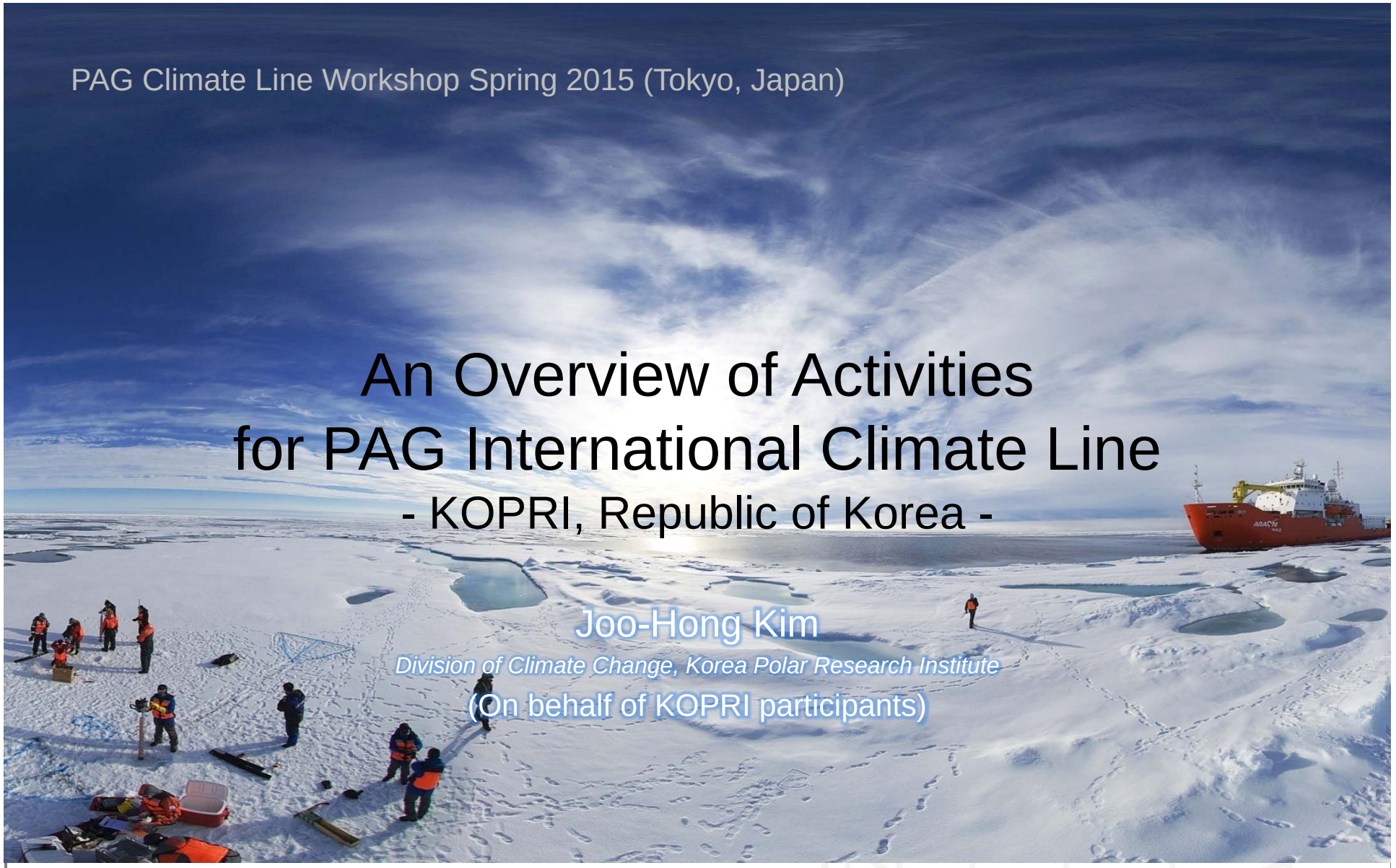
PAG Climate Line Workshop Spring 2015 (Tokyo, Japan)

An Overview of Activities for PAG International Climate Line

- KOPRI, Republic of Korea -



Joo-Hong Kim

Division of Climate Change, Korea Polar Research Institute

(On behalf of KOPRI participants)

