

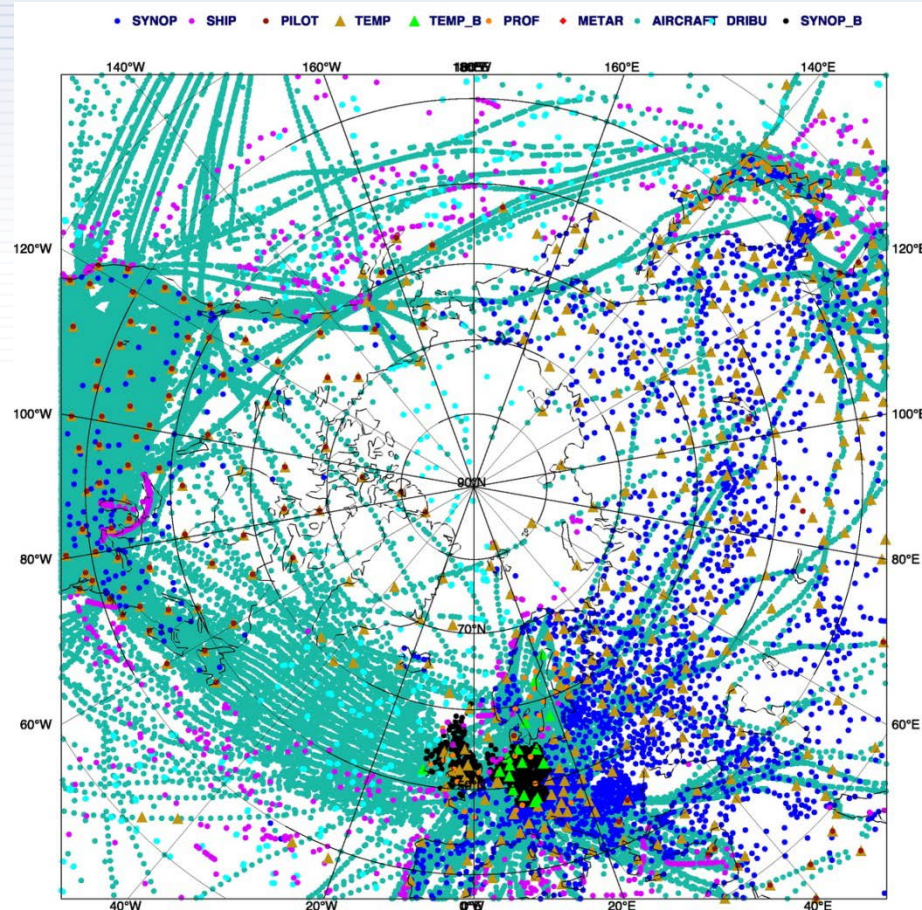
PAG Spring 2017 (ASSW2017, 02 April 2017, Prague, Czech Republic)

Sea-Ice and Atmosphere

Joo-Hong Kim
Korea Polar Research Institute

Polar observations - fill the gaps

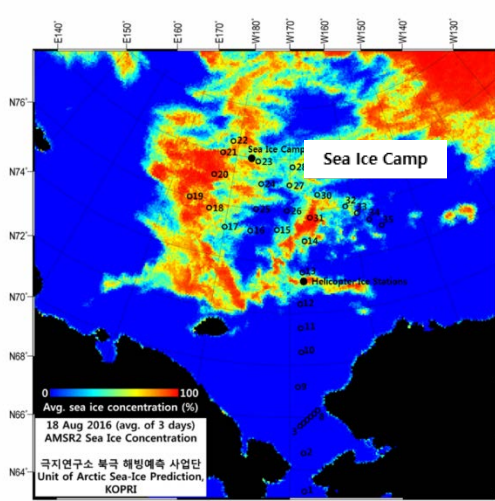
- Conventional observations of different types (assimilated by ECMWF on 15 April 2015)



Jung et al. (2016, BAMS)

“The polar regions are among the most sparsely observed parts of the globe by conventional observing systems.”

