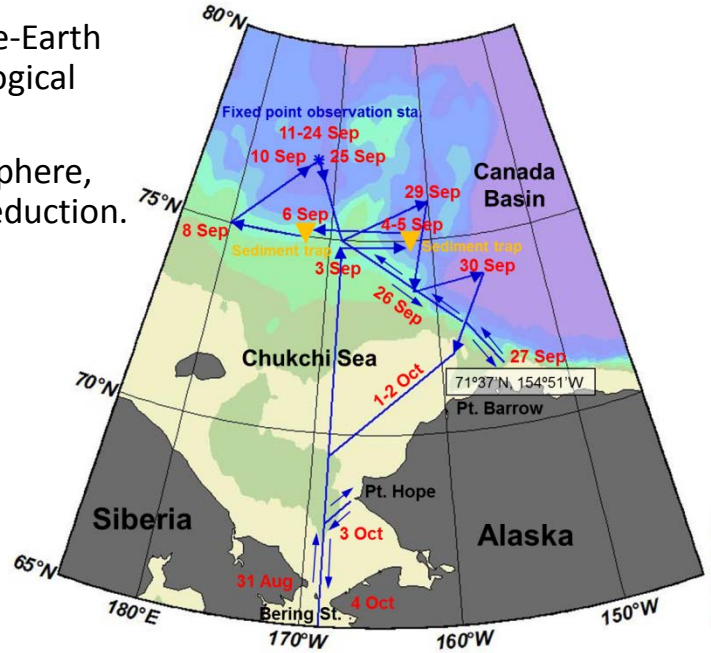
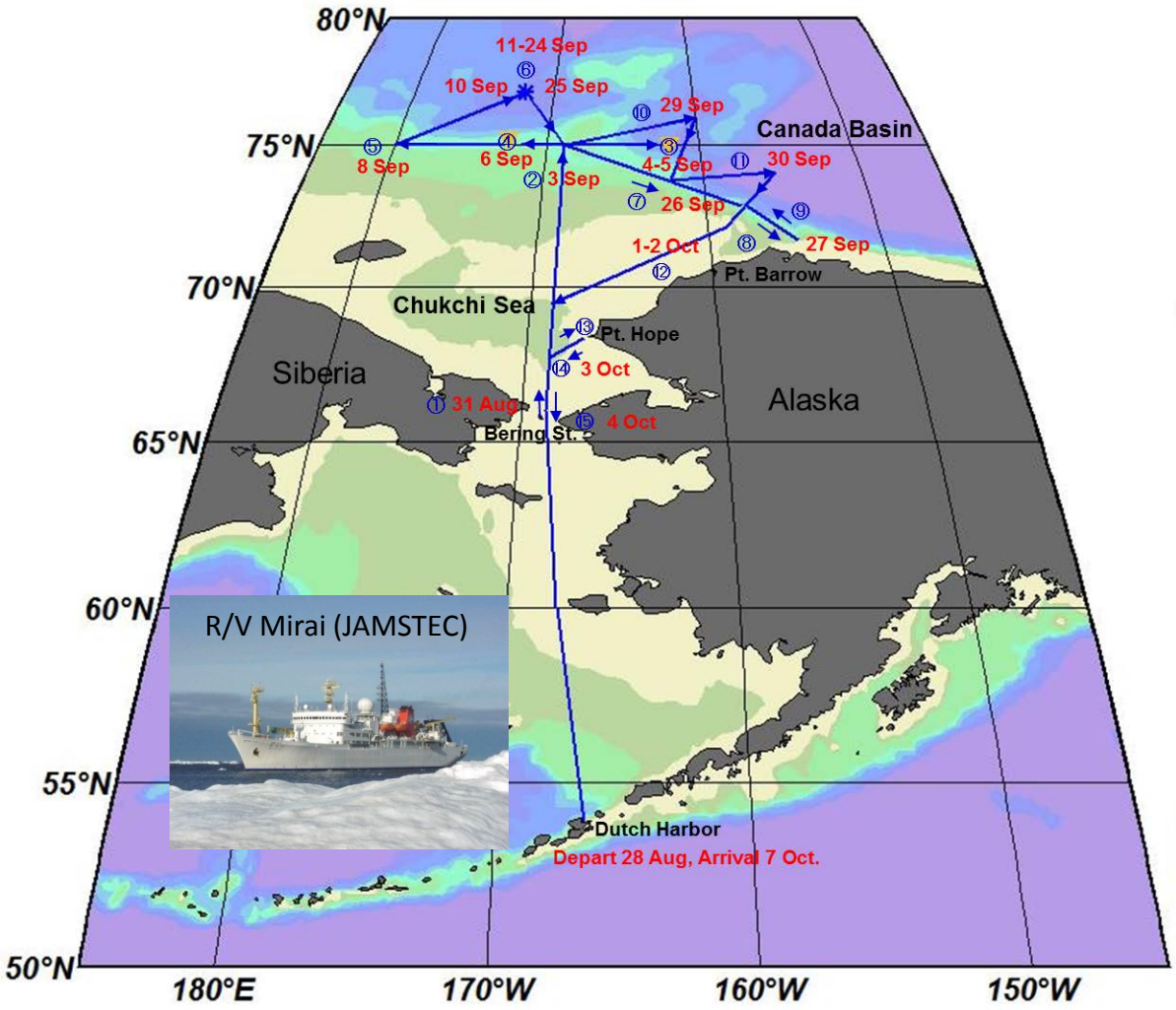
R/V Mirai Arctic Ocean cruise in Aug.-Oct. 2013

