Pacific Arctic Group:
Korean Arctic Ocean Research in 2015

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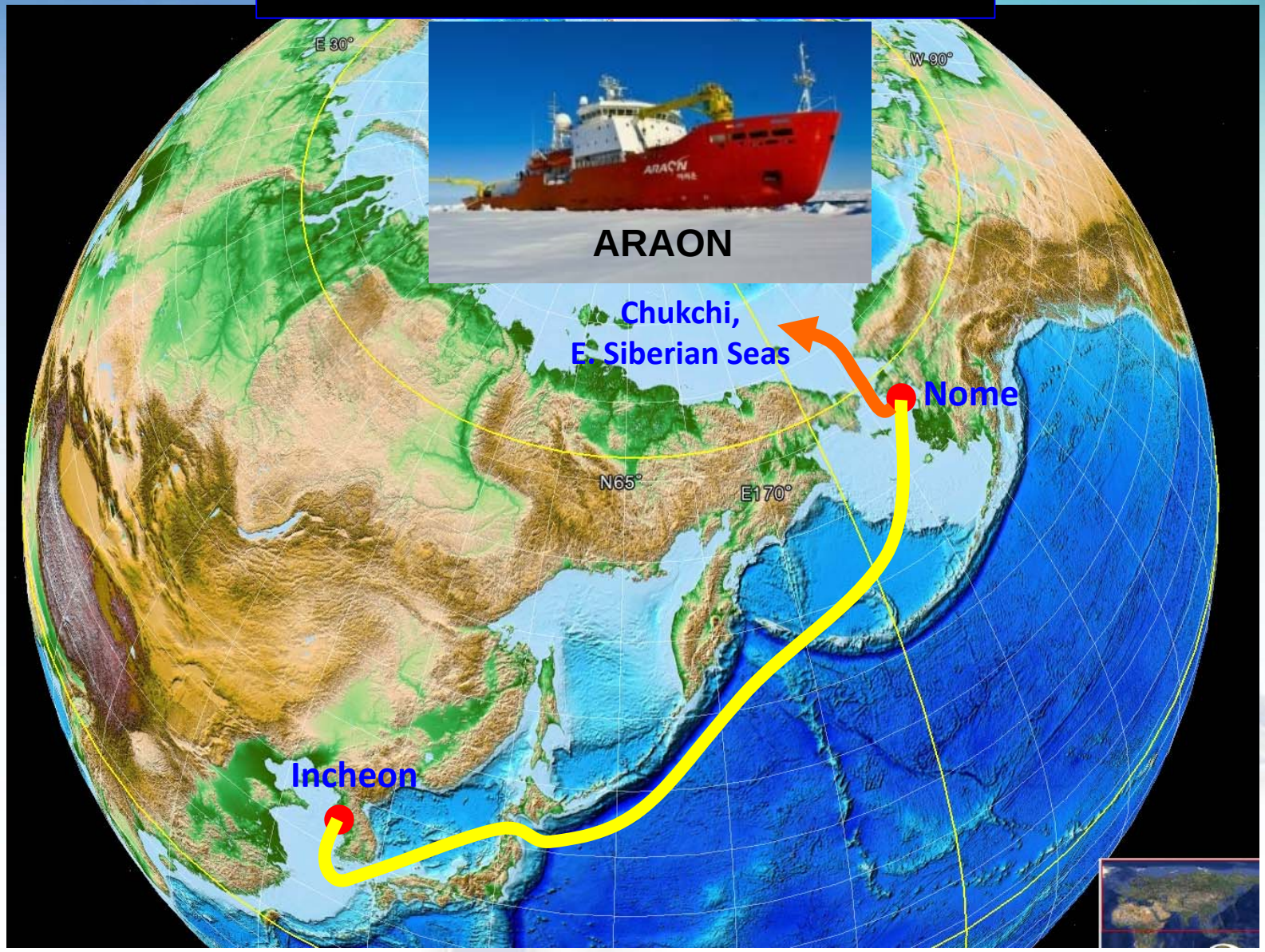
Division of Polar Ocean & Environment Research
KOPRI