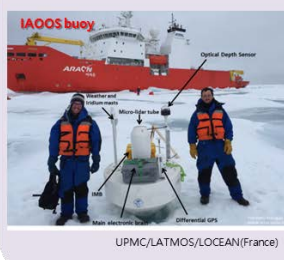
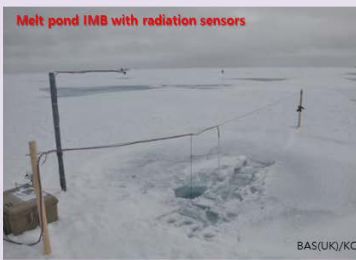
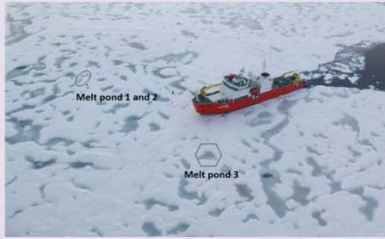
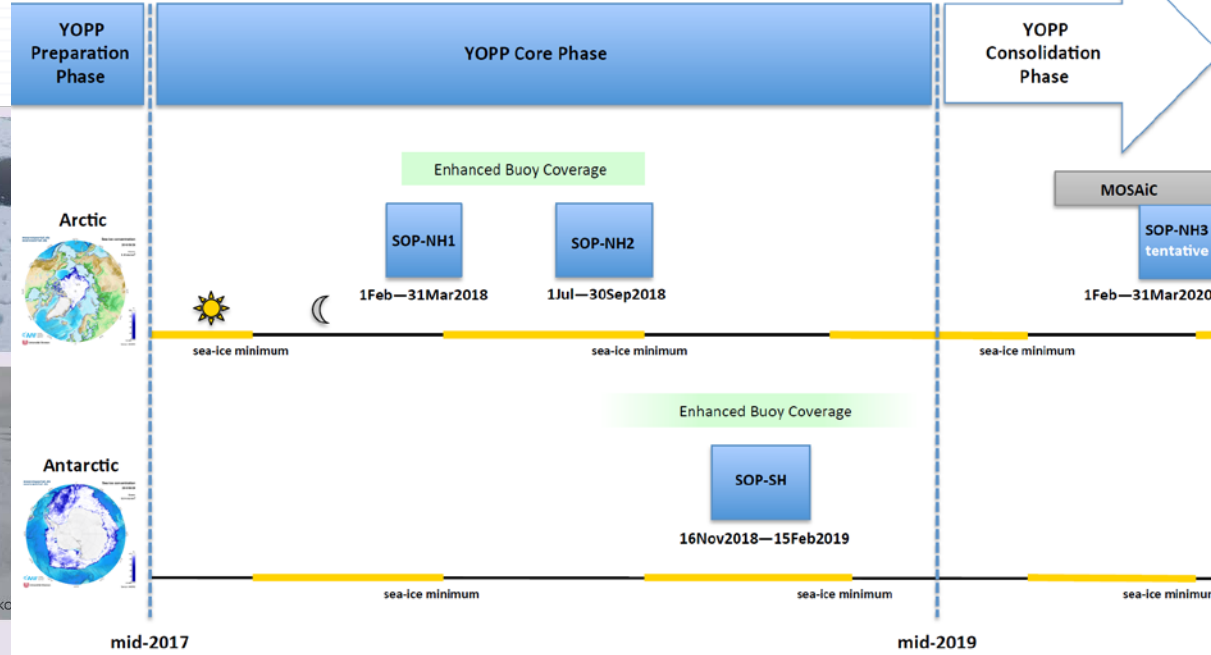
International collaboration on sea-ice (Buoy deployments)



Main Sea Ice Camp (14-15 August)

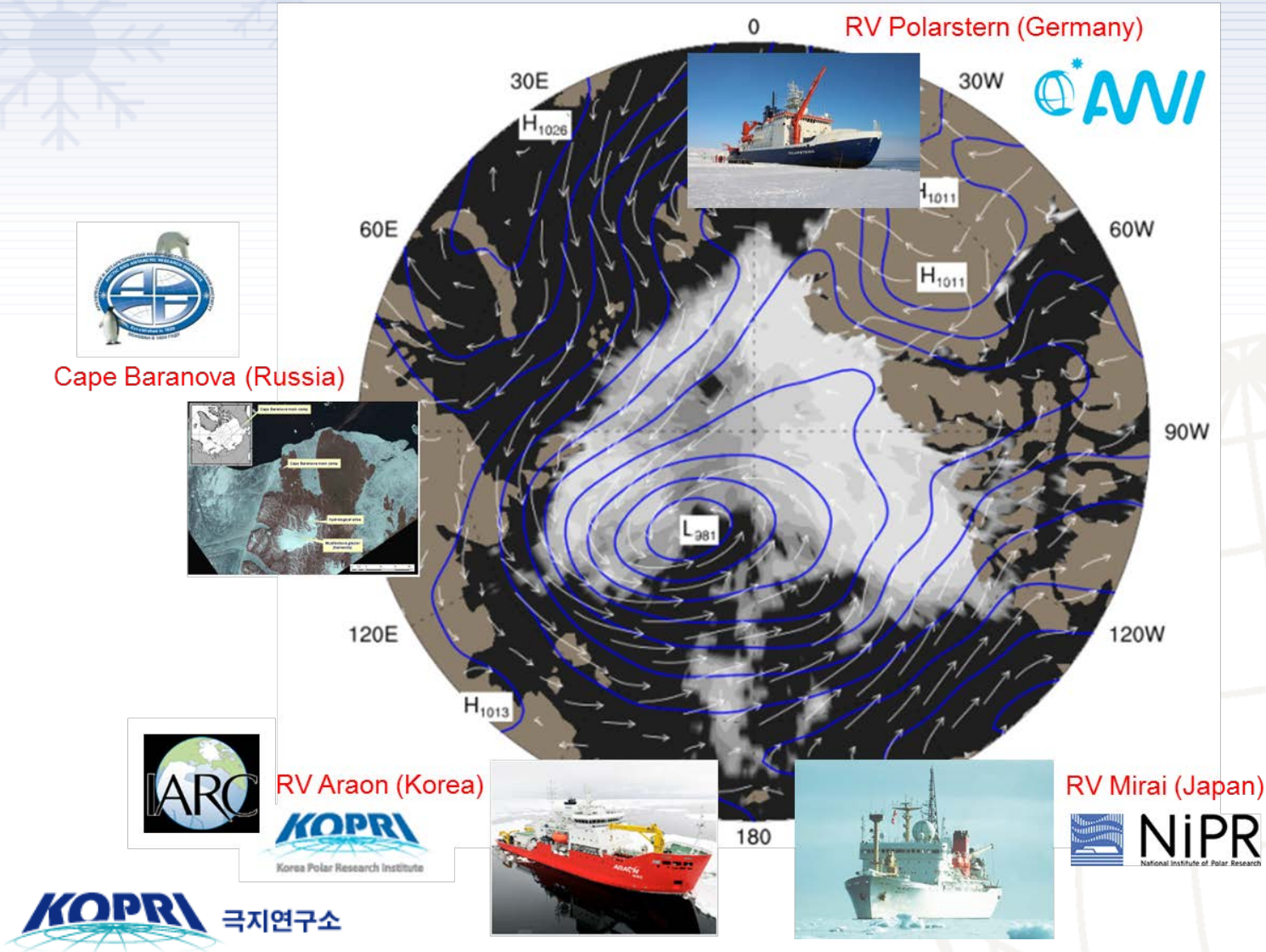
YOPP Buoy Task Team

Year of Polar Prediction
Special Observing Periods (SOPs)