- The Research Vessel Mirai (R/V Mirai) belonging to Japan Agency for Marine-Earth Science and Technology (JAMSTEC) will conduct hydrographic and meteorological surveys in the Arctic Ocean from the late August to early October.

- The objective of this cruise is to quantify on-going changes in ocean, atmosphere, and ecosystem, which are related to the recent Arctic warming and sea ice reduction.



Detailed Map of the R/V Mirai cruise in 2013.



Planned cruise tracks and estimated date of the R/V Mirai cruise in 2013.

- The observational activities are CTD/XCTD, turbulence ocean microstructure measurement, water samplings, plankton net samplings, ship-board ocean current and surface water monitorings, general meteorological monitoring, radiosonde, Doppler radar, sea bottom topography, gravity, and magnetic field measurements, and sediment trap recoveries & deployments.

Objectives

- Understanding the impact of atmospheric events on the ocean stratification and ecosystem in the sea ice reduction region of the Arctic Ocean → Fixed-point observation (2 weeks)

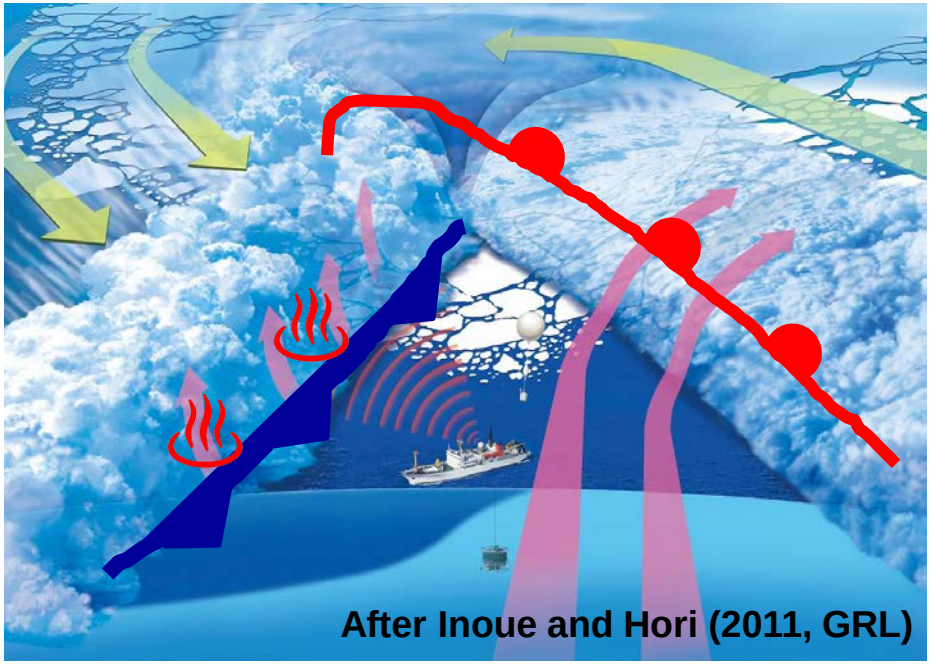
- Estimating the changes in biological production caused by the enhancement of ocean circulation due to the sea ice loss → Wide-area observation

- Monitoring the Arctic ecosystem → Sediment trap experiments

- Capturing the Arctic ocean environmental changes with the seasonal prevalence of sea ice → Collaboration with T/S Oshoro-maru (Hokkaido Univ.)

