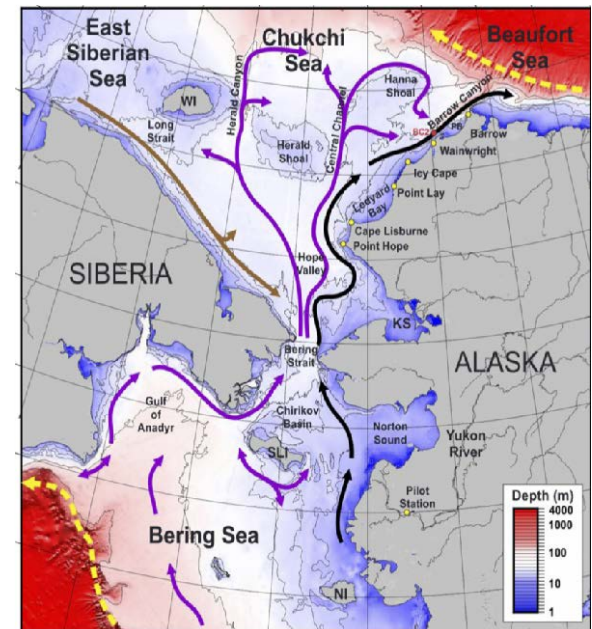


# Linkage between surface phytoplankton size and benthos biomass

Waga *et al.* [2018, DSR2, DBO special Issue]



Major infauna in the Pacific Arctic



(Graph was modified from original one)