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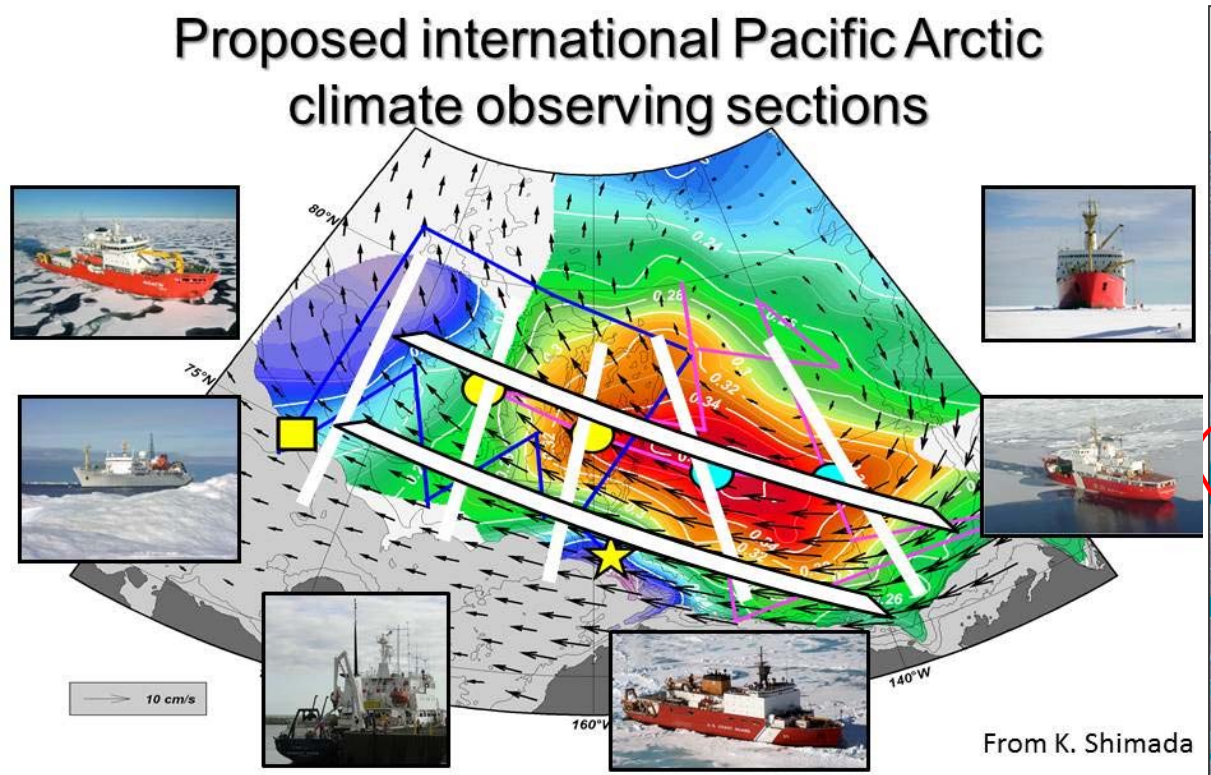
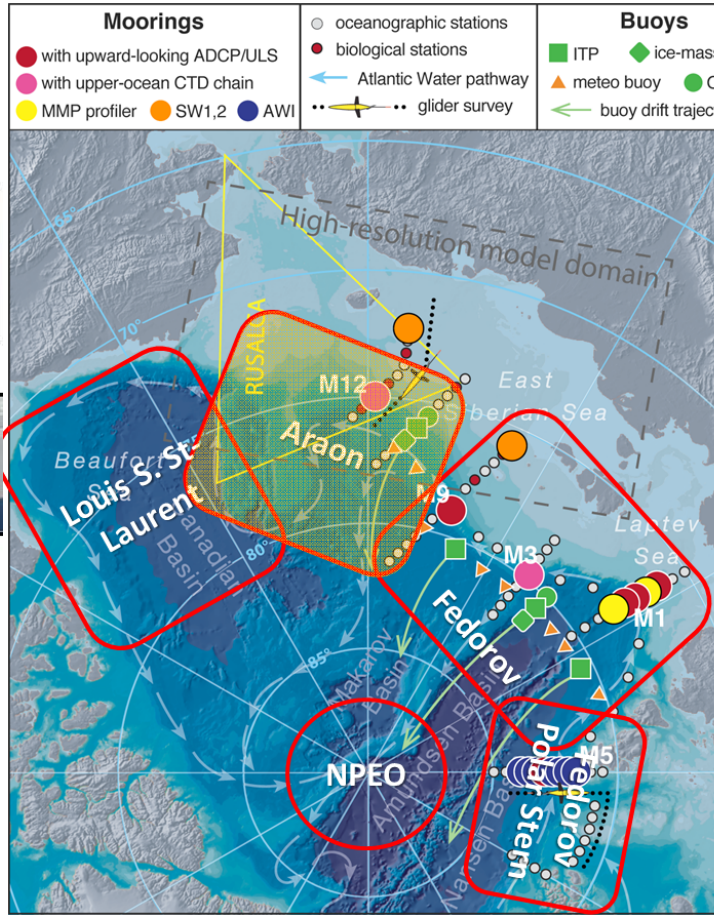
KOPRI Korea Polar Research Institute

Proposed climate line and ARAON's target area



Background color: dynamic height at 100dbar relative to 800dbar from Mirai and Louis S. St-Laurent 2008 cruises (Oceanic Beaufort Gyre)
Black vectors: average sea ice motion vectors for Nov. 2007- Apr. 2008 (Sea Ice Beaufort Gyre)
Symbols: Mooring array in 2012-2013 (TUMSAT/KOPRI/NIPR & WHOI)



From the NABOS plan

- ARAON will cover the region from the Chukchi Borderland to the Mendeleev Ridge.

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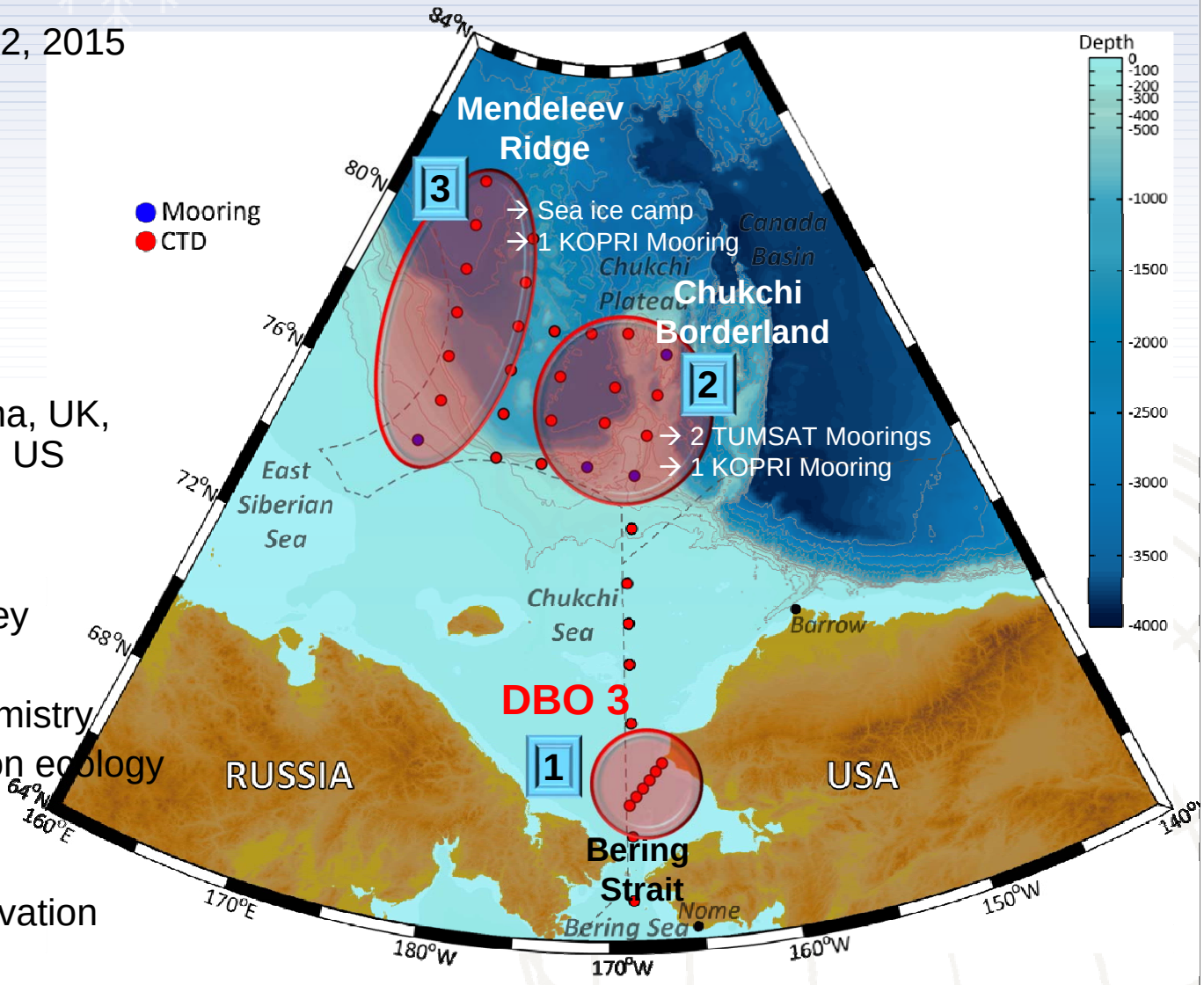
2015 Arctic cruise plan