25 April 2015

Pacific Arctic Group Meeting, Toyama

Korea Polar Research Institute

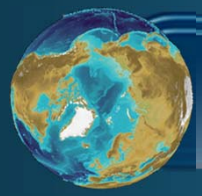
Korean Arctic Ocean Cruise track



Typical expedition periods: from the end of July to the end of September

2015 KOPRI Arctic Research Plan

2015. 8. 1 ~ 9. 23



2015 KOPRI Arctic Cruise (1st leg)

- **Ocean and geophysics study**
- **Aims of the cruise:**

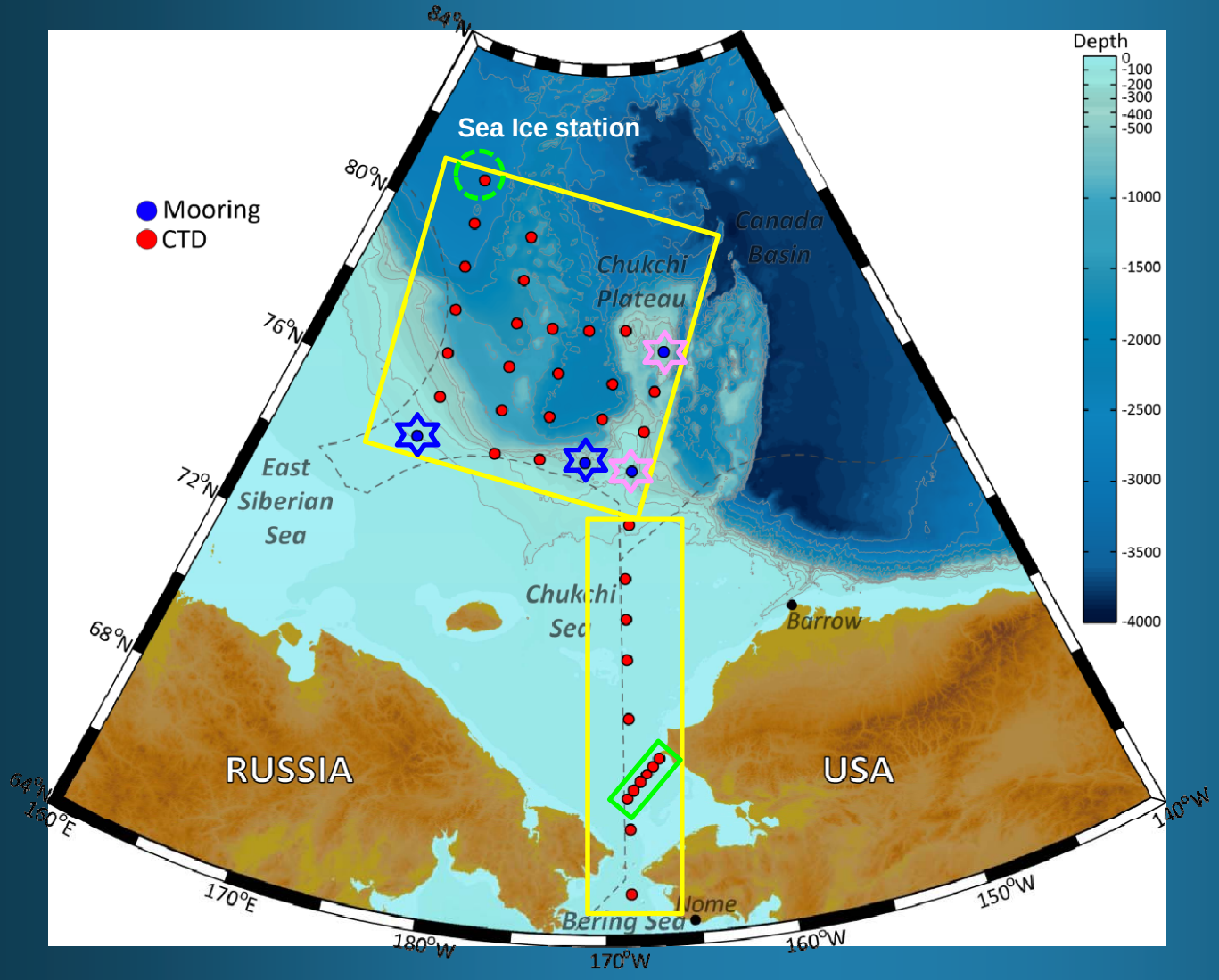
  - To investigate the structure and processes in the water column and sub-bottom layers around the North Bering Sea, Chukchi Sea, and the North site of the East Siberian Sea in rapid transition.

  - To understand sea ice dynamics and sea ice ecosystem

- **Period:** 2015. 8.1 - 8.23 (from Nome to Barrow)
- **Chief Scientists:** Dr. Eun Jin Yang
- **Participating nations:** Korea, US, Japan, UK and France and China

2015 Arctic Survey plan

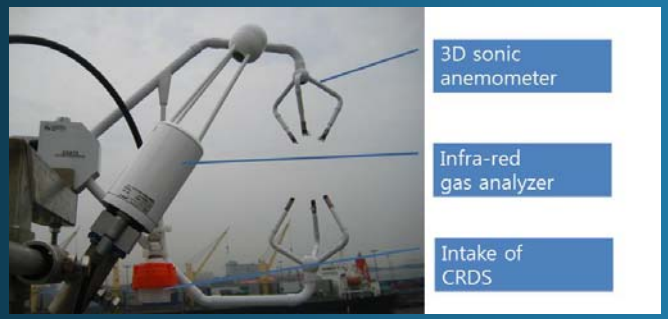
1st Leg (ocean and geophysics study)



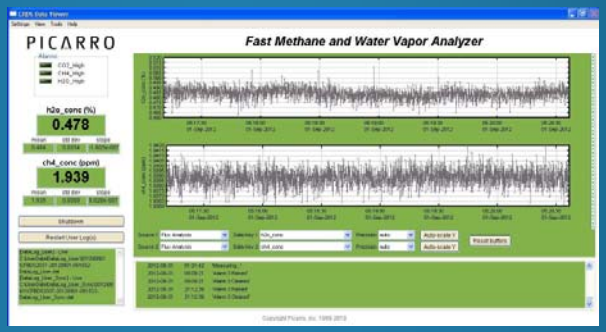
- North Bering Sea (DBO 3)
- Chukchi Sea
- East Siberian Sea & Mendeleev Ridge
- Sea Ice station
- Ocean mooring station
  - KOPRI (deployment)
  - TUMSAT (recovery)

Atmospheric Observation

- Direct measurements of Air-Sea Greenhouse Gas Fluxes (CO_2 and CH_4)



Open-path eddy covariance at the foremast of ARAON

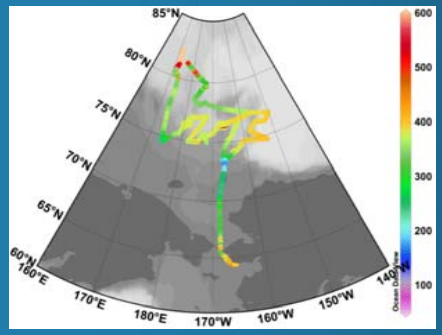


Real time variation of CH_4 and H_2O in flux mode

Chemistry in water column

- Pursuing spatial and temporal variation of CO_2 system in the Arctic Ocean
- Behavior of nutrients (NH_4, NO_2+NO_3, PO_4 and SiO_2)
- Characteristics of dissolved and particulate organic matters (DOM and POM)

