PAG fall 2019 (15 October 2019, Jinxi Hotel, Hangzhou, China)

- Updates on the PACEO Activity –

1. Sea-Ice Buoys & On-site Sampling
2. Atmospheric Observations and Their Applications

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Topics

- Sea ice buoys and on-site sampling (K-AOOS project, PI: S.-H. Kang)
  - Physics
    - IAOOS & IMB
    - Random (T, S) sampling of pond water
  - Biology
    - L-arm TriOS measurements
    - Bio-physics buoys
- Atmospheric obs. and applications to weather and climate (KPOPS project, PI: me)
  - Weather (YOPP activity)
    - Radiosonde balloon launches & ship-borne surface met obs.
    - Real-time Arctic weather forecast
  - Climate
    - Micro-pulse Lidar (MPL) observation for studying the surface cloud radiative effect
    - Arctic summer storms

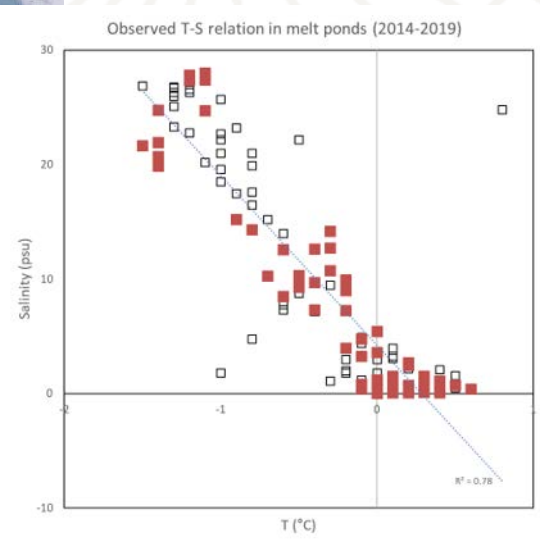
Melt ponds: IMB deployment & on-site sampling

- Korea–UK–Sweden collaboration

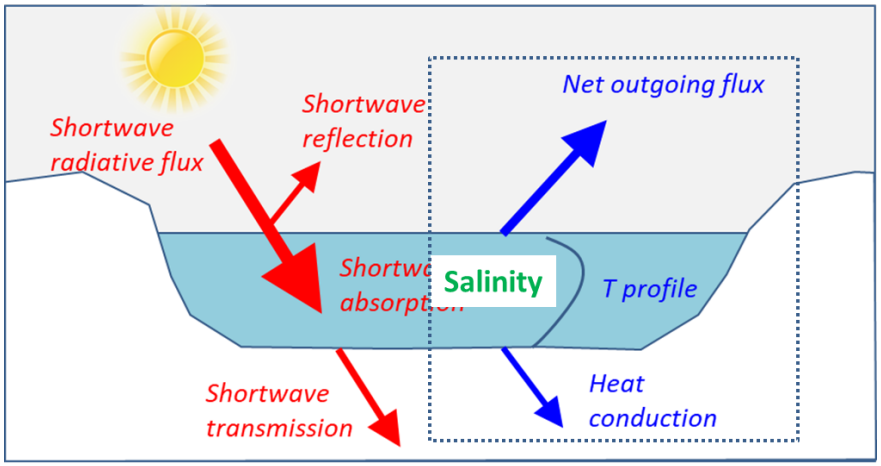
IMB with Radiation & Salinity

Random (T, S) sampling of pond water

A total of >80 (T, S) samples at 12 sites over three different floes



Melt pond energy balance



Kim et al. (2018)