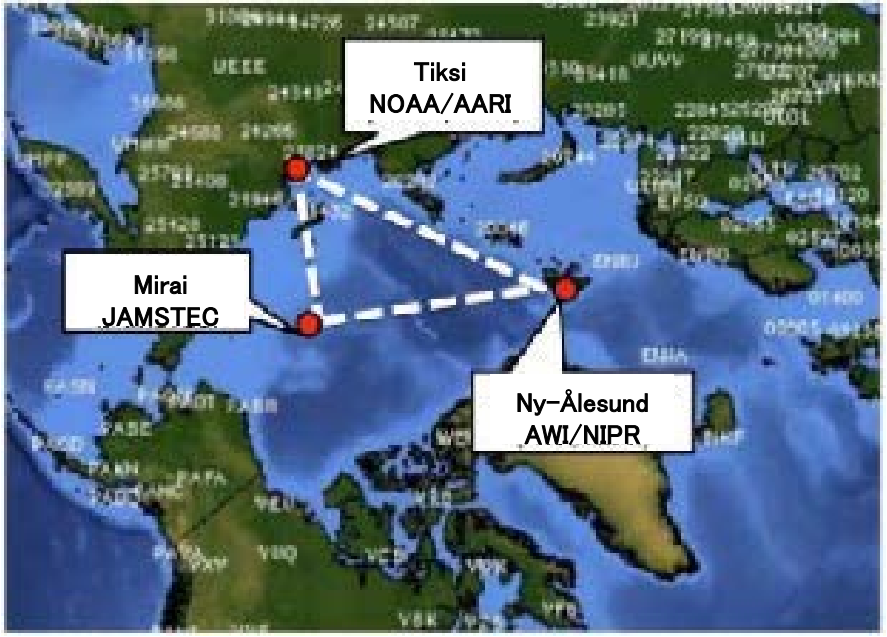
Impact of atmospheric events on the ocean stratification and ecosystem in the sea ice reduction region
<Meteorological observation>

Schematic of meteorological observation



Heat flux from the ocean to the atmosphere behind the cold front could produce polar cyclones

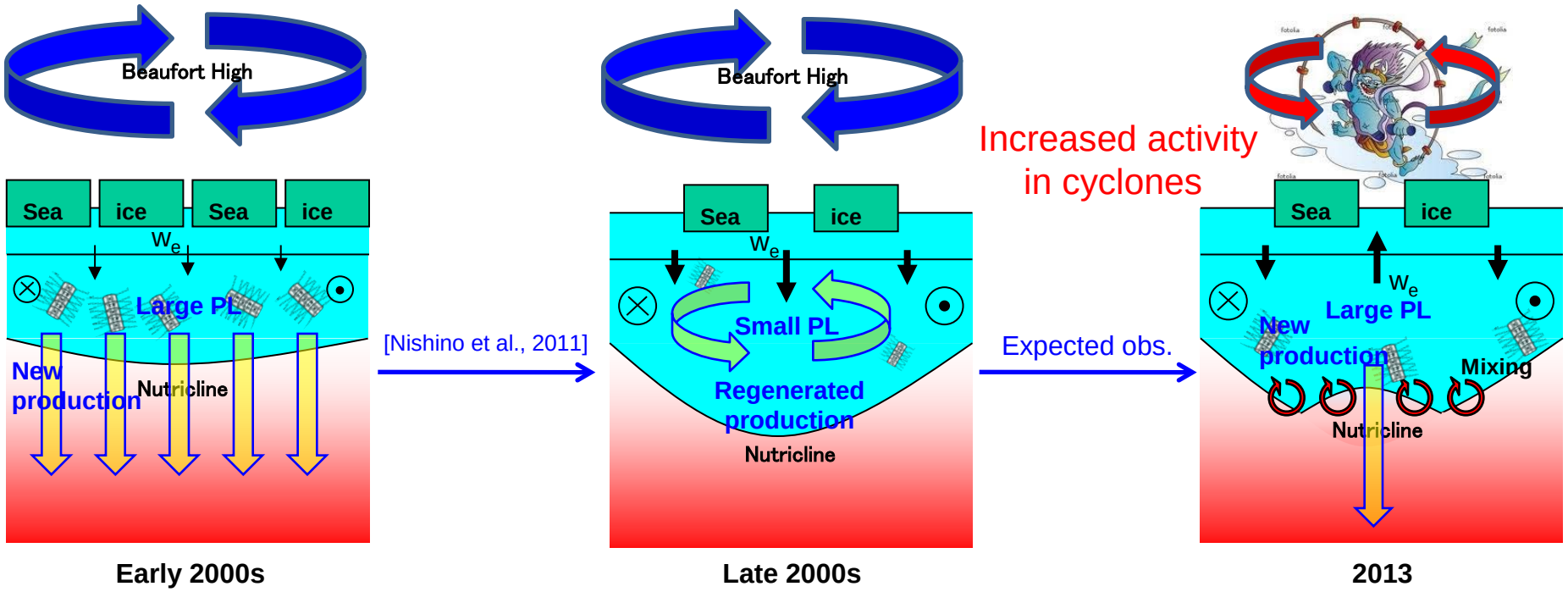
Intensive observation of radiosonde under international collaborations