International radiosonde campaign

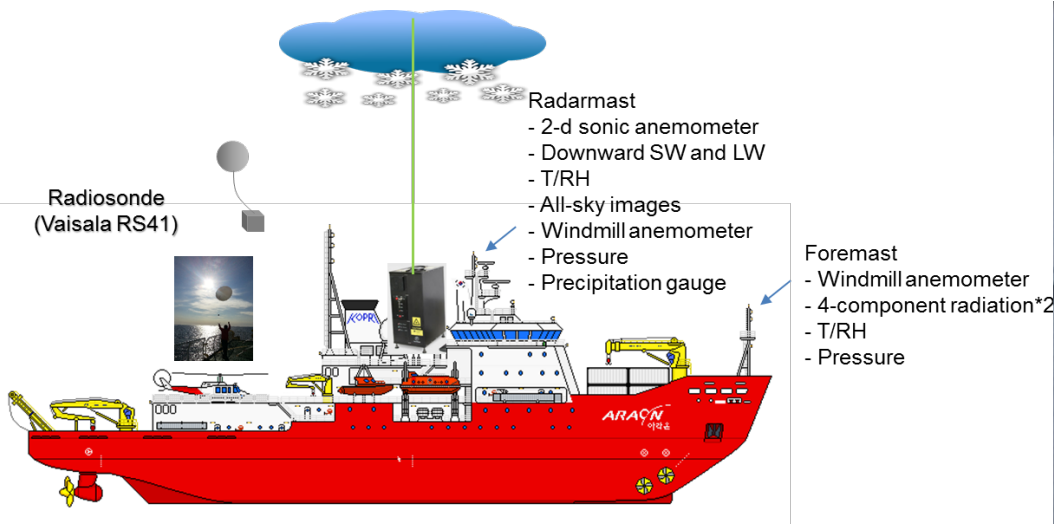
- Weather and sea-ice forecasts (lead by Jun Inoue (NIPR, Japan))



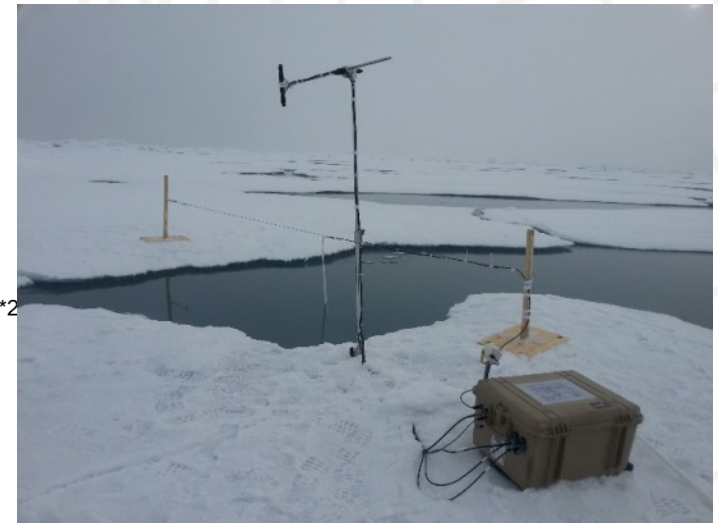
Field activities in 2017

- **Leg 1: 8 August to 23 August (15 days)**
 - Region: Bering, Chukchi and East Siberian Seas
 - Ship-borne meteorological observations
 - Surface: Air temperature, Humidity, Winds, SW/LW Radiations, etc.
 - Upper-atmosphere: Radiosonde launch, Sky Cam, **Micro Pulse Lidar**
 - Sea-ice buoy deployments (5-day ice camp)
- **Leg 2: 30 August to 12 September (13 days)**
 - Region: Chukchi and East Siberian Seas
 - Ship-borne meteorological observations
 - Surface measurements and upper-atmospheric sounding