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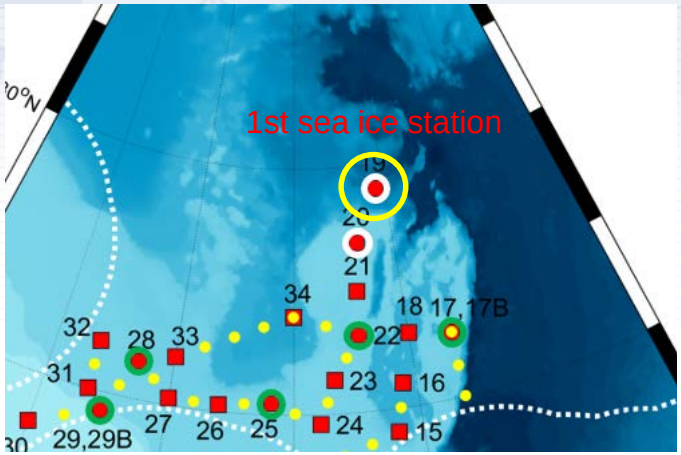
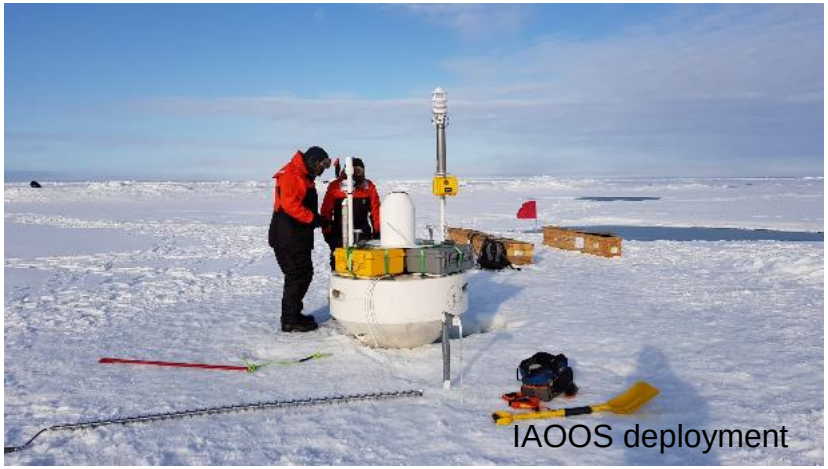
J.-H. Kim (KOPRI), J. P. Wilkinson (BAS), W. Moon (Stockholm), A. Wells (Oxford)

IAOOS(Ice, Atmosphere, Arctic Ocean Observing System)

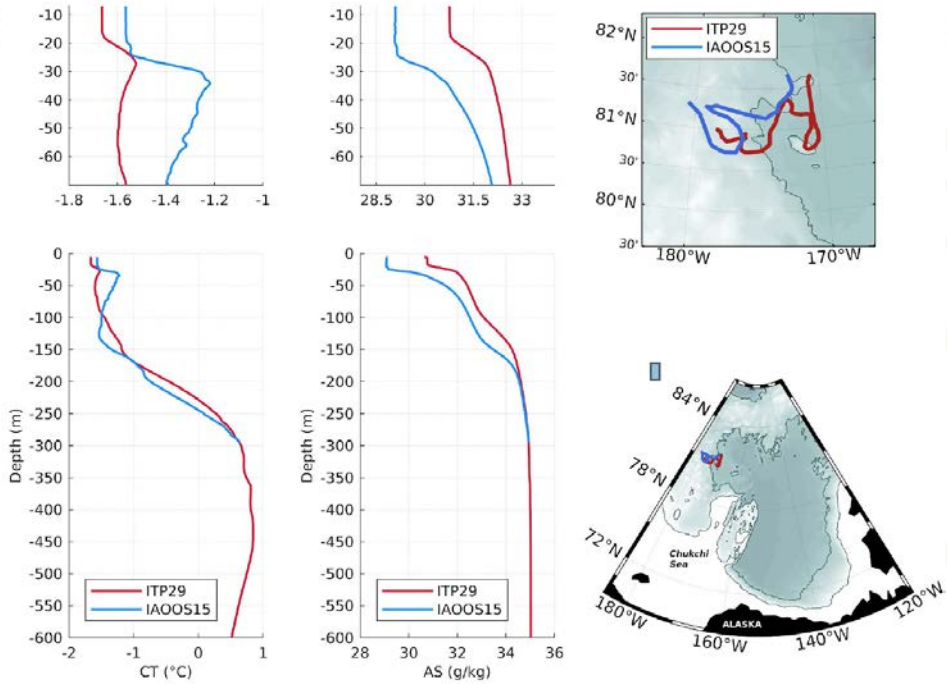
- Korea–France collaboration
  - 2 x IAOOSs at different ice floes nearby (IAOOS 29, 30)





A model-observation study of the Arctic ocean freshwater content spreading from the Beaufort Gyre northward

ITP29 (2008) vs. IAOOS15 (2015)



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C. Bertosio, C. Provost, Y. Park (LOCEAN), K. Cho, and J.-H. Kim (KOPRI)

Light transmission and biology: on-site sampling & bio-physical buoys

- Korea–UK–Germany collaboration
  - Project: Eco-Light (Ecosystem functions controlled by sea ice and light in a changing Arctic)

Changing Arctic
- Transition to FYI, thinner ice, faster ice
- Longer melt season
- Changes in snow accumulation