- Period
  - Leg 1: August 1 - 22, 2015
  - Nome to Barrow
- Chief Scientist
  - Dr. EunJin Yang
- Nations
  - Korea, Japan, China, UK, France, Spain, and US
- Research fields
  - Hydrographic survey
  - Sea ice physics
  - Sea ice biogeochemistry
  - Microbes & plankton ecology
  - Marine chemistry
  - Remote sensing
  - Atmospheric observation



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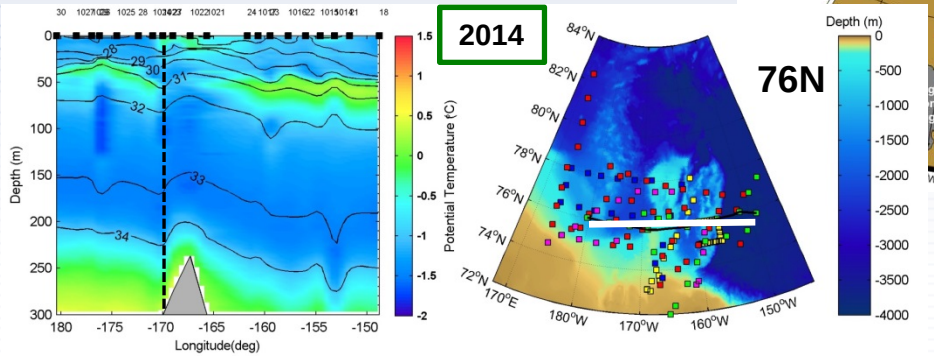
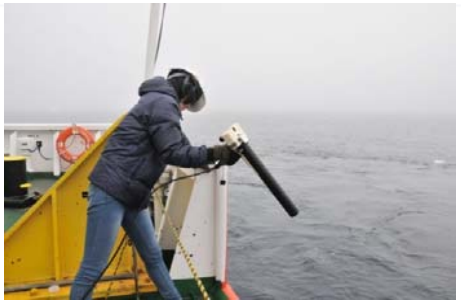
Research activities