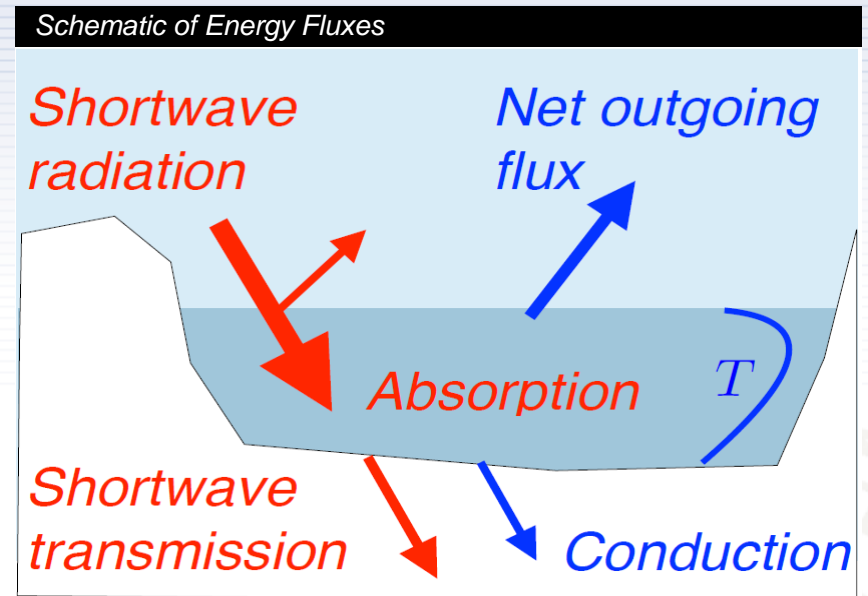
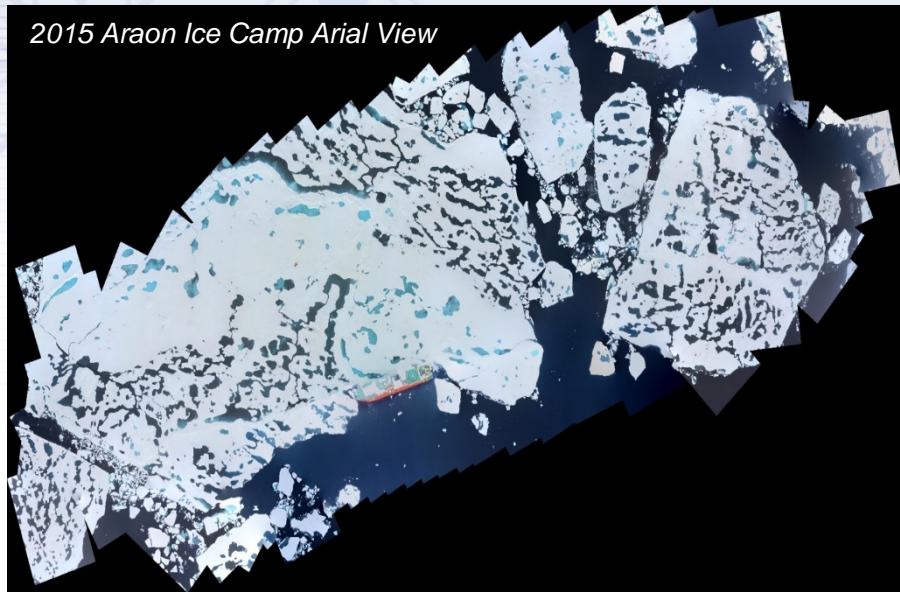
Atmosphere



Sea-ice



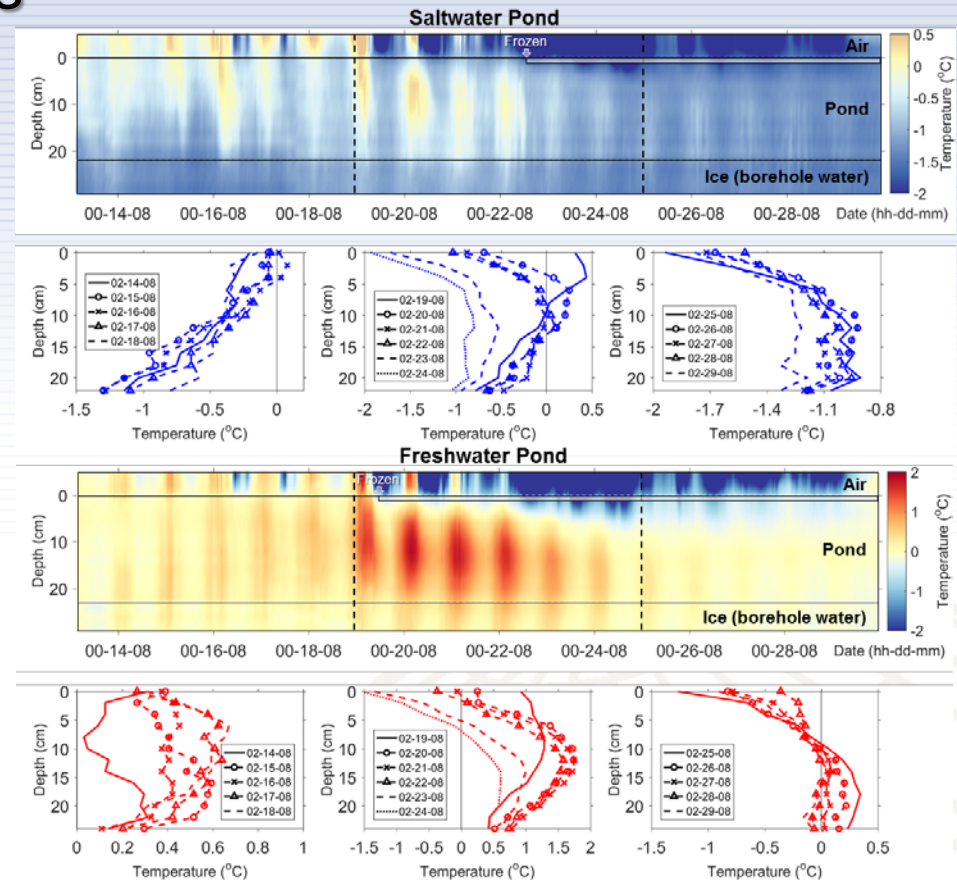
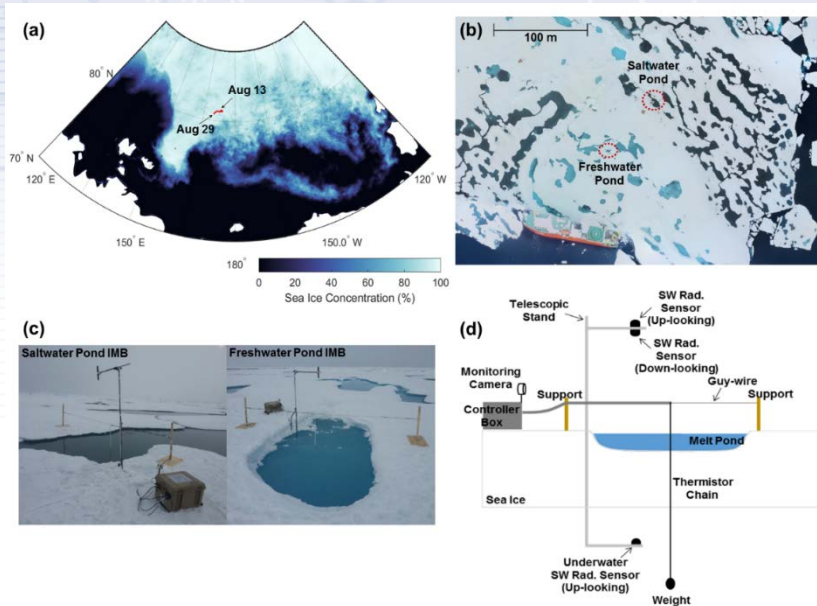
Motivation: melt ponds energy budget