Analytical system for DIC and TA



Dissolved pCO_2 along the track

TOC-TN analyzer

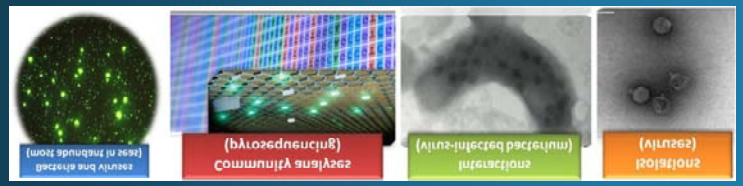
Microbes/Plankton Ecology

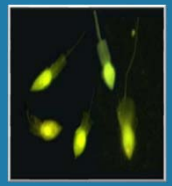
- **Distribution of bacteria and virus and community structure**
- **Species compositions of phytoplankton , chlorophyll *a* concentration and primary production**
- **Abundance and community structure of heterotrophic protists**
- **Mesozooplankton community and grazing impacts on phytoplankton biomass**







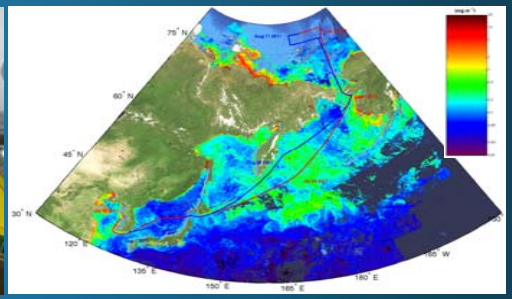

Satellite Remote Sensing

- Ocean Color Remote Sensing (Ocean Optics Measurement)