- Physical oceanography

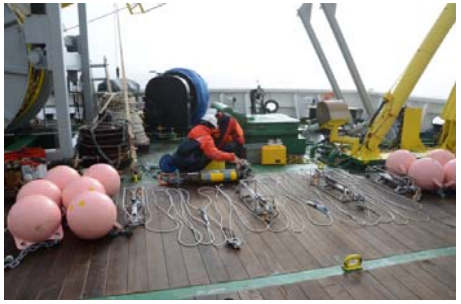
- CTD/XCTD

CTD & LADCP



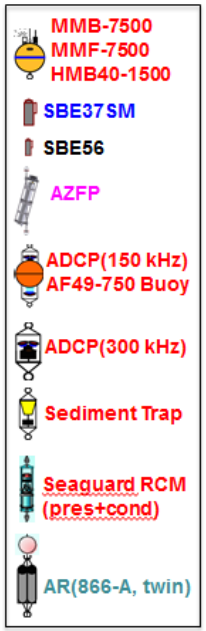


XCTD

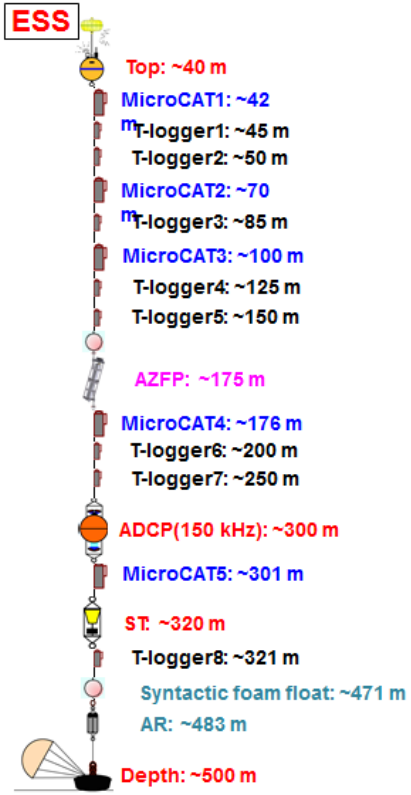


Ocean Mooring

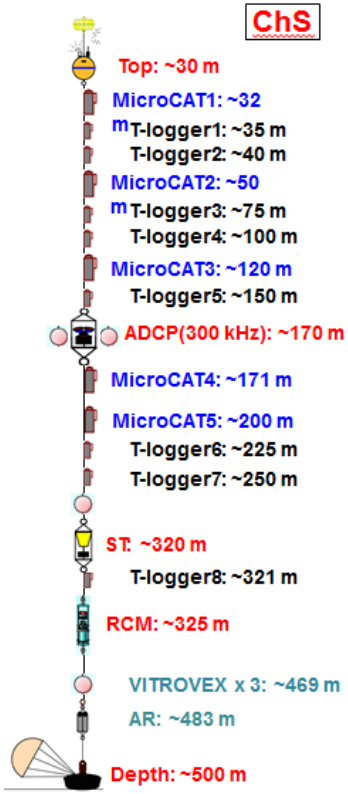
- Ocean mooring



ESS



ChS



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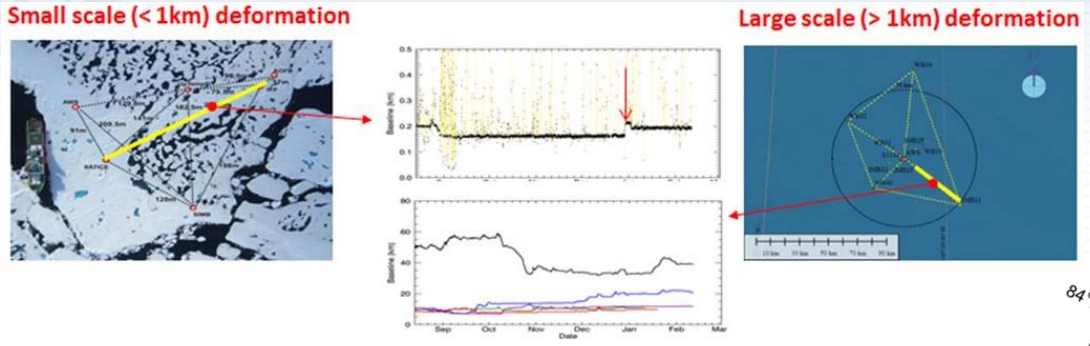
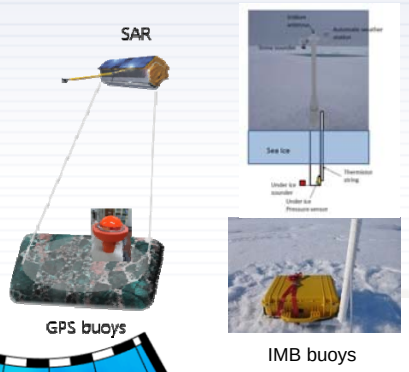
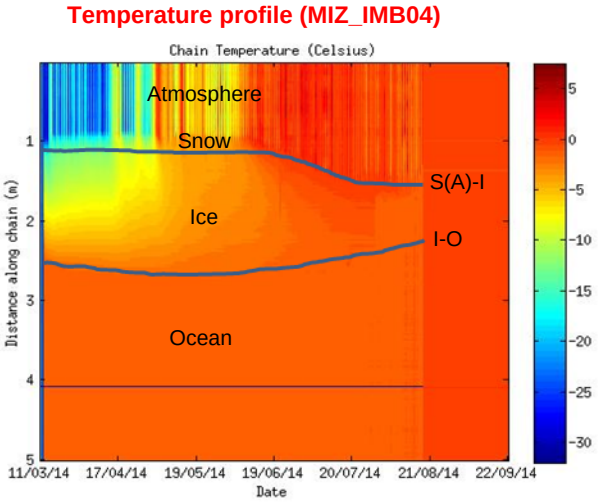
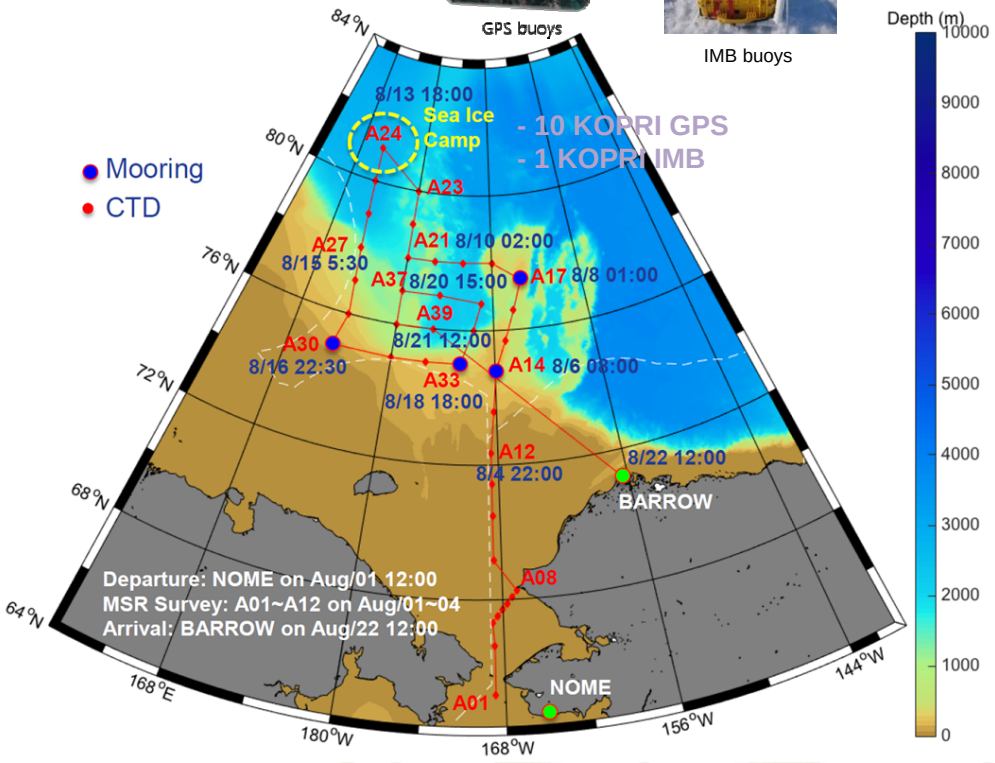
Research activities

- Sea ice physics (dynamics/thermodynamics)
  - The floe-scale deformation process
  - The heat flux at ice-ocean boundary during the freezing season