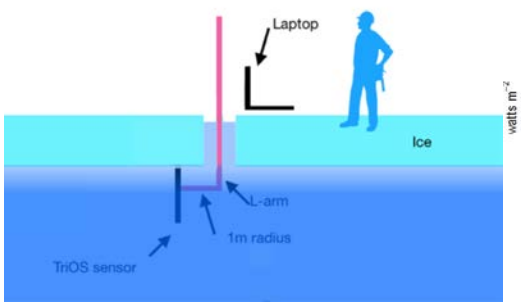
Microbial life in sea ice

(Working hypothesis) ***Changes*** *in the* ***timing*** *and duration of* ***primary production*** *events, as well as changes in the* ***grazing*** *habits of zooplankton, mirror the variability in the* ***light*** *climate, which is driven by changes in the* ***snow and sea ice*** *regimes.*

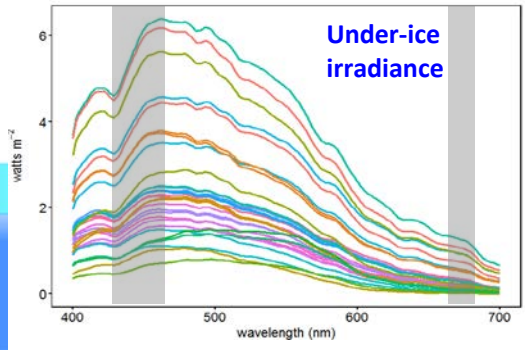
Observations
- In situ & Remote sensing

Modeling
- Sea ice biogeochemistry

In situ: L-arm & ice coring

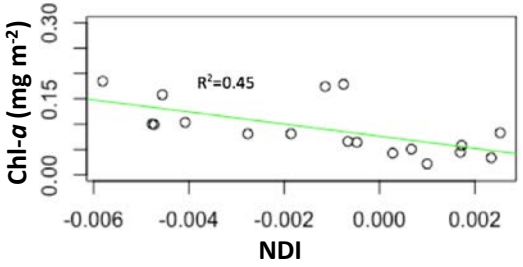


Measurements of under-ice spectral irradiance in combination with ice-cores for HPLC analysis to correlate spectral shape with Chl-*a* content



Chl-*a* absorption bands

Bio-optical model for retrieval of in ice Chl-*a*



Courtesy of A. Hayward (UCL)

Data from 2018 sea ice stations

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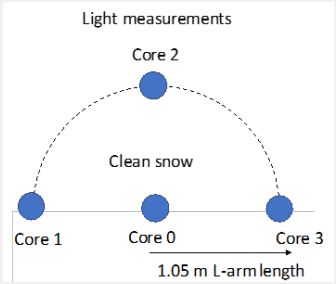
In 2019 summer