Assimilation of radiosonde data from polar regions could improve the reconstruction of atmospheric circulation in the mid-latitudes.

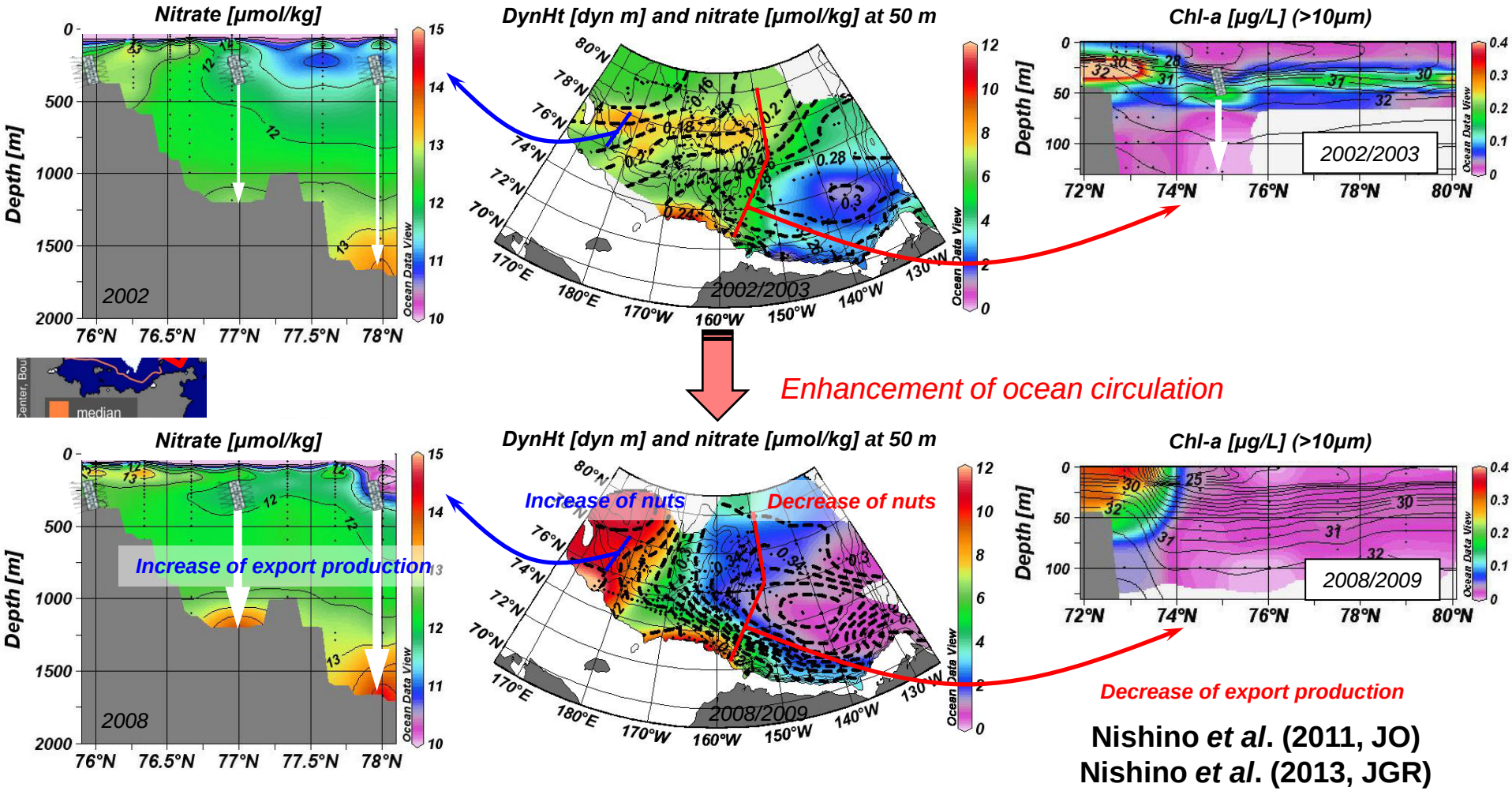
Impact of atmospheric events on the ocean stratification and ecosystem in the sea ice reduction region