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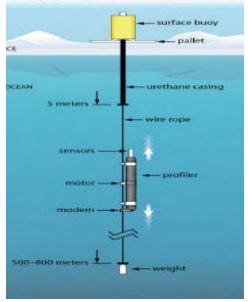
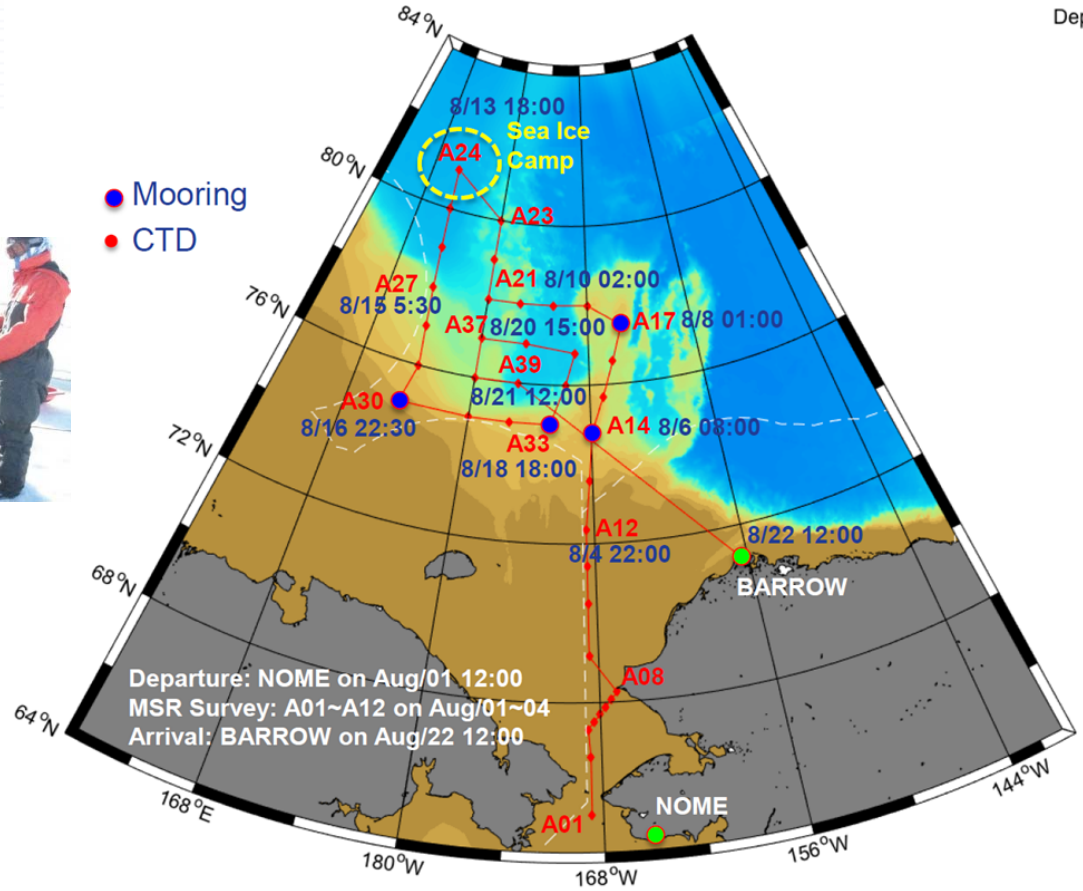
Research activities

- Upper ocean physics under sea ice
  - To understand the condition for heat release from the ocean
  - To examine temporal variation of halocline structure in the upper ocean (up to 500 m depth)
  - To study the mixing produced by ice drag stress and stratification





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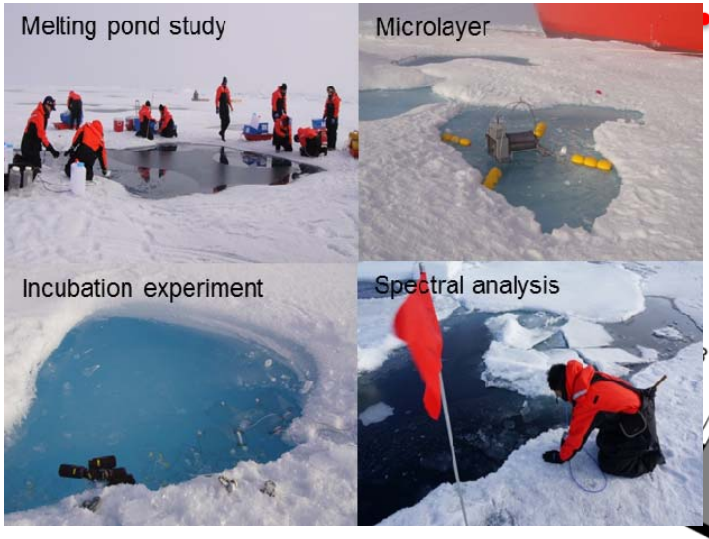
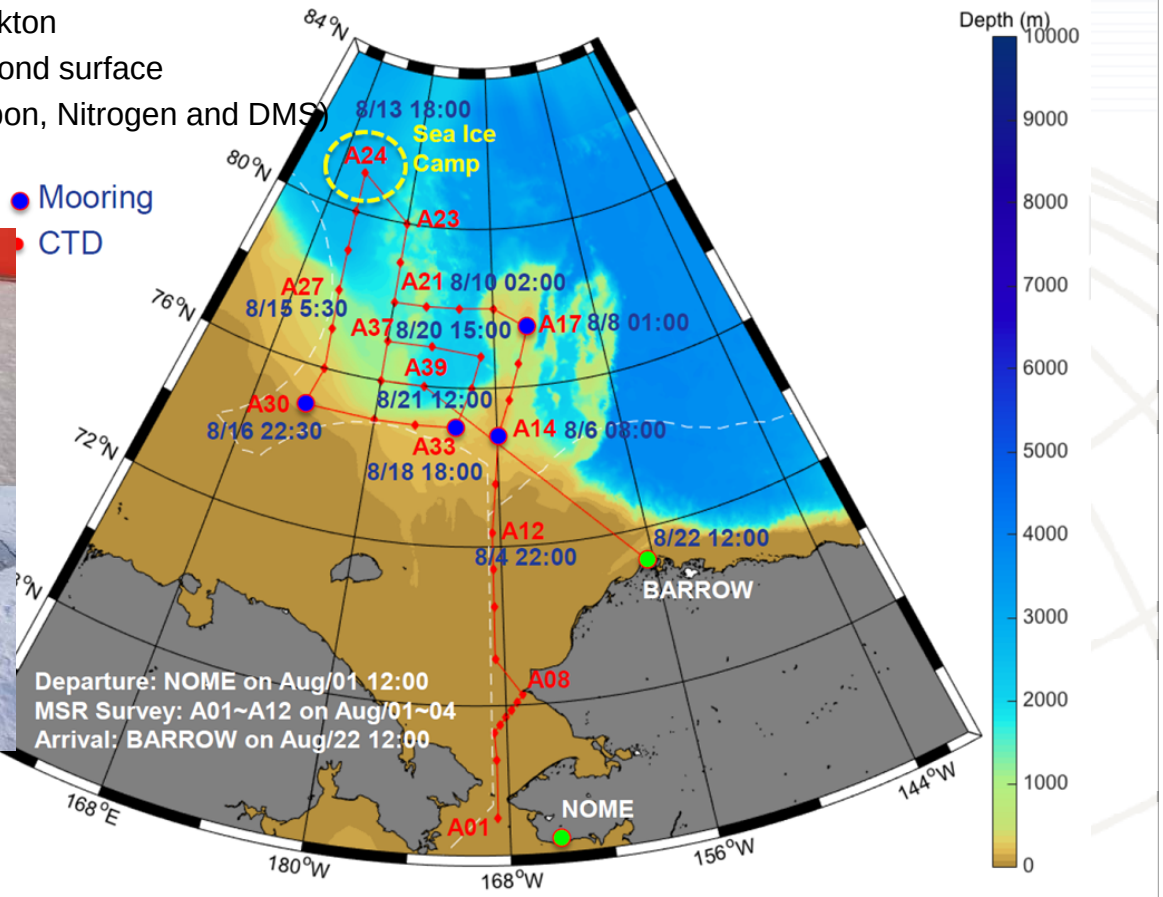
Research activities

