

# PACEO: KOPRI's PO Activity in 2016 and Plan for 2017

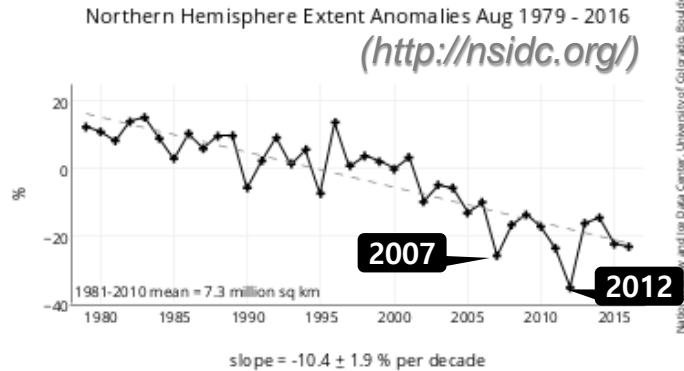


**Presenter: Kyung-Ho Cho**

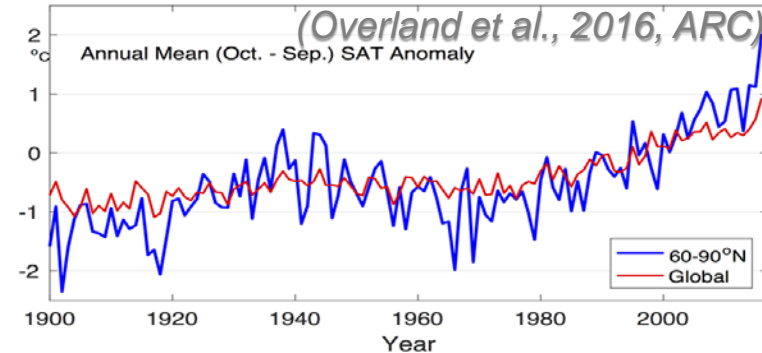
**Division of Polar Ocean Sciences  
Korea Polar Research Institute, Korea**

# Background & Objective

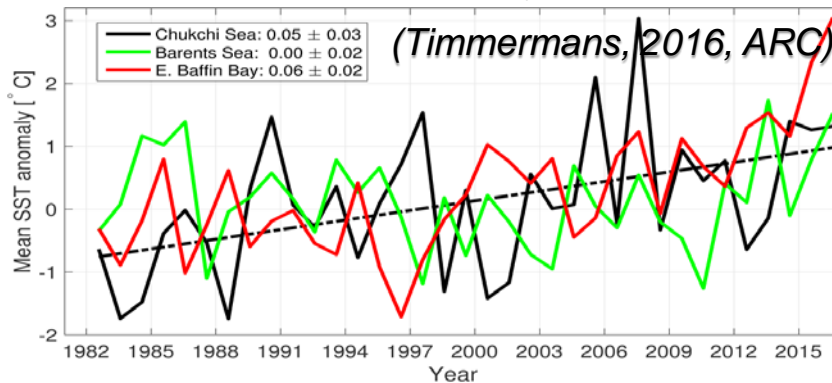
## Sea Ice Extent (%)