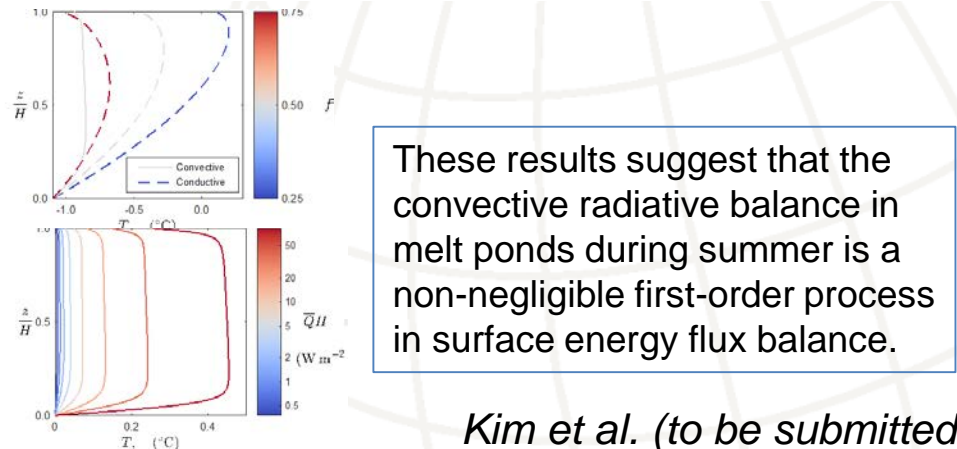
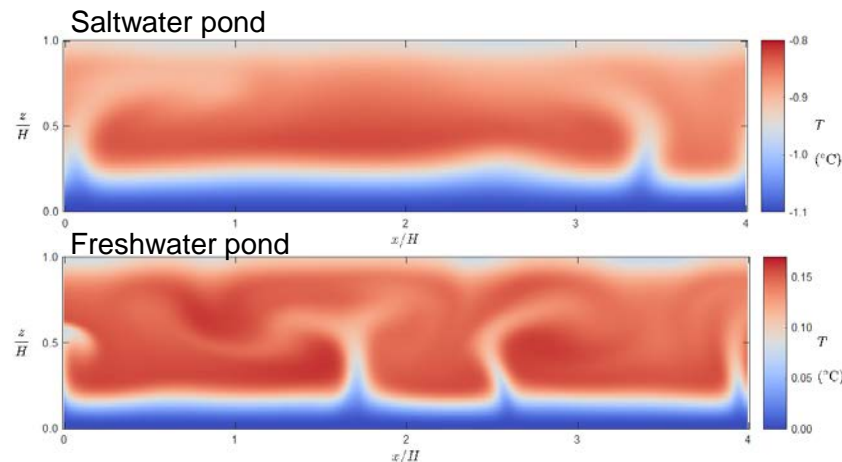
- Surface melt ponds are a key element of the ice-albedo feedback.
 - Melt ponds affect sea-ice energy budget
 - Ice thickness is sensitive to net heat flux perturbations of $\sim 1 \text{ W m}^{-2}$ (Kwok and Untersteiner 2011)
 - Spring pond fraction is a good predictor for September sea-ice extent (Schroeder et al. 2014)