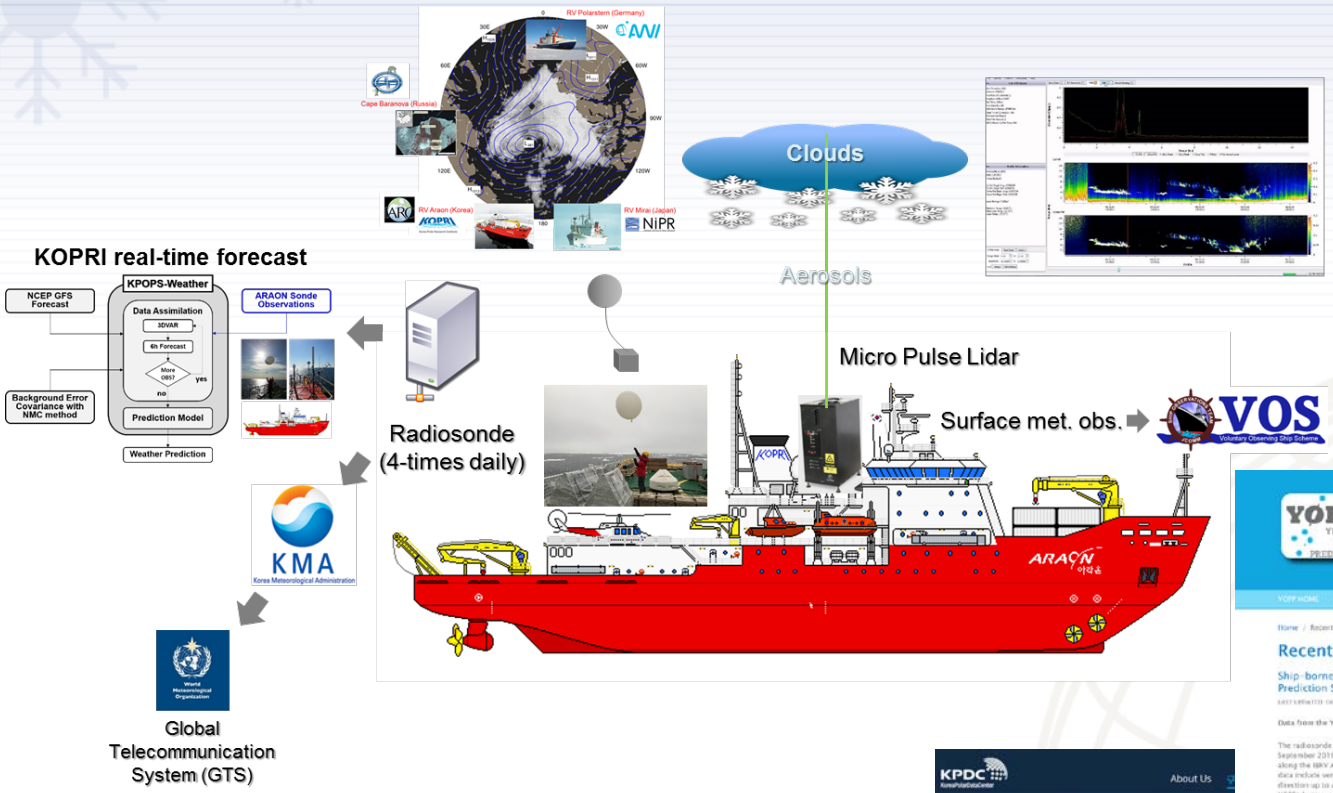


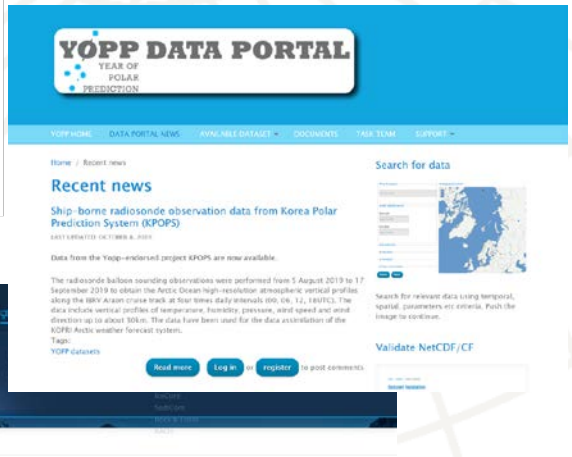
On-site sampling procedures
- Core0 (T/S/Nutrients)
- Light measurements with snow
- Snow properties
- Light measurements without snow
- Cores 1-3 (HPLC/Chl/POC)
- Ice thickness

G. Castellani, M. Karcher (AWI), J. Wilkinson, G. Veyssiere (BAS), L. Valcic (Bruncin), E. J. Yang, H. La, J.-H. Kim (KOPRI)

IBRV *Araon*'s atmospheric observations

Project (2016-2019): Development and Application of the Korea Polar Prediction System (KPOPS) for Climate Change and Disastrous Weather Events (KOPRI, PI: J.-H. Kim)





Ship-borne radiosonde observation data over the Arctic Ocean in the 2019 Ar aon summer expedition (ARA10B, ARA10C)

The radiosonde balloon sounding observations were performed from 5 August 2019 to 17 September 2019 to obtain the Arctic Ocean high-resolution atmospheric vertical profiles along the IBRV Araon cruise track at four times daily intervals (00, 06, 12, 18UTC). The data include vertical profiles of temperature, humidity, pressure, wind speed and wind direction up to about 30km. The data have been used for the data assimilation of the KOPRI Arctic weather forecast systems.

Register faveorites + Add

Disclosure Request + Add

Radiosonde balloon launches on the Araon in 2019

- 6-hourly from 5 August to 17 September (A total of 150 launches)
- All data were sent to the GTS