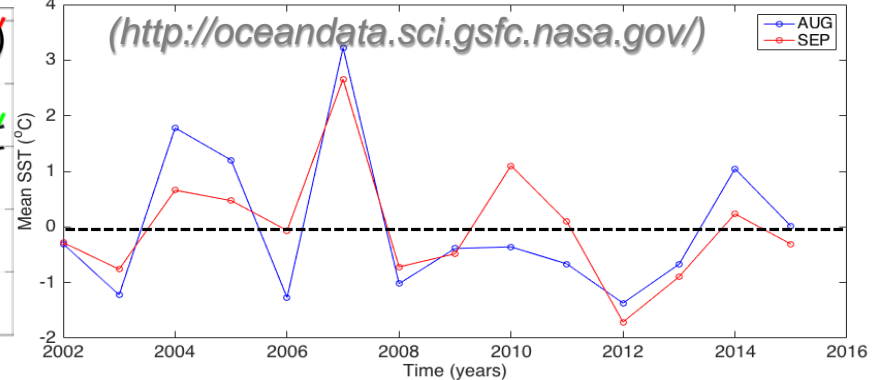
## Land Surface Air Temperature



## Mean SST anomaly (NOAA OI)



## Chukchi Sea SST (MODIS-Aqua: 4km)

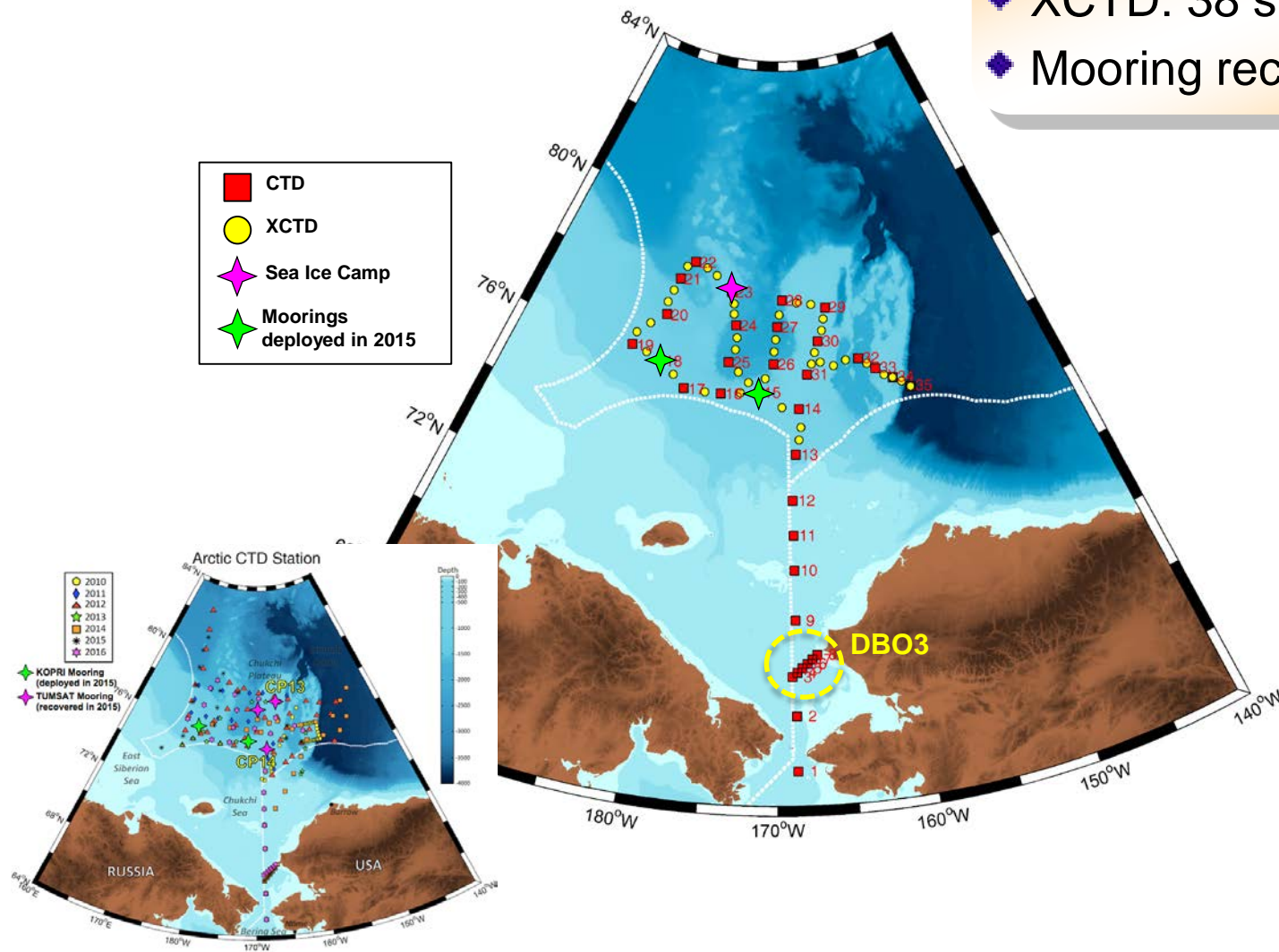


Under such an environmental change in western Arctic Ocean, we would like to understand water mass distribution and its variability in the Chukchi Borderland region (i.e., Chukchi Borderland, etc.)



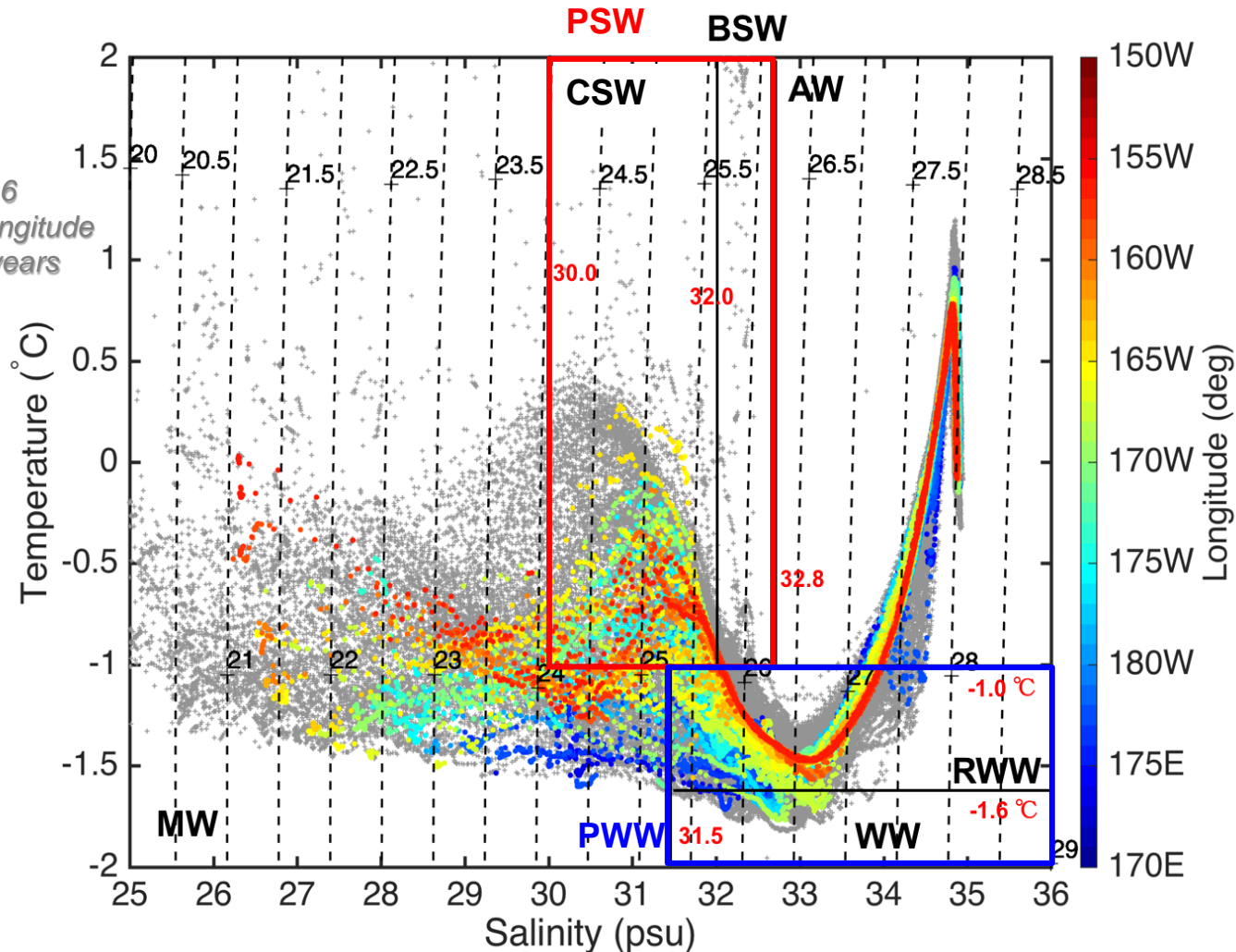
# IB R/V ARAON Arctic Cruises (2016)