Thermal evolution of melt ponds

In-situ observation in 2015

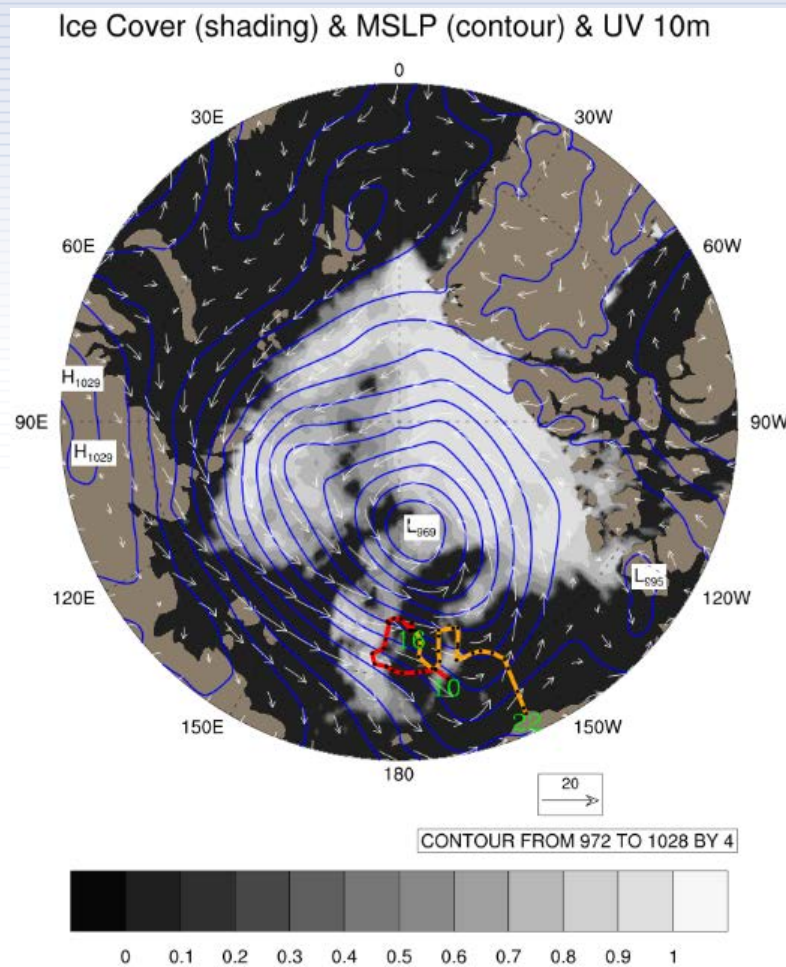
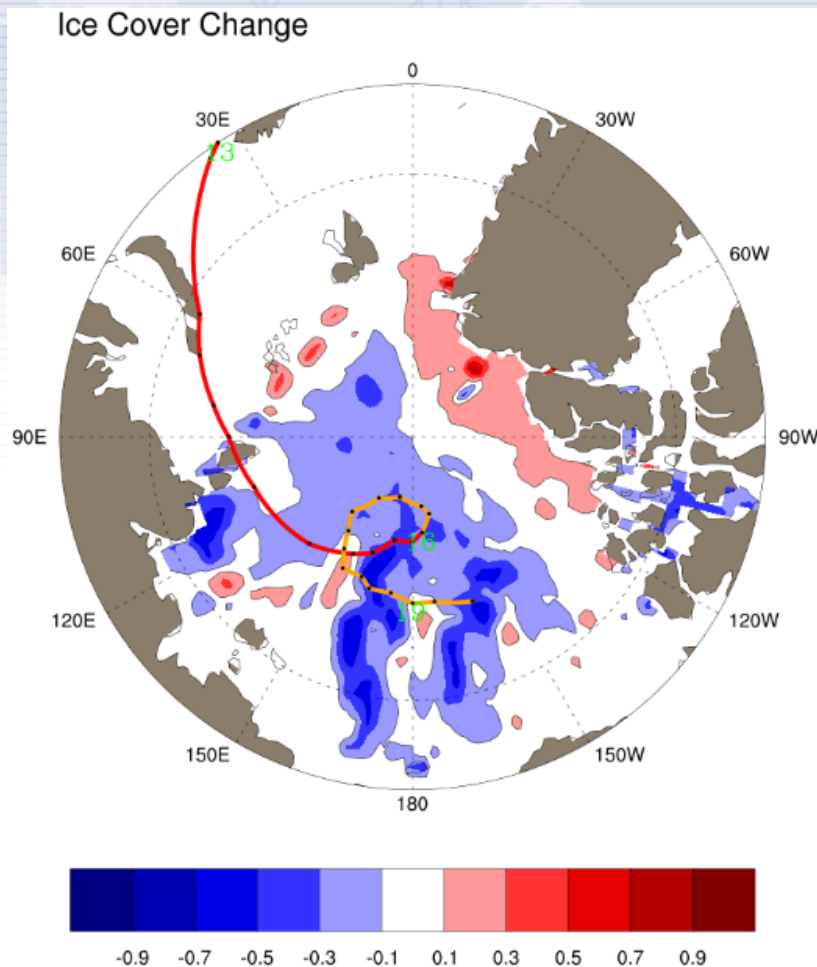


2-D numerical simulation



These results suggest that the convective radiative balance in melt ponds during summer is a non-negligible first-order process in surface energy flux balance.