<Ocean observation>



- In the Canada Basin (within the Beaufort Gyre), deepening of nutricline may result in the decrease of export production.
- Recent increased activity in cyclones may enhance the vertical mixing, resulting in the increases of nutrient supply to the surface layer and export production.

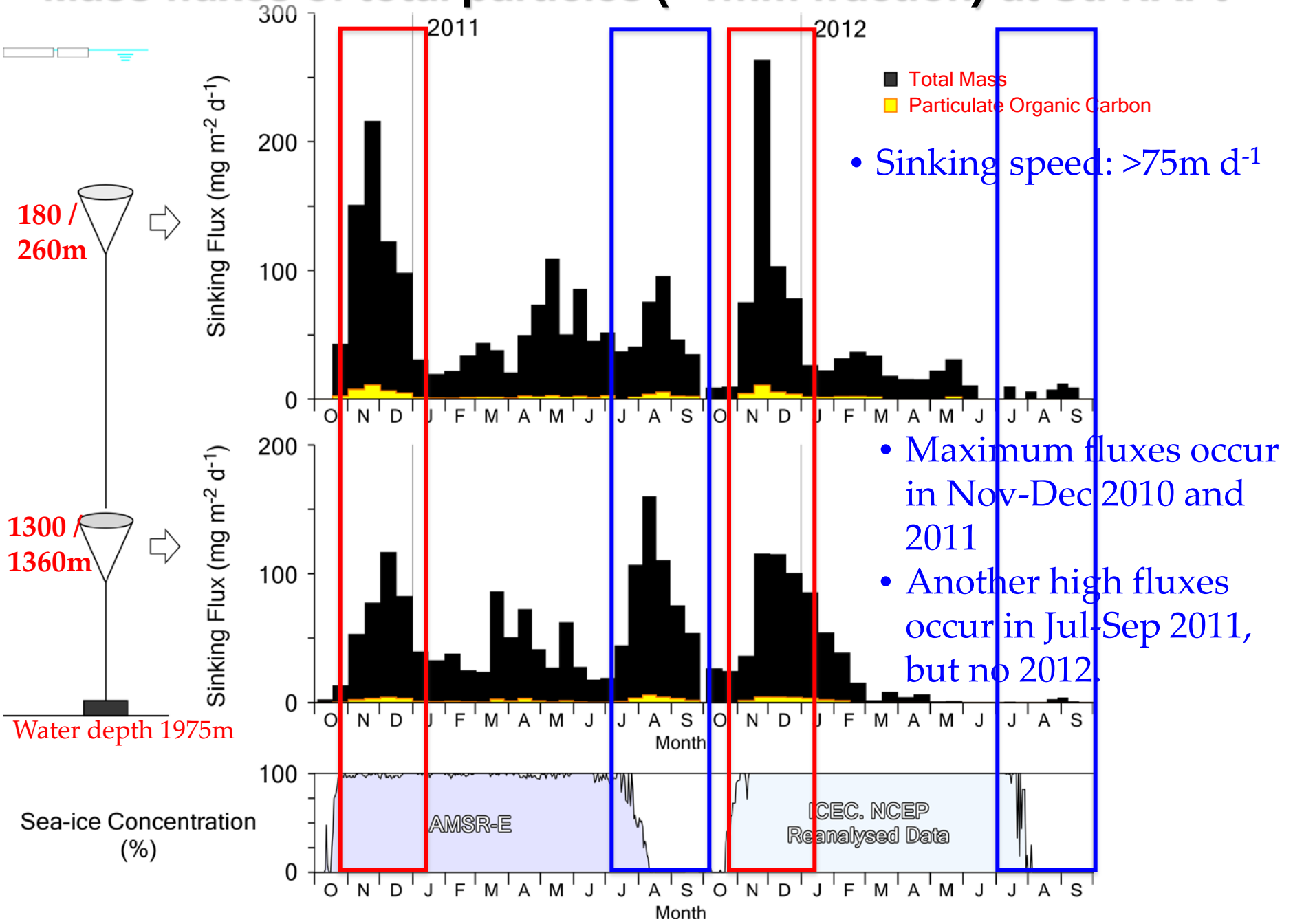
Changes in biological production caused by the enhancement of ocean circulation