- ◆ CTD: 34 stations
- ◆ XCTD: 38 stations
- ◆ Mooring recovery failed



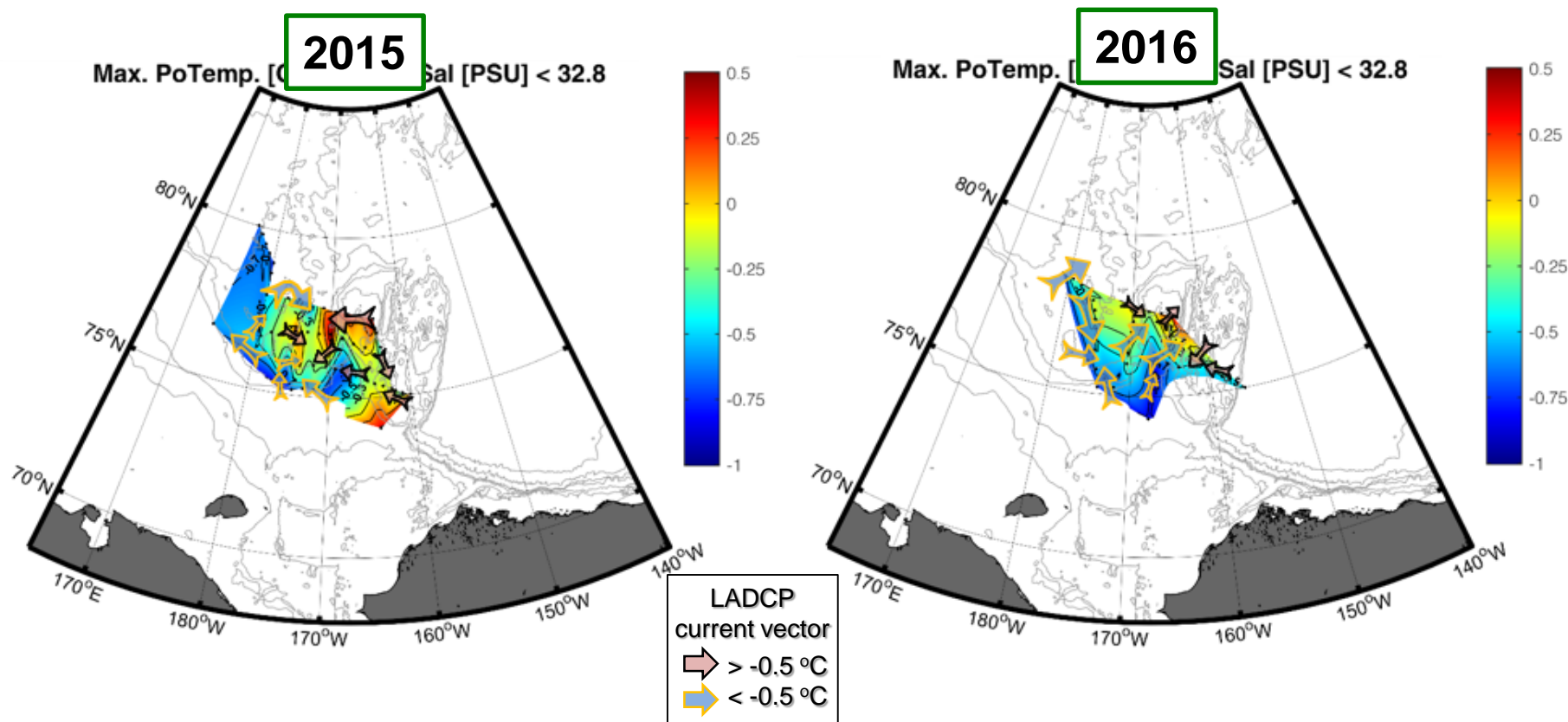
# Results: T-S Diagram

(Water mass criteria based on Itoh et al., 2015; Gong & Pickart, 2015)



MW: Melt Water; CSW: Chukchi Summer Water; BSW: summer Bering Sea Water;  
RWW: remnant Winter Water; WW: newly ventilated Winter Water; AW: Atlantic Water

# Distribution of Summer Water ( $\theta_{\max}$ )



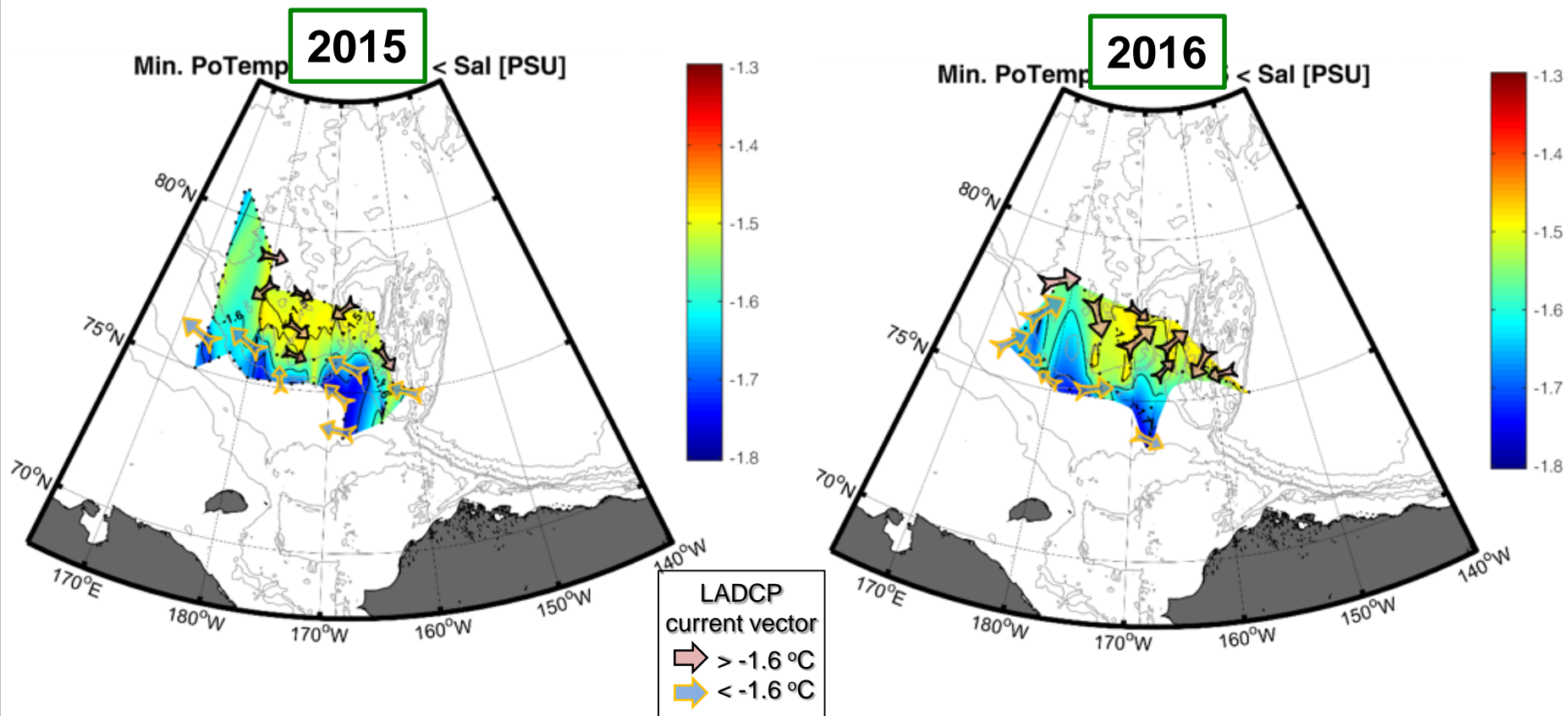
## Findings

1. Warm summer water tends to extend westward from Beaufort Sea
2. Cold summer water tends to extend northward from the shelf (toward MR, CP and NWR)
3. Eastward cold summer water tends to depress warm summer water showing temporal variation

*Lowered ADCP current vector does not mean a pathway of water mass.*



# Distribution of Winter Water ( $\theta_{\min}$ )



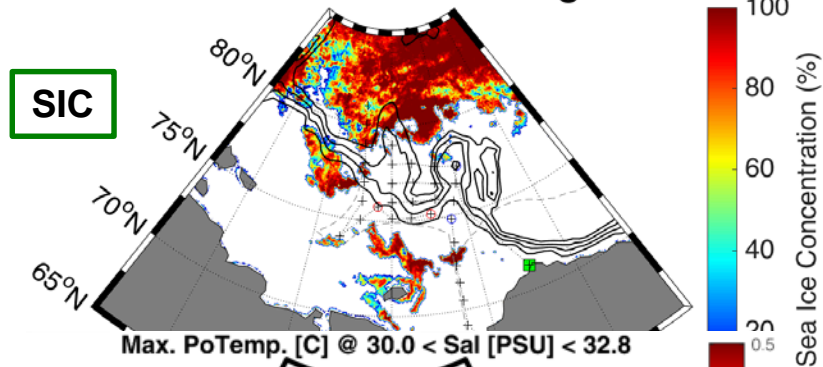
## Findings:

1. WW tends to extend to the MR, CP, and NWR similar to cold summer water
2. RWW exists in the Chukchi Borderland and seems to be depressed by WW in recent years

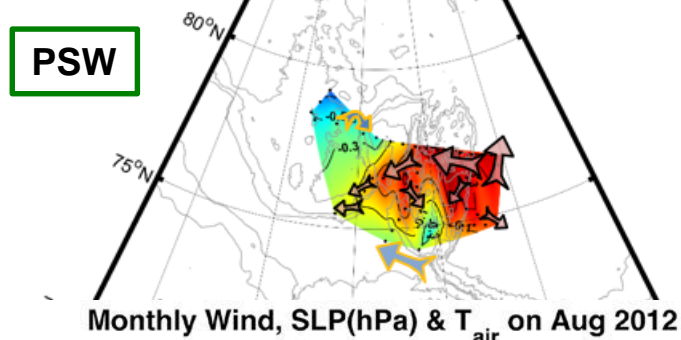
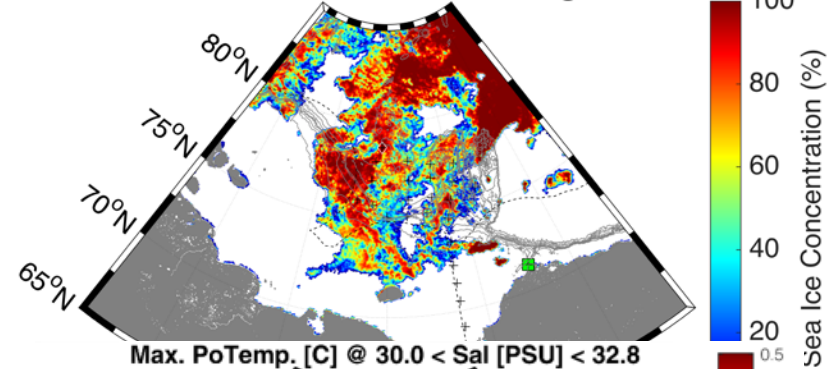
*Lowered ADCP current vector does not mean a pathway of water mass.*

# Comparison (2012 vs. 2016)

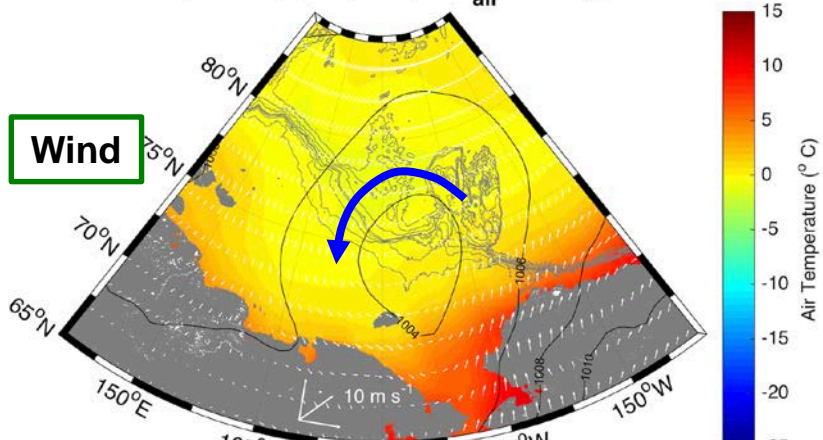
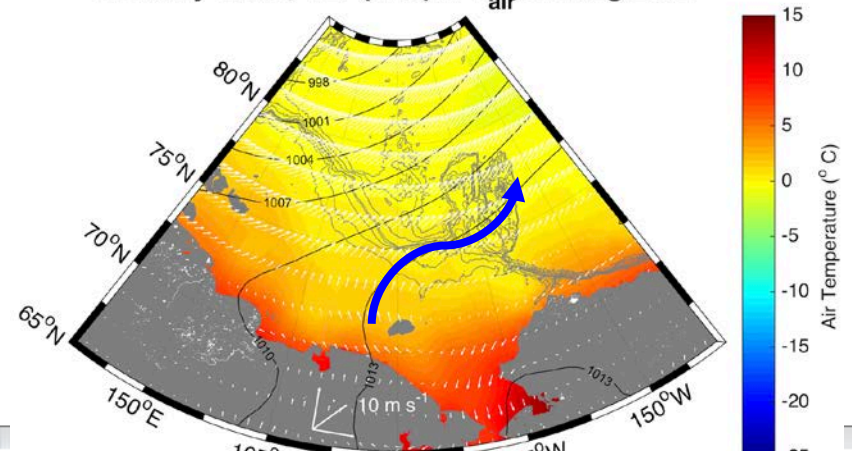
Sea Ice Concentration on Aug 15 2012



Sea Ice Concentration on Aug 15 2016



Monthly Wind, SLP(hPa) & T<sub>air</sub> on Aug 2016

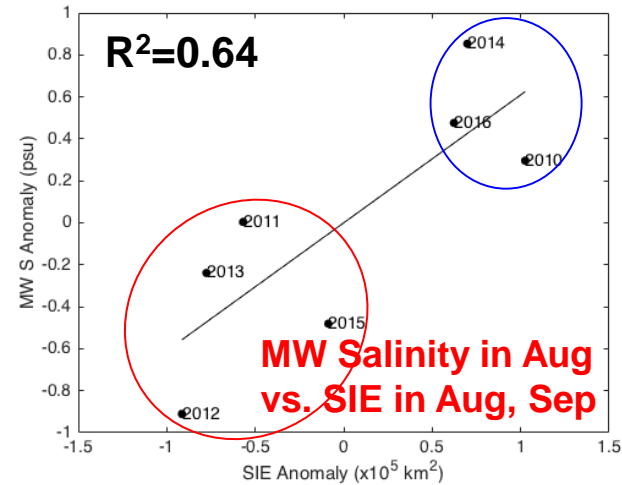
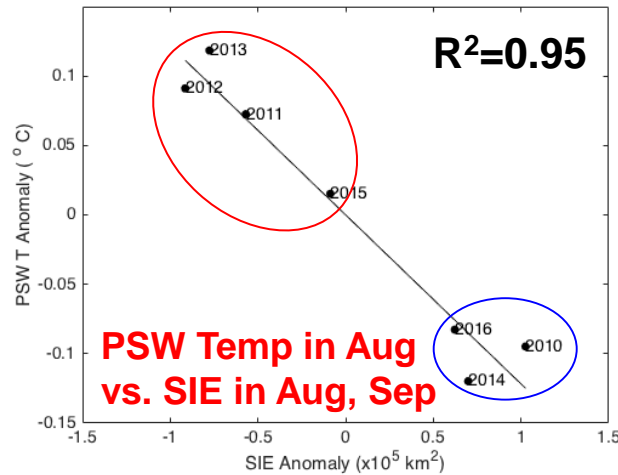