Hyper-spectroradiometer

Above water spectroradiometer

APC deployment

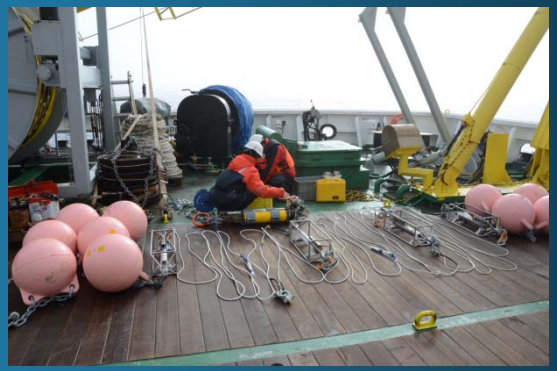


Hydrographic Survey

- Water mass distribution & characteristics

CTD & LADCP

XCTD

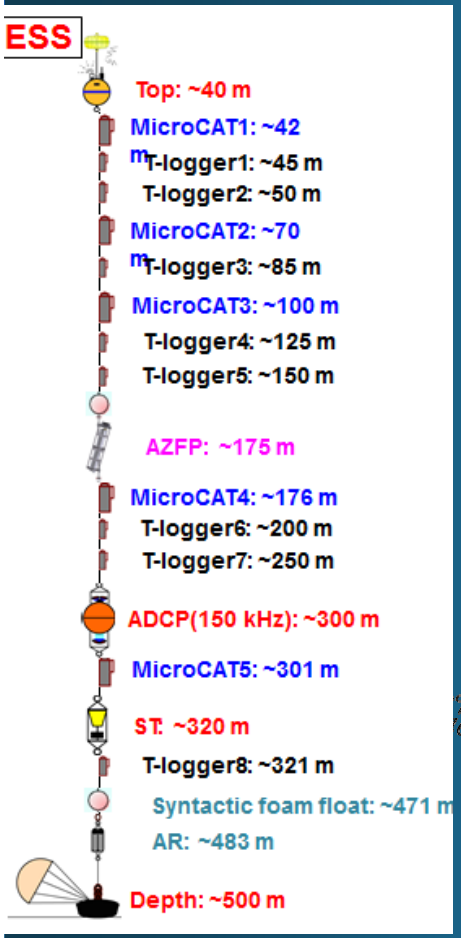


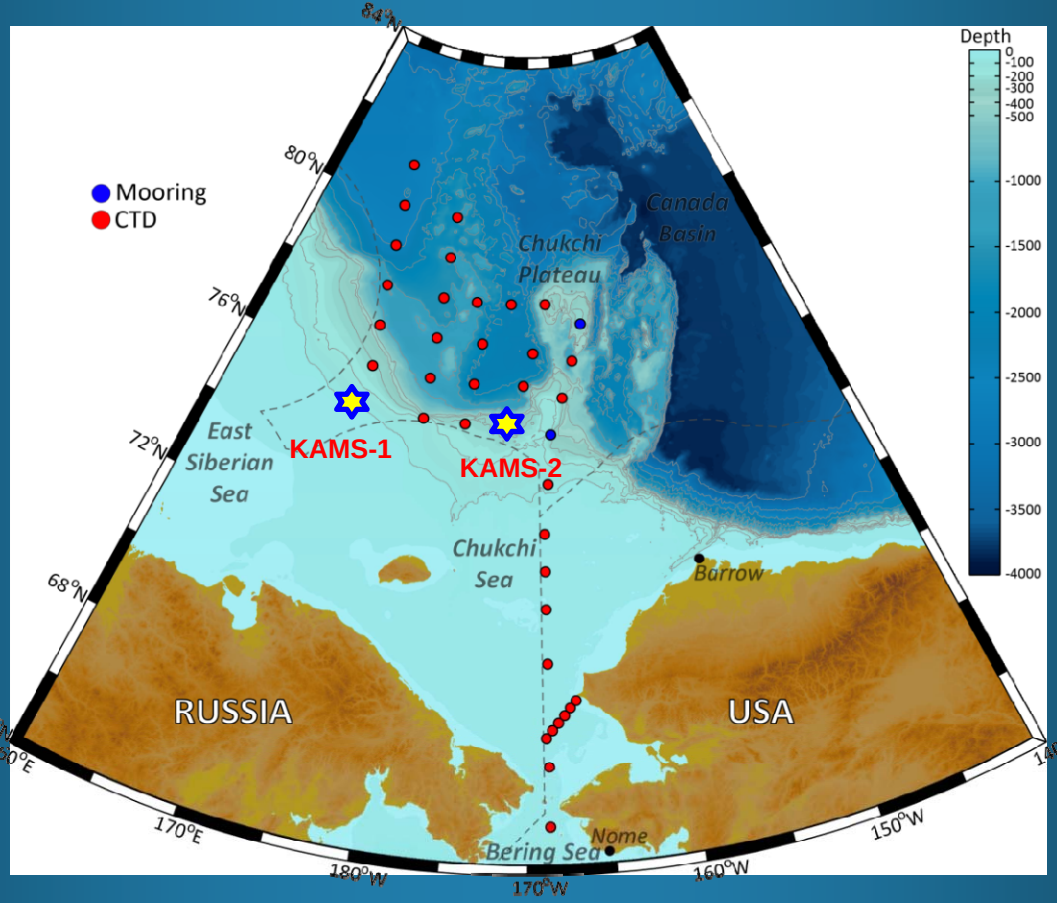
Ocean Mooring

KOPRI ocean mooring system

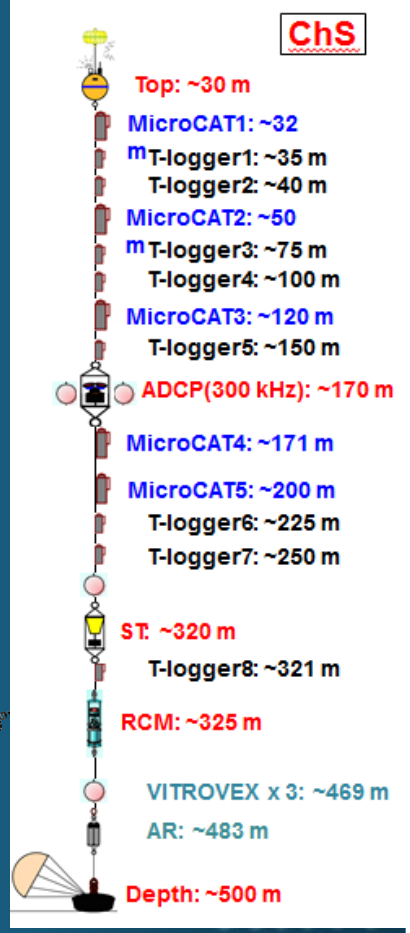
- Chukchi Sea and East Siberian Sea
- ADCP, Microcat, Sediment trap, RCM, AZFP

KAMS-1





KAMS-2



Collaboration – Ocean buoys and mooring

Mooring
(TUMSAT)

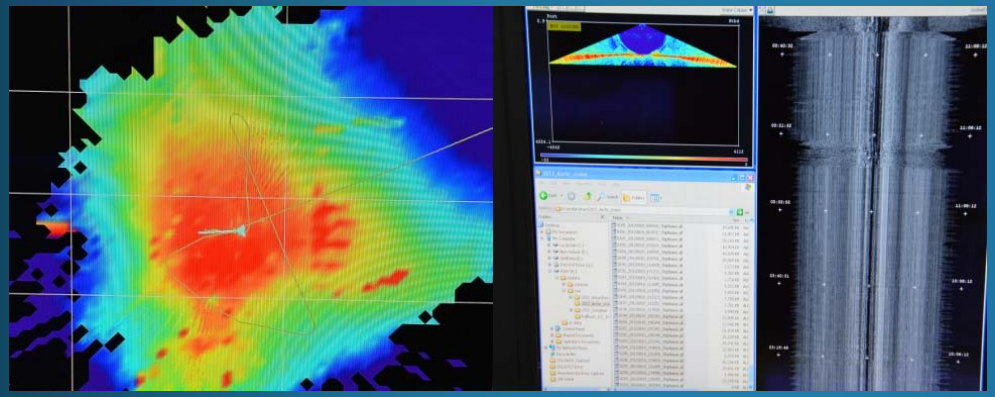
UpTempO
(University of Washington)

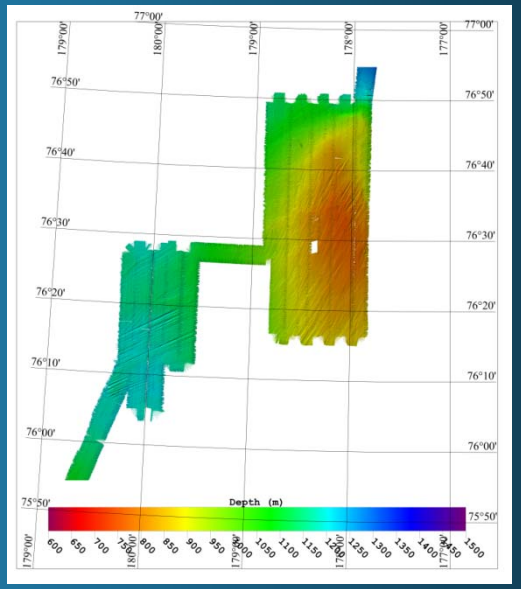
SWIFT Buoy (UW)

Wave Buoy (SAMS)