Nishino *et al*. (2011, JO)
Nishino *et al*. (2013, JGR)

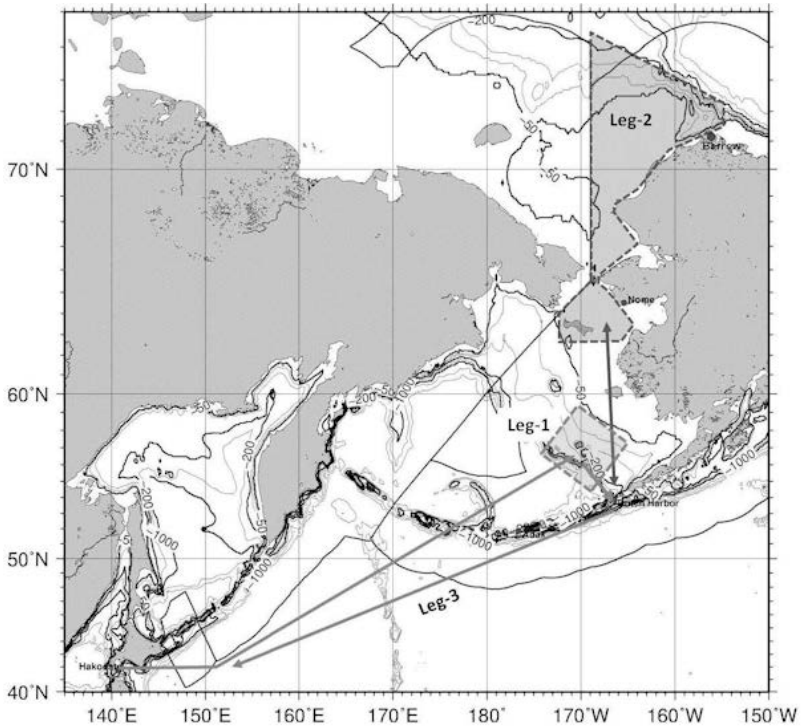
- In the Canada Basin (within the Beaufort Gyre), deepening of nutricline may result in the decrease of export production.
- In the Makarov Basin (outside of the Beaufort Gyre), shoaling of nutricline may result in the increase of export production.

Mass fluxes of total particles (<1mm fraction) at St. NAPt



- Sinking speed: >75m d^{-1}
- Maximum fluxes occur in Nov-Dec 2010 and 2011
- Another high fluxes occur in Jul-Sep 2011, but no 2012

Collaboration with T/S Oshoro-maru (Hokkaido Univ.)



2013 Japanese Arctic Ocean Cruises

T/S Oshoro-maru: July (melting season)

R/V Mirai: Late August to early October (freezing season)

Objectives

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2013 T/S Oshoro-maru cruise