# Anomaly correlation

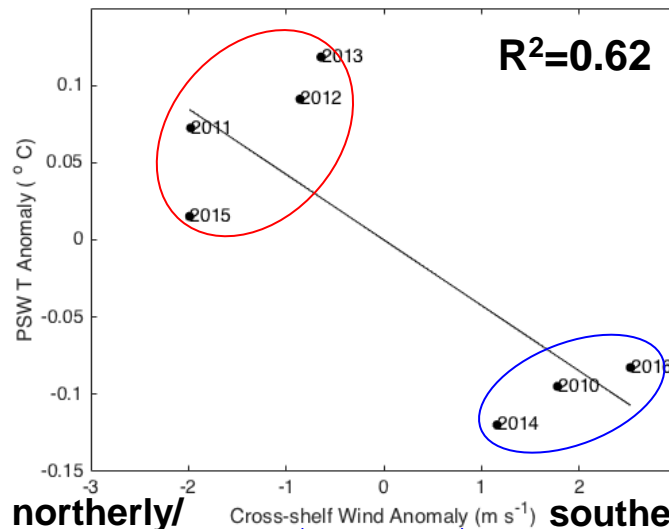
2011, 2012,  
2013, 2015



2010, 2014,  
2016



Southerly/southwesterly winds directly/indirectly intensify eastward/northeastward along-shelf currents → appear to change a pathway of warm summer water flowing from the Beaufort Sea



PSW Temp in Aug vs. cross-shelf Wind in Aug

- PSW & MW selected from the area of [170°W~160°W, 74°N~78°N]
- SIE calculated from the areas of central Arctic and Chukchi Sea
- ECMWF wind (monthly) selected from the shelf areas of [150°E~160°W]

northerly/  
northeasterly



southerly/  
southwesterly

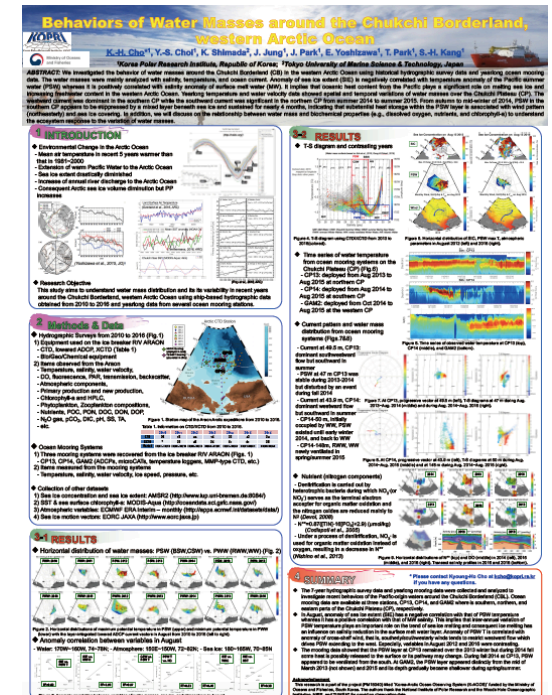


# Further Discussion

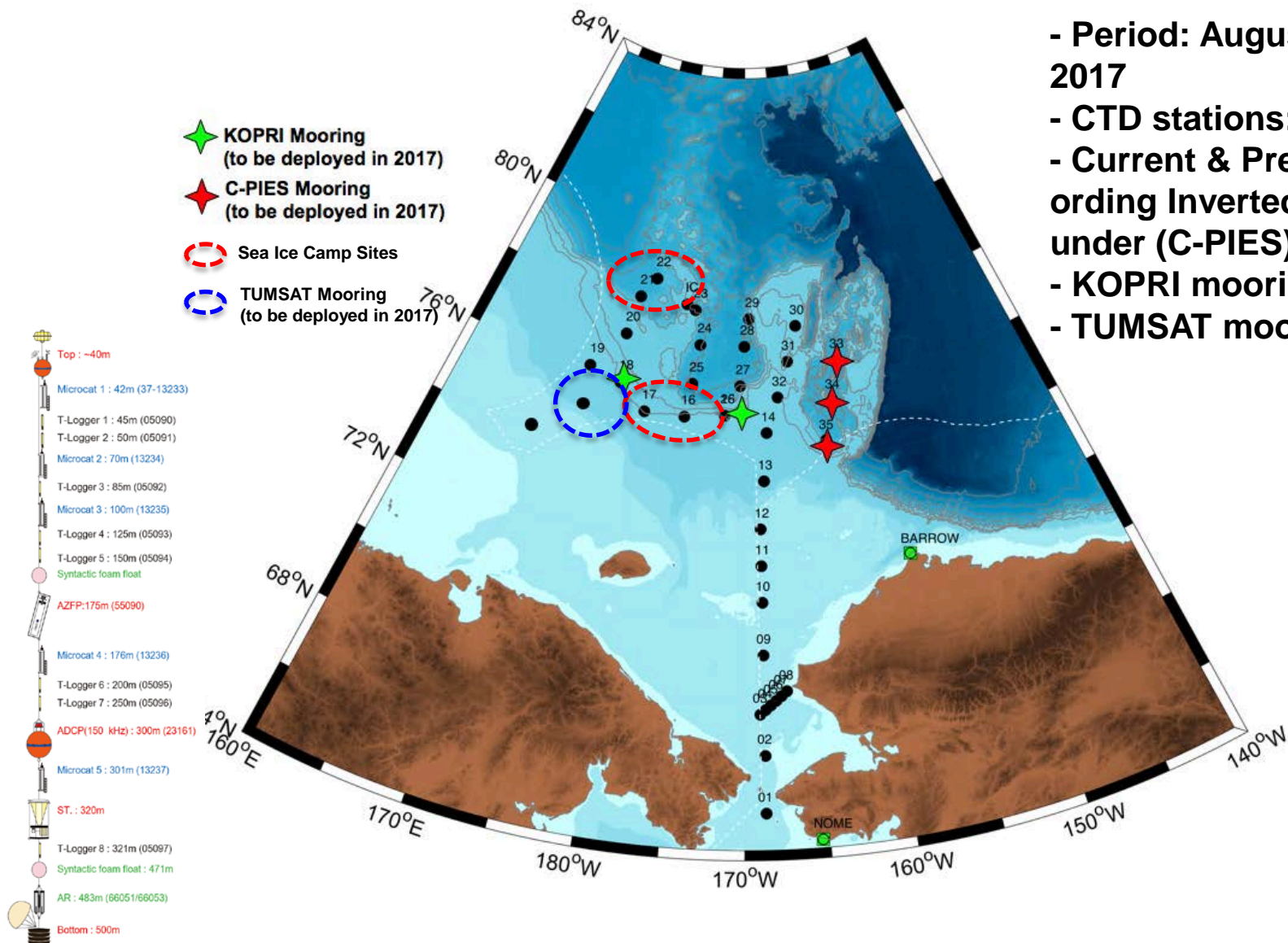
## Scientific Session:

### 5. Arctic Ocean dynamics, transformations, and ecosystem response (Zenit, 14:00~17:30 April 6<sup>th</sup>)

### Poster Session I (17:30~19:00, April 5<sup>th</sup>) P-211: “Behavior of water masses around the Chukchi Borderland, western Arctic Ocean”



# 2017 ARAON Cruise Plan: Station Map

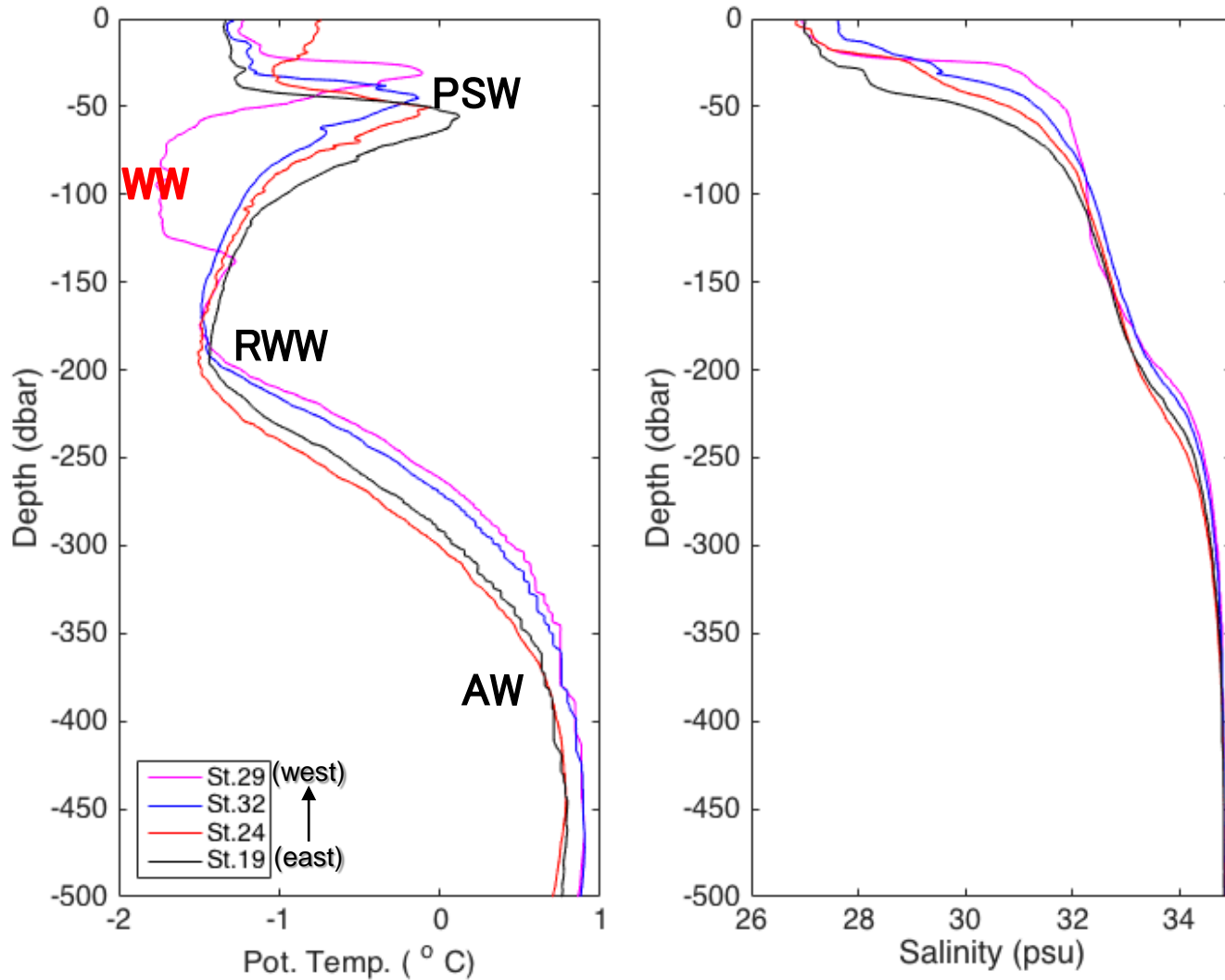


# Supplement



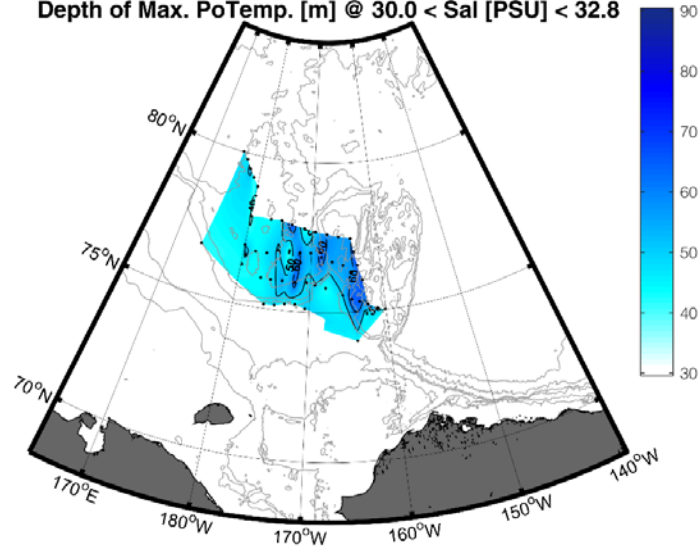
# Vertical Profiles

Vertical profiles at selected CTD stations in 2014