- Melt pond biogeochemistry
  - Objectives
    - To define environmental characteristics of various melt ponds on sea ice floes in the Arctic Ocean
    - To understand food web interaction associated with environmental variation
    - To estimate the carbon contribution of entire sea ice floes in the Arctic Ocean
  - Research components
    - Plankton composition and diversity
    - Production and respiration of plankton
    - Gas interaction between air and pond surface
    - Biogeochemical parameters (Carbon, Nitrogen and DMS)
    - Spectral observation





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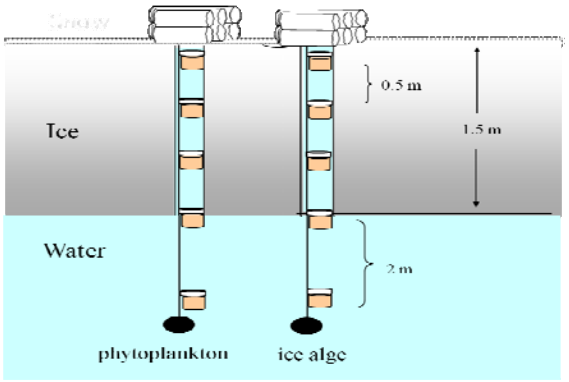
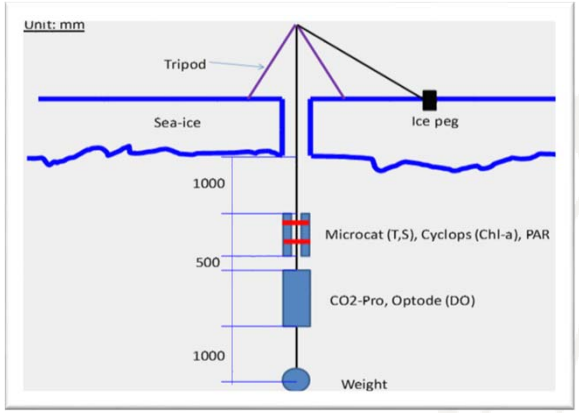
Research activities

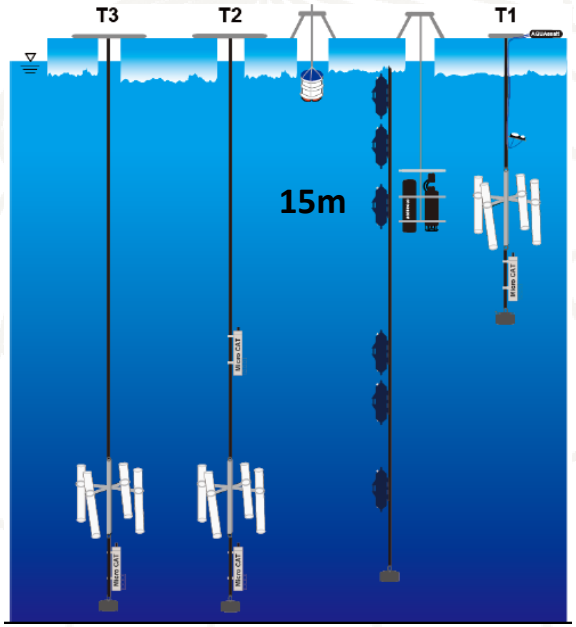
- Biogeochemistry under sea ice
  - The effect of changing sea-ice on Arctic marine ecosystem
  - Species composition, abundance, and diversity associated with sea ice condition
  - Carbon interaction between Sea Ice and water column
  - Particle flux and vertical distribution under the sea ice
  - Research components
    - Plankton composition and diversity
    - Production and macromolecular of ice algae
    - pCO_2 monitoring under sea ice
    - Sediment trap & LISST Holo



Incubation for production



pCO_2 monitoring system



Sediment trap, LISST- holo, AQUAscat, Microcat

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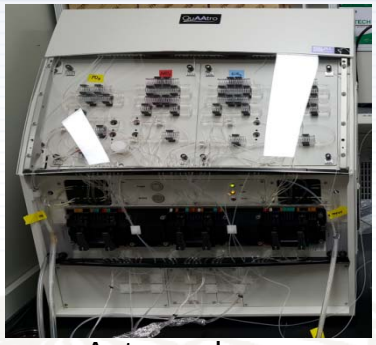
Research activities

- Marine chemistry
  - Inorganic chemistry
    - Spatial and temporal variation of inorganic carbon system
    - Behavior of nutrients (NH_4, NO_2+NO_3, PO_4 and SiO_2)

Underway pCO_2 measurement

Analytical system for DIC

pH measurement system



Auto-analyzer

  - Organic chemistry
    - Characteristic of dissolved and particulate organic matter (DOM and POM)