Great Arctic cyclone 2016



Change in sea ice concentration after the storm passage

Polar WRF simulated Arctic cyclone at 00UTC 16 August and the locations of radiosonde sounding

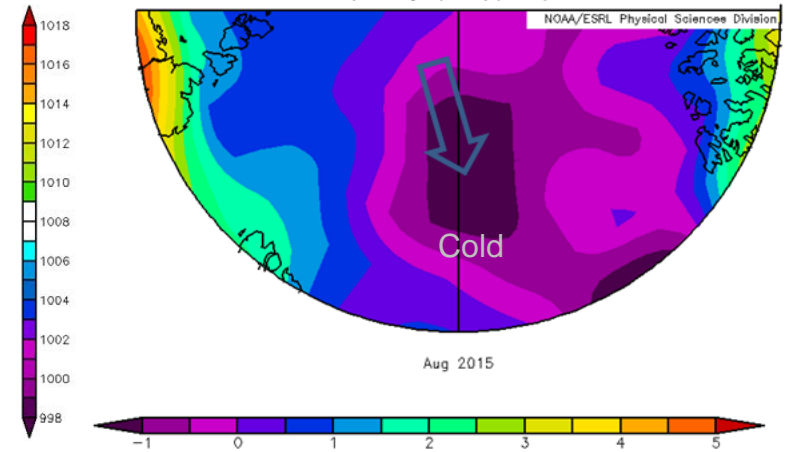
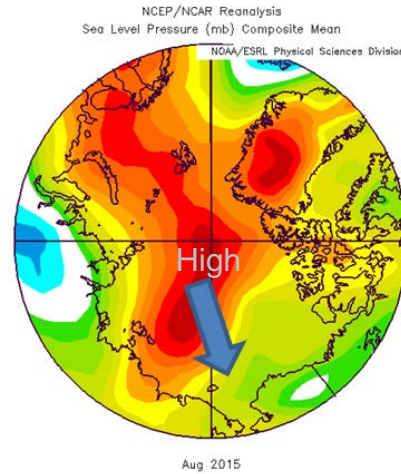
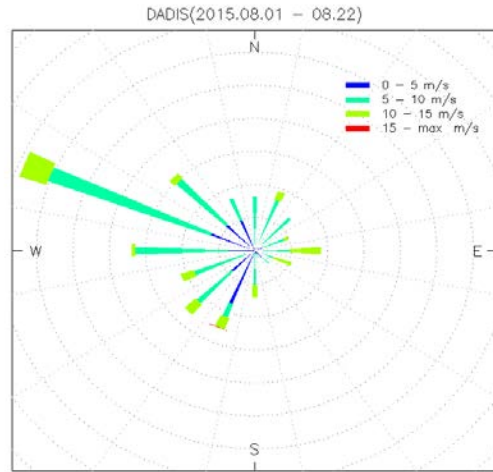
Analysis of interannual climate variability

Araon observed near-sfc winds

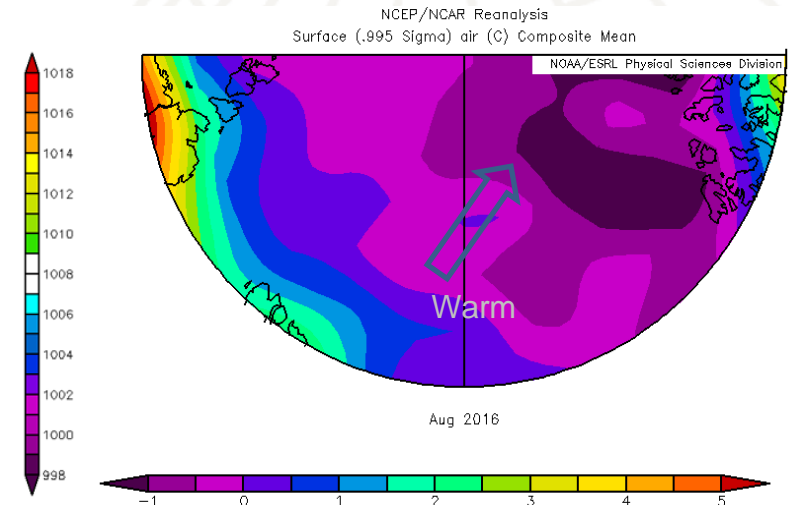
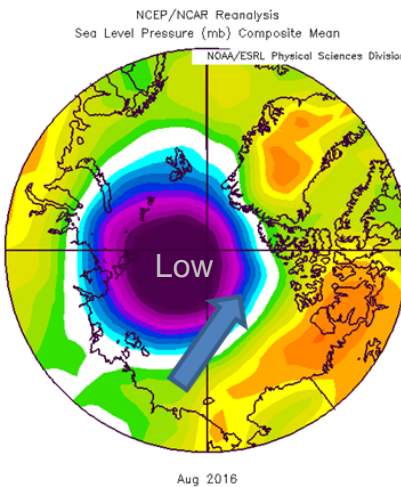
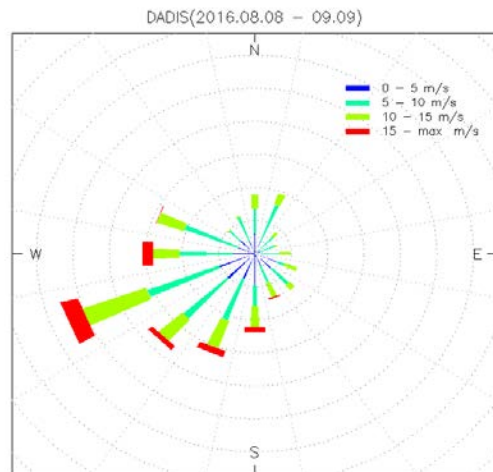
NCEP sea level pressure