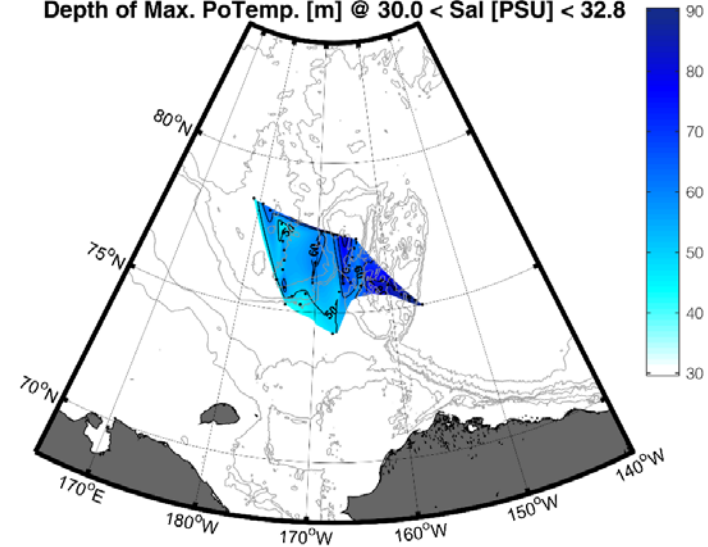


# Depths of $\theta_{\max}$ and $\theta_{\min}$

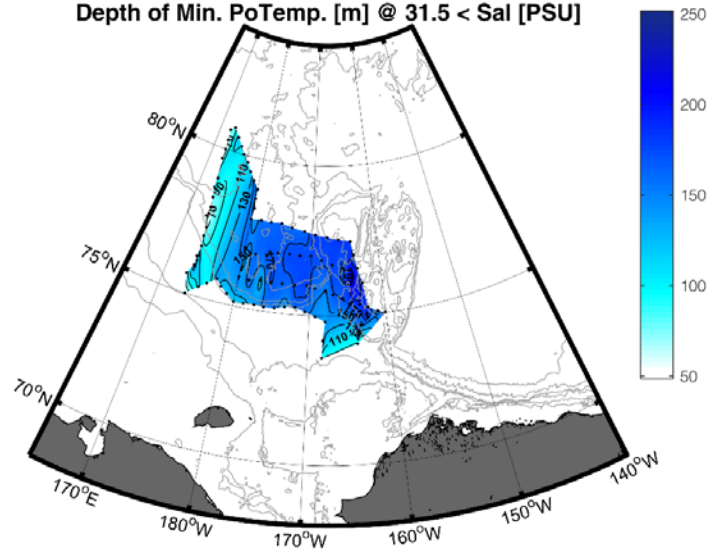
Depth of Max. PoTemp. [m] @  $30.0 < \text{Sal} [\text{PSU}] < 32.8$



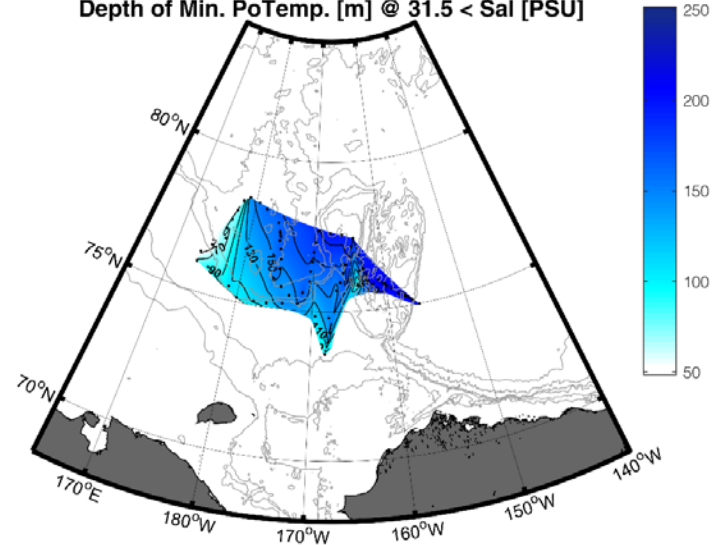
Depth of Max. PoTemp. [m] @  $30.0 < \text{Sal} [\text{PSU}] < 32.8$



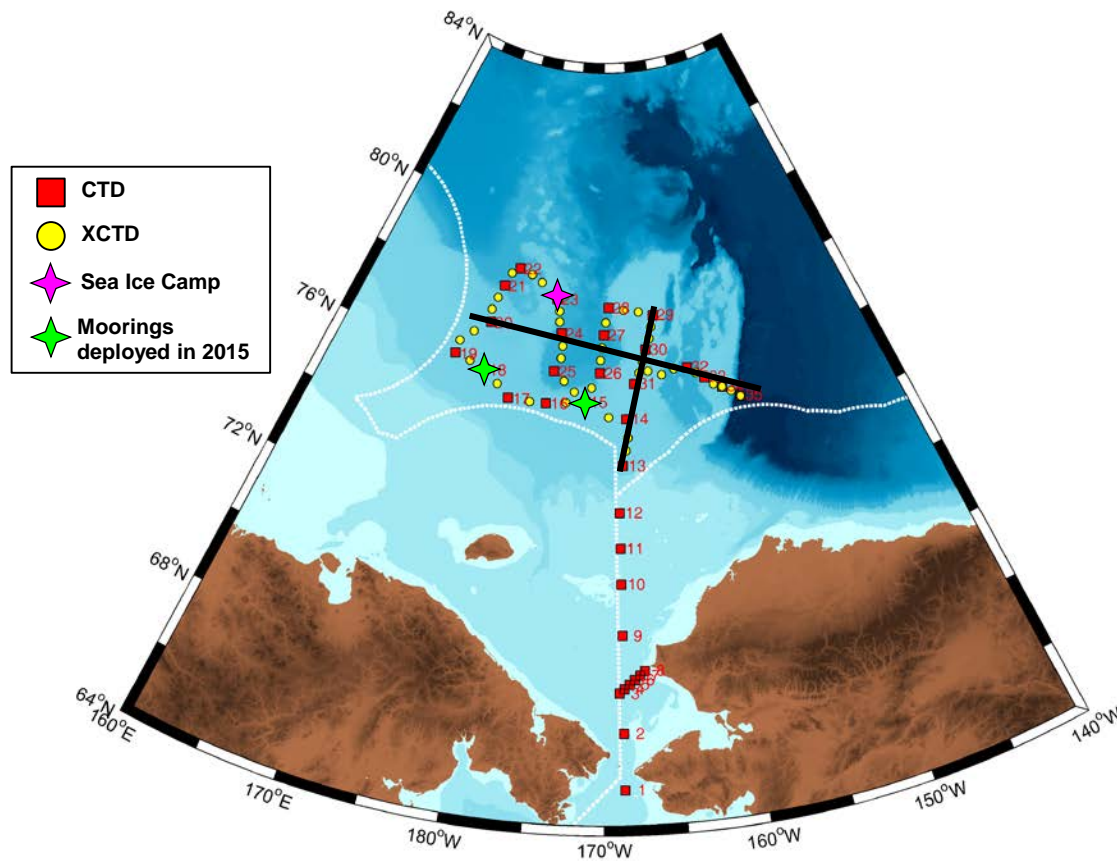
Depth of Min. PoTemp. [m] @  $31.5 < \text{Sal} [\text{PSU}]$