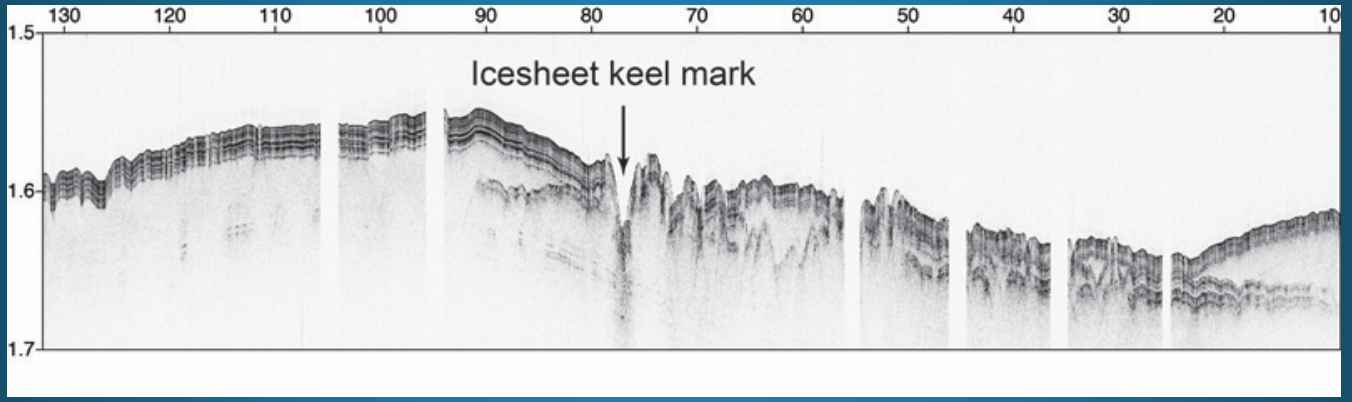
Marine Geophysics

- **Swath bathymetry**





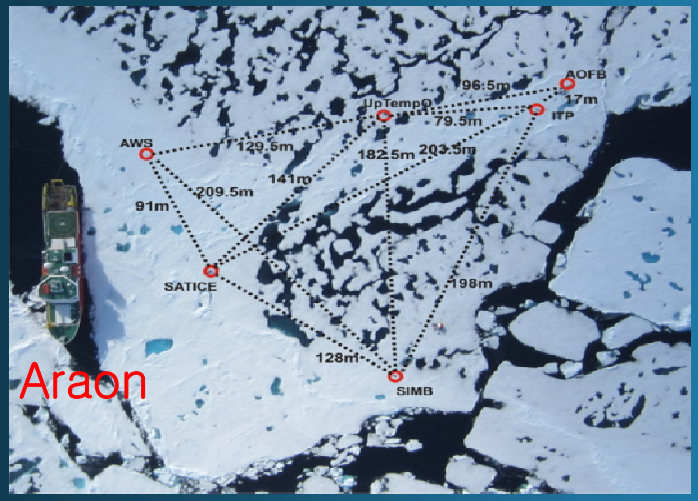
- **High-resolution subsurface features (Subbottom Profiling)**

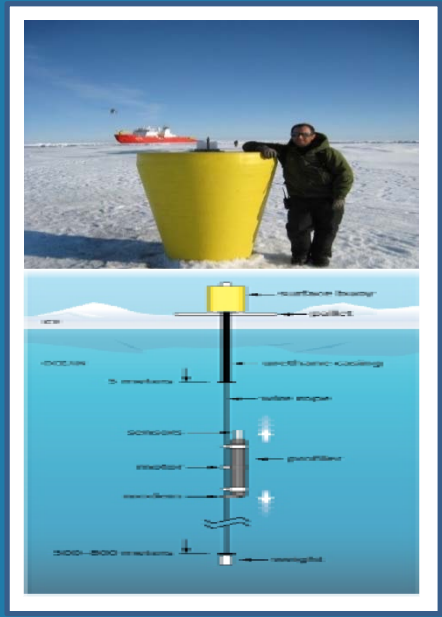


- **Gravity Survey**
  => Data shared with Arctic Gravity Project

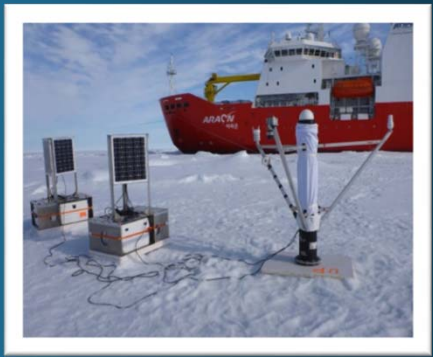
Sea ice dynamics

- International collaboration : KOPRI-SAMS- China(OCU)-France(UPMC)
- Buoy deployment and helicopter survey





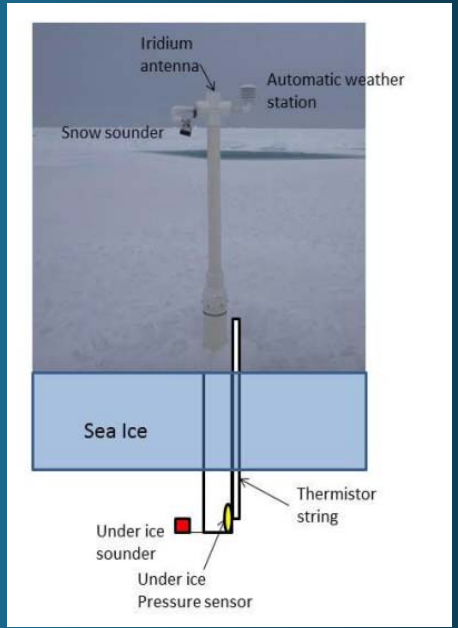
ITP buoy



SATICE buoy

IAOOS (UPMC-LOCEAN-LATMOS)