NCEP surface air temperature

2015

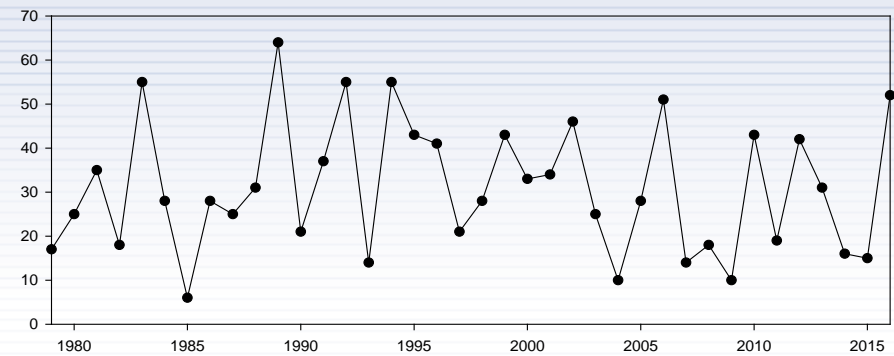
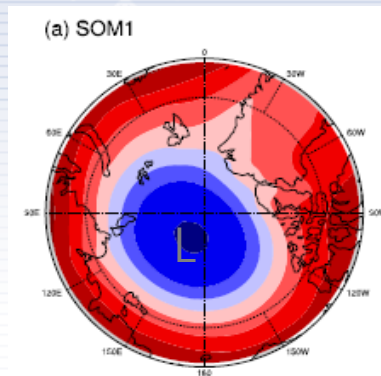
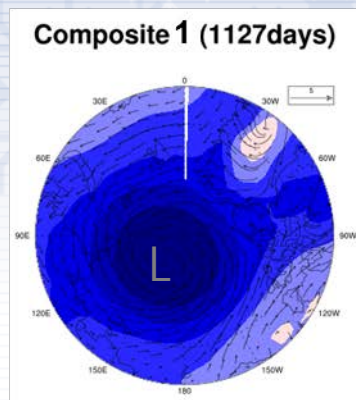


2016

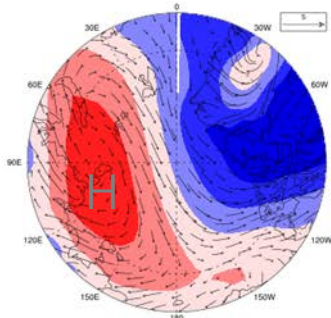


Analysis of interannual climate variability

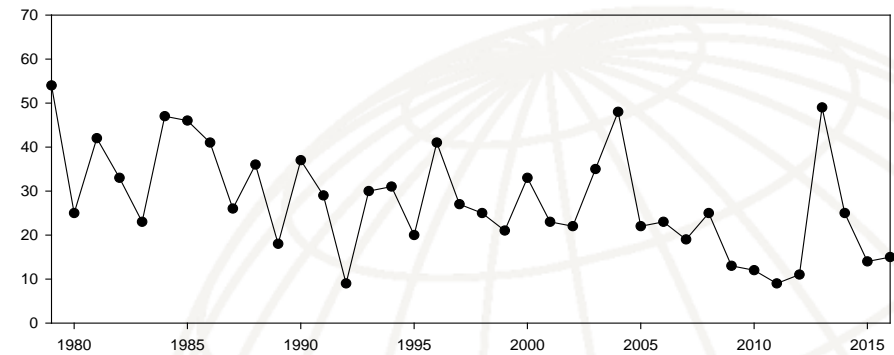
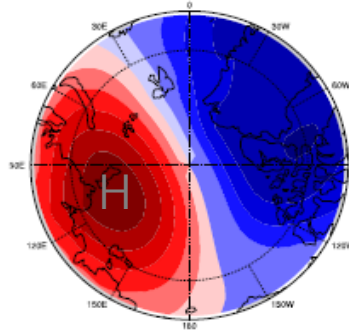
- “Self Organizing Map (SOM)” analysis – daily sea level pressure (June to August)



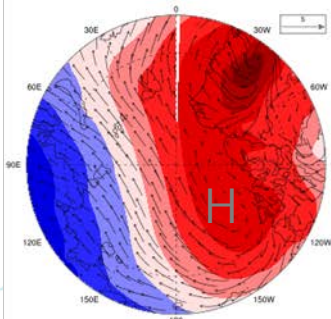
Composite 2 (1040days)



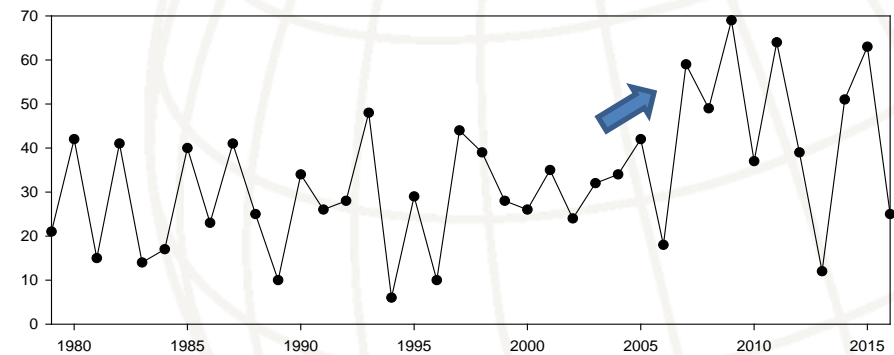
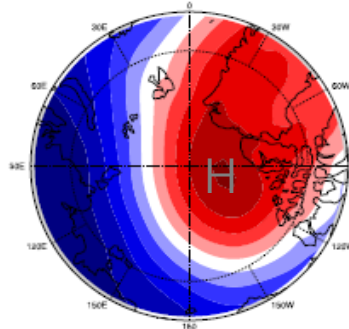
(b) SOM2



Composite 3 (1237days)



(c) SOM3



1004 1006 1008 1010 1012 1014 1016 1018 1020 1022



Thank You