Filtering system for DOM

TOC-TN analyzer

POM collecting system

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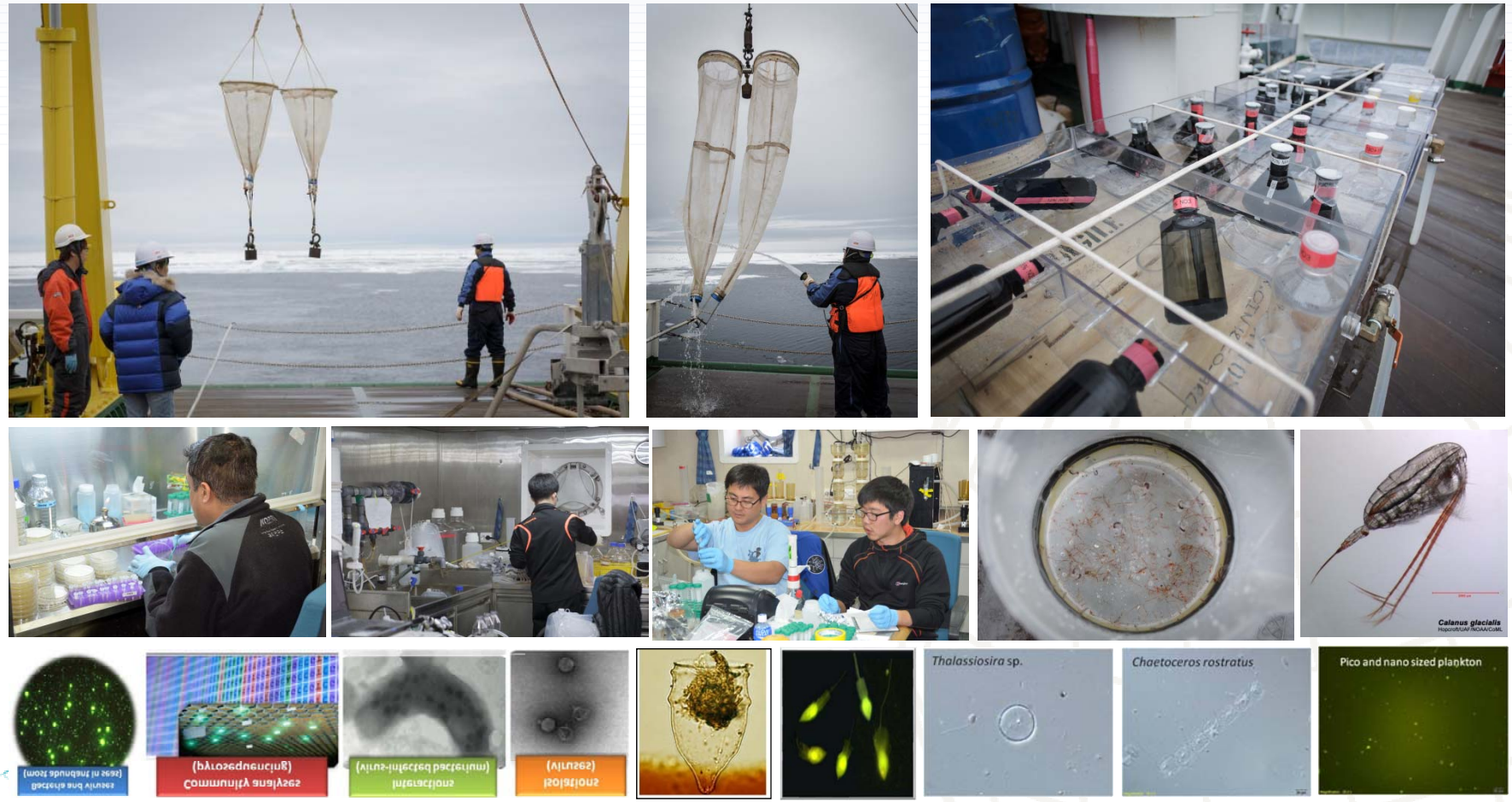
Research activities

- Microbes/Plankton ecology
  - Distribution of bacteria and virus and community structure
  - Species compositions of phytoplankton, chlorophyll *a* concentration and primary production
  - Abundance and community structure of heterotrophic protists
  - Mesozooplankton community and grazing impacts on phytoplankton biomas



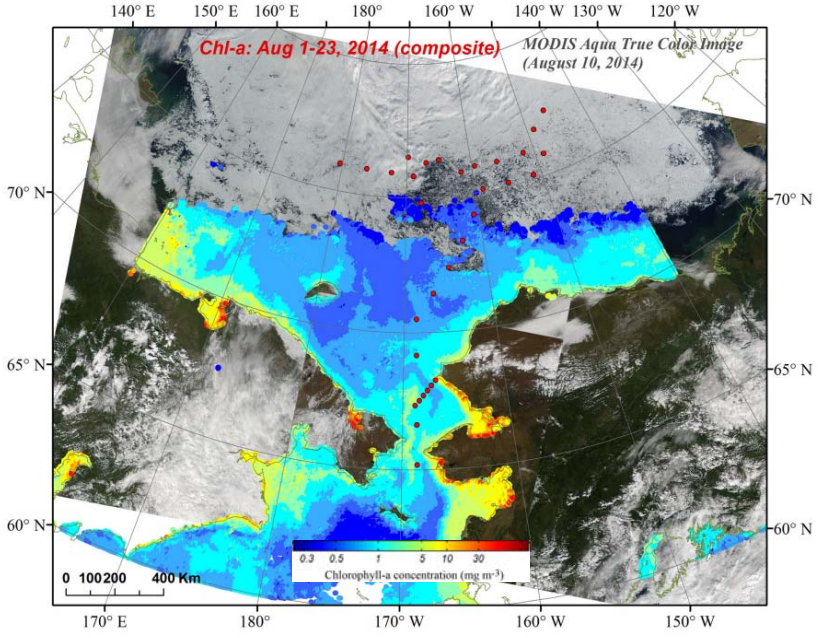
Research activities

- Remote sensing
  - Ocean optics measurement (ocean color)