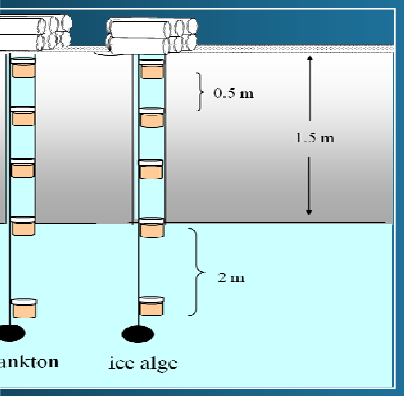
GPS buoy



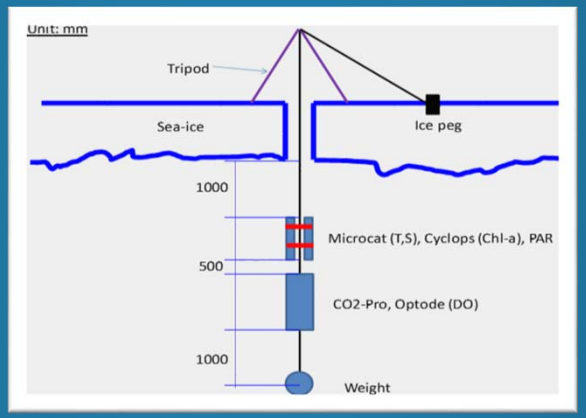
CRREL SIMB buoy

geochemical Study under Sea Ice

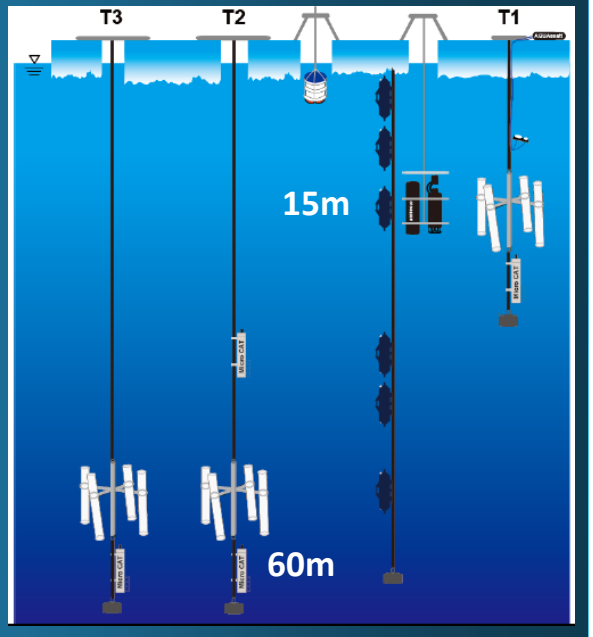
effect of changing sea-ice on Arctic marine ecosystem
cies composition, abundance, and diversity associated with sea ice condition
oon interaction between Sea Ice and water column
icle flux and vertical distribution under the sea ice



ation for production



PCO_2 monitoring system



arch components;

Melt Pond study

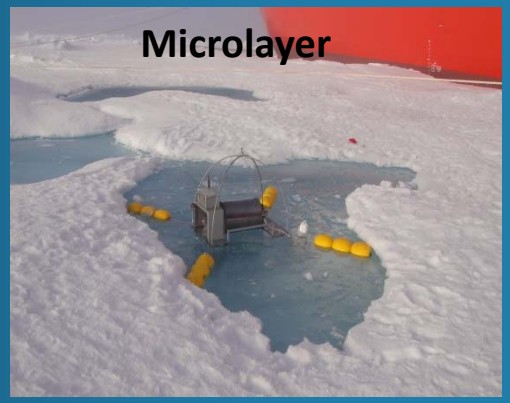
fine environmental characteristics of various melt ponds on sea ice floes in the Arctic Ocean

derstand food web interaction associated with environmental variation

timate the carbon contribution of entire sea ice floes in the Arctic Ocean.

g pond study

Microlayer



Incubation experiment

Plankton netting

earch components;

nkton composition, diversity and physiology

duction and respiration of plankton

2015 KOPRI Arctic Cruise (2nd Leg)

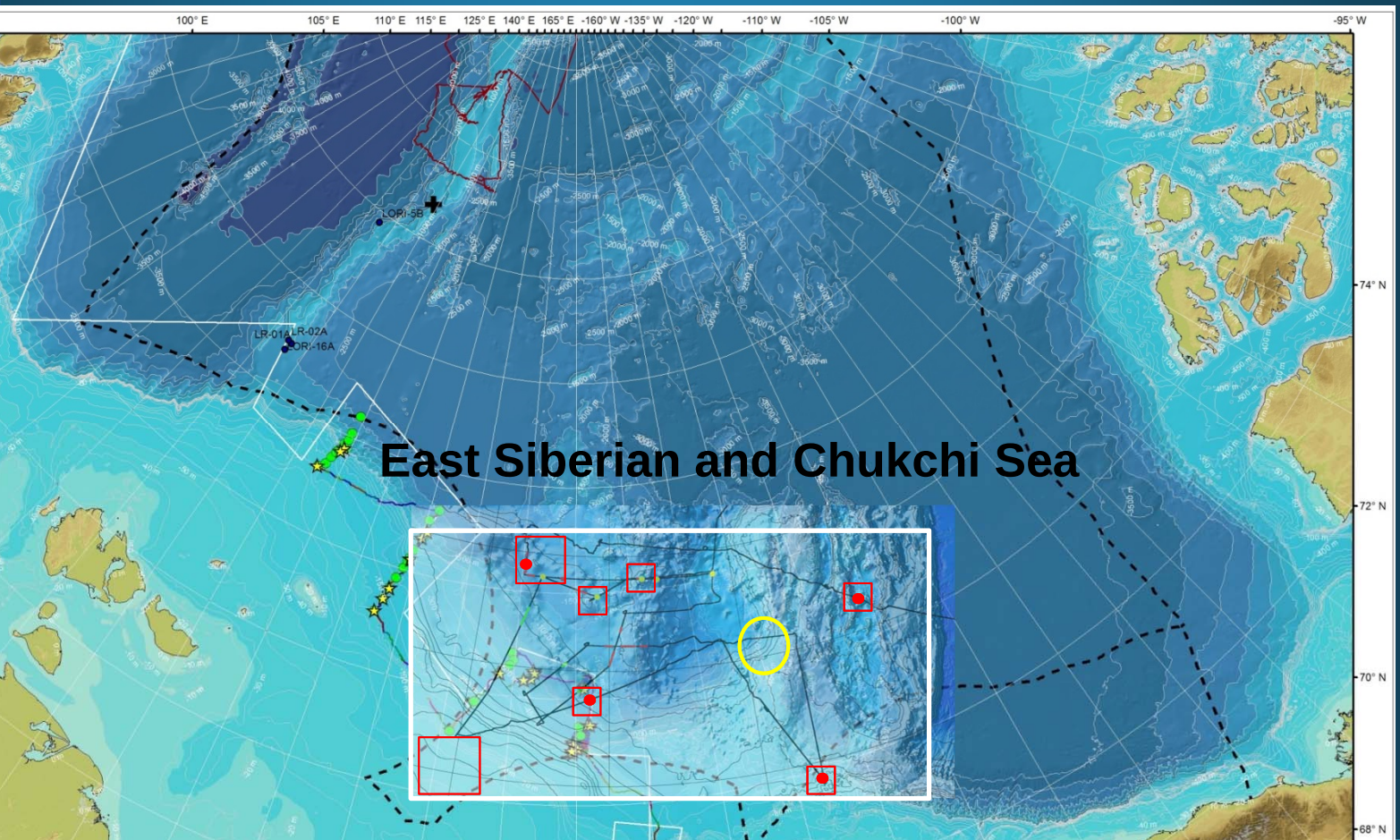
ceanography program (East Siberian Sea and Chukchi Sea)