Depth of Min. PoTemp. [m] @  $31.5 < \text{Sal} [\text{PSU}]$



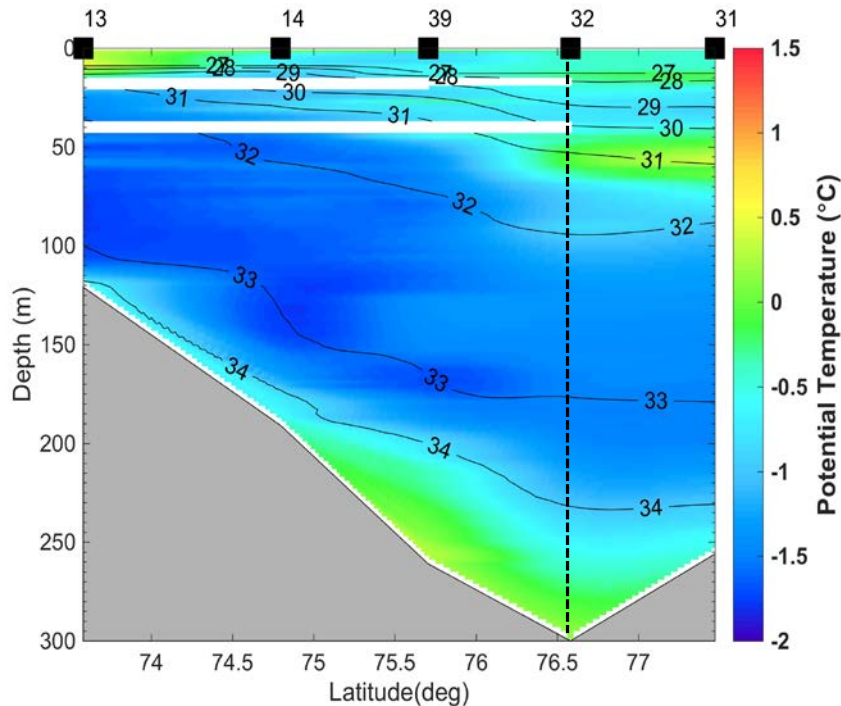
# CTD/XCTD: Transects



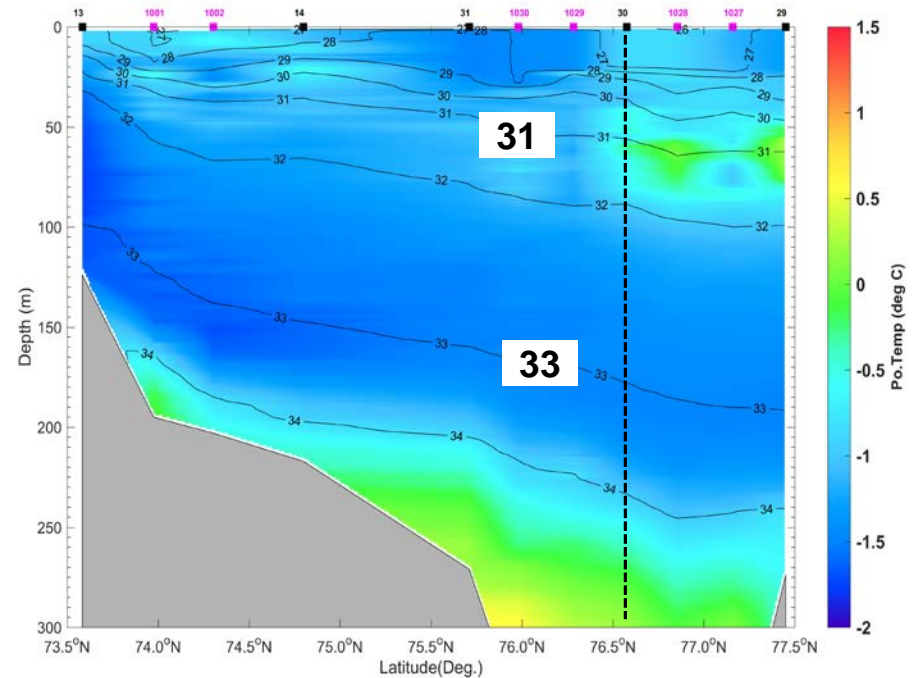


# CP Observation (CTD-T, S)

2015



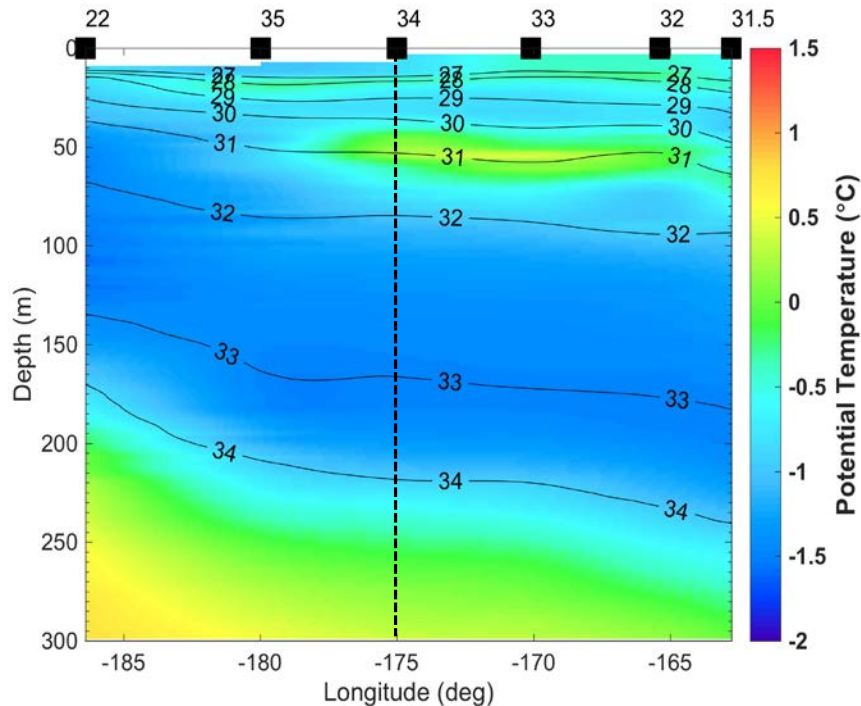
2016



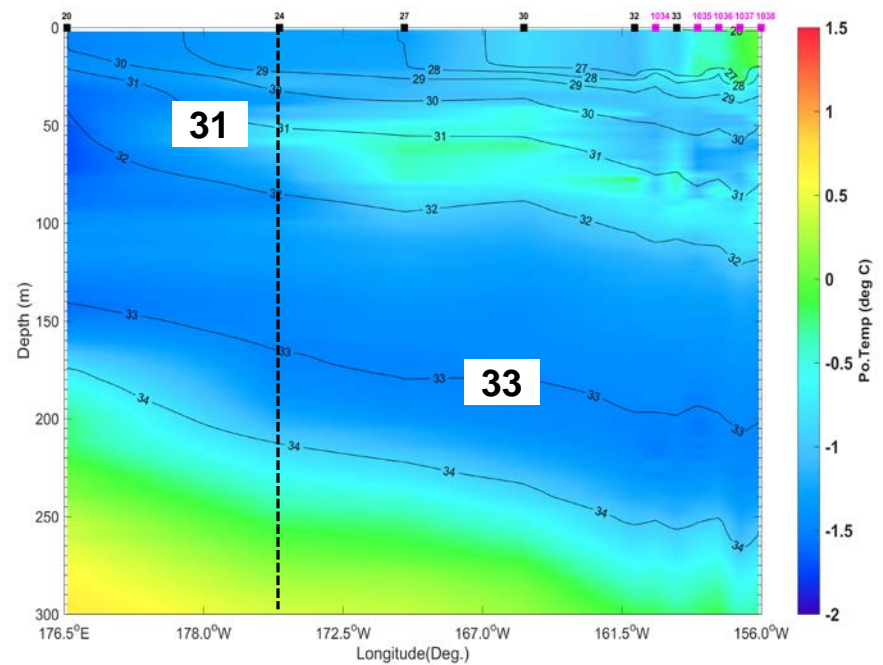
- ◆ SML deepened, NSTM weakened, PSW weakened but thickened in 2016

# CBL Observation (CTD-T, S) - 77 N

2015



2016



- ◆ PSW weakened but thickened, its extension to the west weakened in 2016