Hyper-spectroradiometer

Above water spectroradiometer

APC deployment



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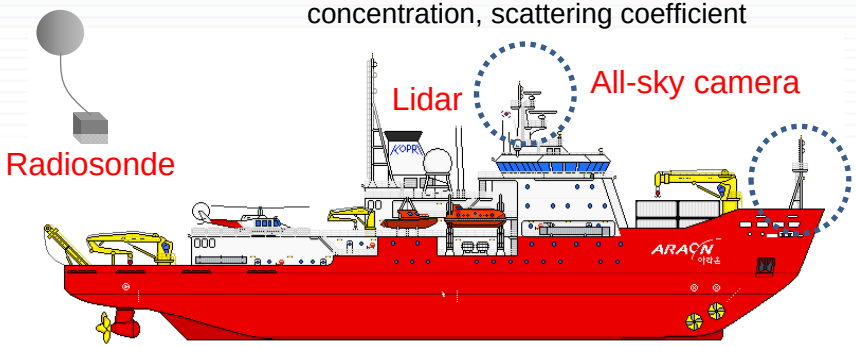
Research activities

- Atmospheric observation

  - Aerosols properties
    - condensation particle count, black carbon mass concentration, scattering coefficient



  - Enhance on-board meteorological observations
    - Cloud observing instruments
    - Radiosonde profiles

    → Contribution to YOPP
  - Study of sea ice and clouds
    - Spatial distribution, cover & type, optical and radiative properties
    - Surface properties and synoptic conditions

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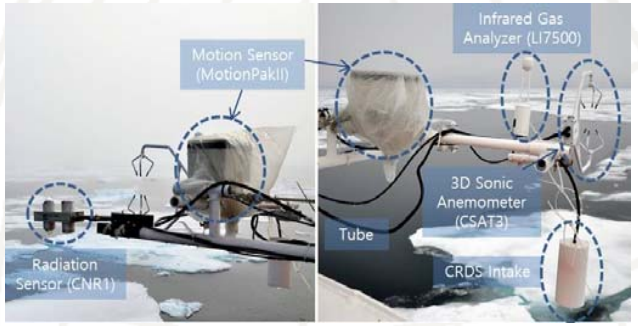
- Basic meteorological variables
  - pressure, temperature, wind speed & direction, and humidity

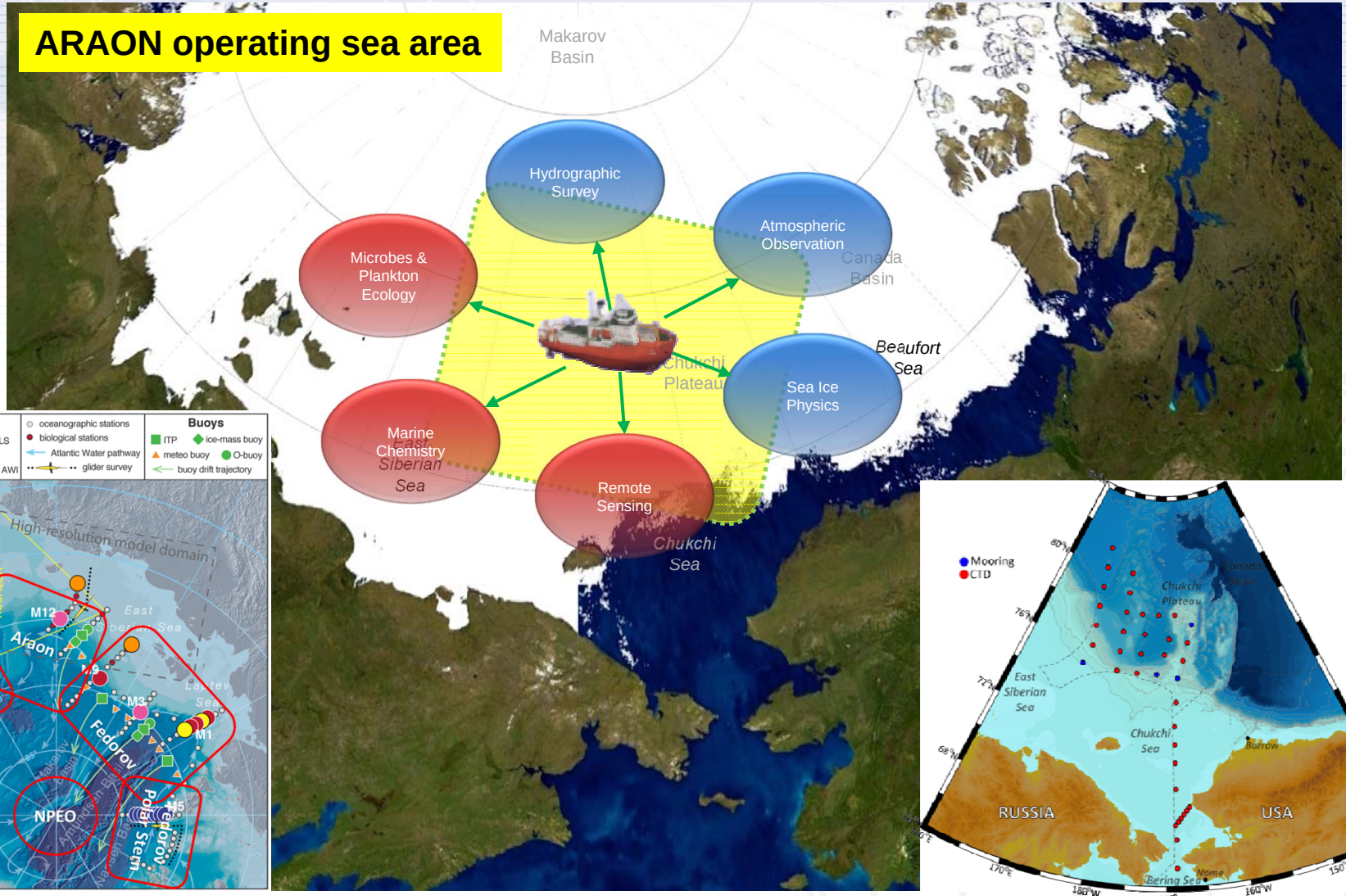
- 4-component radiations
  - shortwave and longwave radiations



- Eddy-covariance
  - momentum, sensible and latent heat, and gas fluxes

Summary : KOPRI activities for climate line (2015~)

ARAON operating sea area



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Details will be presented in the following sections.