of the cruise:

cterization of paleoceanographic conditions during warm periods of the exemplified by the Holocene
resolution reconstruction of changes in paleoclimate, paleoceanic ation, paleoproductivity, and sea-ice distribution during Late Quaternary
tigation of the western Arctic Pleistocene glacial history :
t and timing of glaciations, ice provenance and flow patterns,
ifying potential sites for future coring with a Jumbo piston corer (JPC)
ell as ocean deep drilling (e.g., MeBo)

d: 2015. 8.25 - 9.9 (from Barrow to Nome)

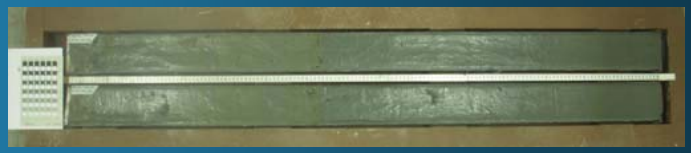
2nd Leg (Paleocenography)



Paleocenography

tibeam bathymetric mapping for seafloor morphology combined with subbottom
tion profiling (SBP) for geometry of sedimentary sequences and seismo-
graphic correlations;
ing seafloor sediment with a JPC and gravity corer for sediment composition
tratigraphy (up to ~ 15 m deep);
ng with a multiple/box corer for modern/recent seafloor processes;
ging recovered cores with the Multi-Sensor Core Logger and ITRAX geochemical
scanner along with describing the split cores and taking various samples for
er analyses

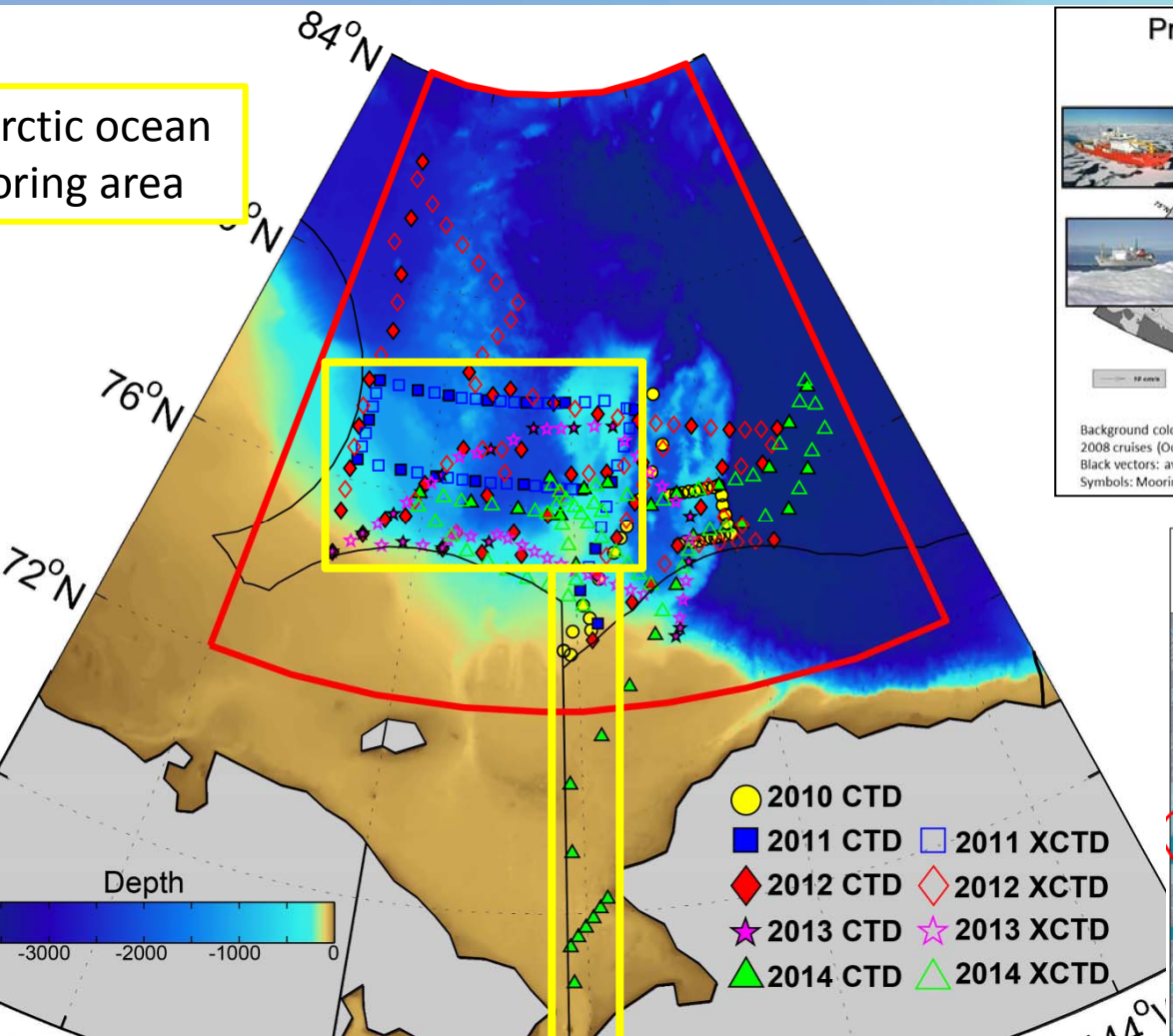


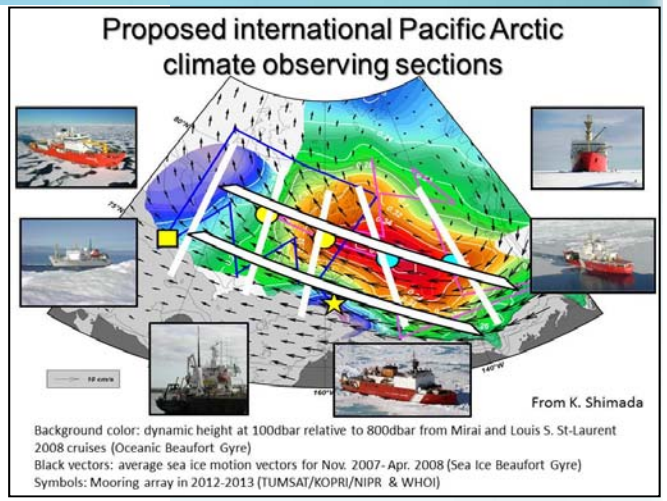



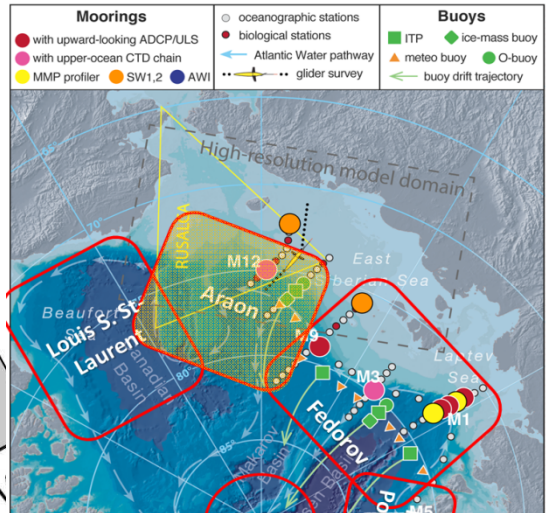

Future KOPRI Arctic research plans

Future KOPRI Arctic survey (2015 ~)

rctic ocean
oring area







PAG Synthesis

hesis-status and future plans: ARAON DSR II Special issue update-
an Arctic expeditions in the northern part of the Chukchi Sea from
to 2012 (11 papers) -> online version(10) and accepted (1)

scale deformation of an Arctic sea ice floe detected by GPS and satellite imagery
Jun Hwang, Pedro Elosegui, and Jeremy Wilkinson
nment by the sea-ice movement in the surface mixed layer and its impact on under-ice blooming dynamics
Hoon Kim, Ho Kyung Ha, Sang Heon Lee, Hae-Cheol Kim, Hyun Jung Lee, Byongjun Hwang, Jae-Hun Park
l properties of in 2012 summer open water from Mendeleev Ridge to Chukchi Plateau (Accepted)
g Zhao, Weibo Wang, Tae-Wan Kim, Eun-Jin Yang and Sung-Ho Kang
ial Diversity along Water Column in the Western Arctic Ocean
Han, Ho Kyung Ha, Chung Yeon Hwang, Bang Yong Lee, Hor-Gil Hur, Yoo Kyung Lee
nal productivity of phytoplankton in the western Arctic Ocean during early summer in 2010
n Yun, Bo Kyung Kim, Hui Tae Joo, Eun Jin Yang, Kyung Ho Chung, Sung-Ho Kang, Sang Heon Lee
molecular compositions of phytoplankton in the Arctic Ocean during the summer in 2011
ung Kim, Mi Sun Yun, Hui Tae Joo, Jang Han Lee, Jae Hyun Lim, Kyung Ho Chung, Sung-Ho Kang, Sang Lee
Carbon budget of Arctic sea ice floes
Heon Lee, Bo Kyung Kim, Hui Tae Joo, Jung Wook Park, Hyoung-Min Joo, Doo Byoul Lee, Chang-Keun Kang, and
Ho Kang
l structure variations of pelagic ciliated microzooplankton communities in response to the summer sea ice
tion in the western Arctic Ocean -Yong Jiang, Eun Jin Yang, Sung-Ho Kang and SangHoon Lee
cteristics of the sound-scattering layer in the Pacific Summer Water, Arctic Ocean
g Sul La, Myounghee Kang, Hans-Uwe Dahms, Ho Kyung Ha, Eun Jin Yang, Young Nam Kim, and Kyung Ho Chung
zooplankton community structure and grazing impact on major phytoplankton in the Chukchi Sea and the
ern Canada Basin, Arctic Ocean- Eun Jin Yang, Ho Kyung Ha, Kyung Ho Chung, and Sung-Ho Kang


Thank you