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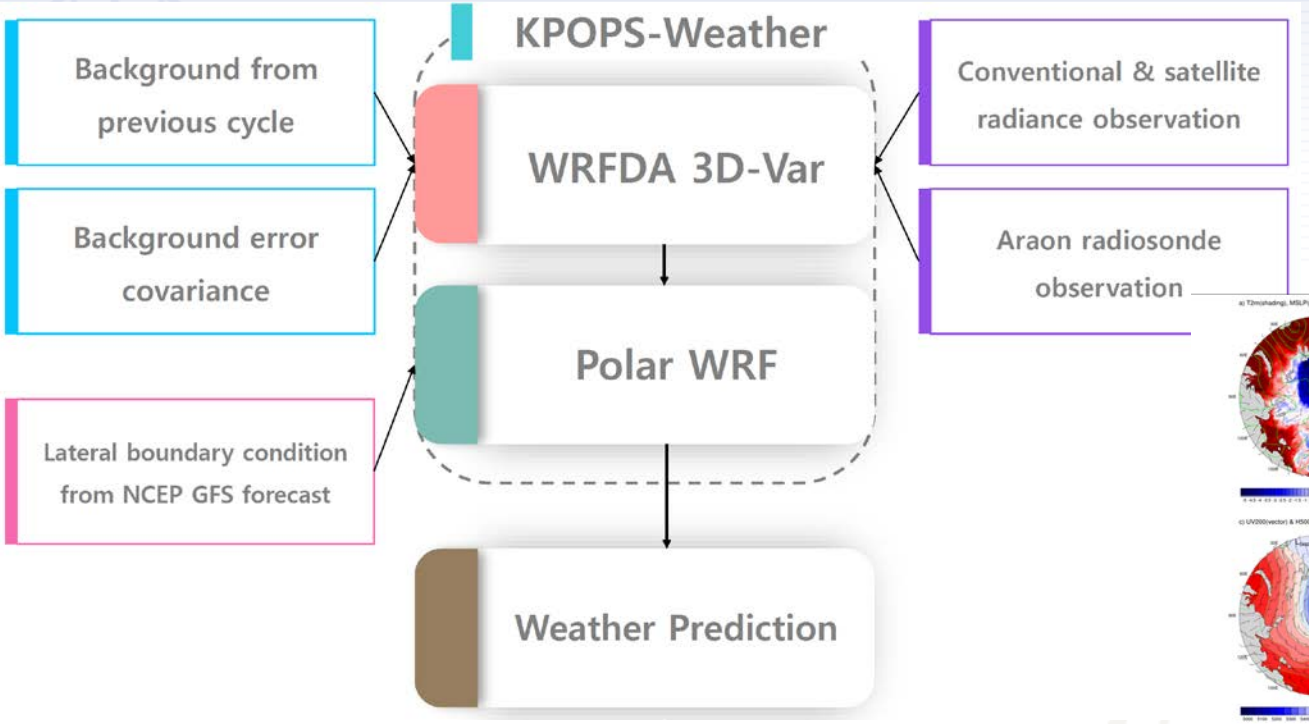
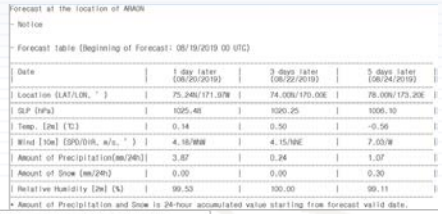
Real-time Arctic weather forecast

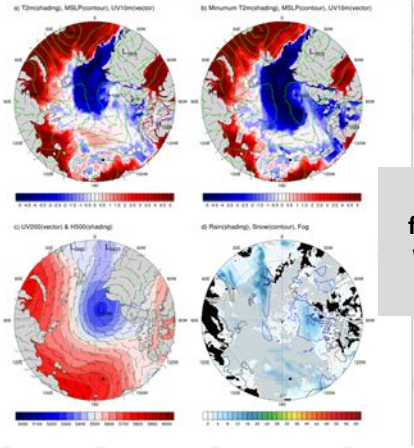
- Participation of YOPP
- Crucial weather forecast information for sea ice field operation

KOPRI Arctic Weather Forecast System



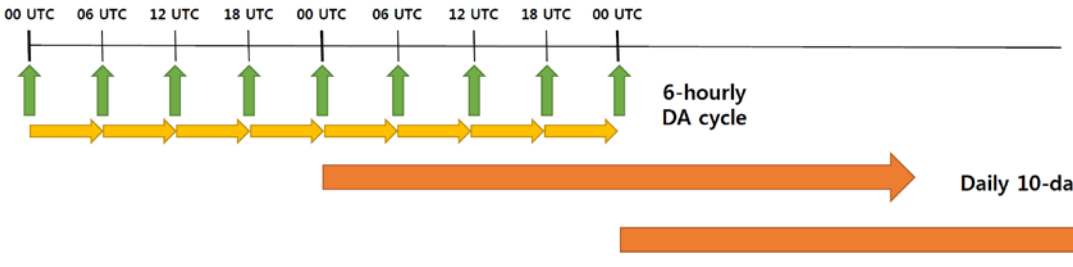
Near real-time transmission of 1, 3, 5-day weather forecast information to the *Araon*





(Example) 1-day forecast of KPOPS-Weather (00 UTC, 20 Aug 2019)

- Real-time operation



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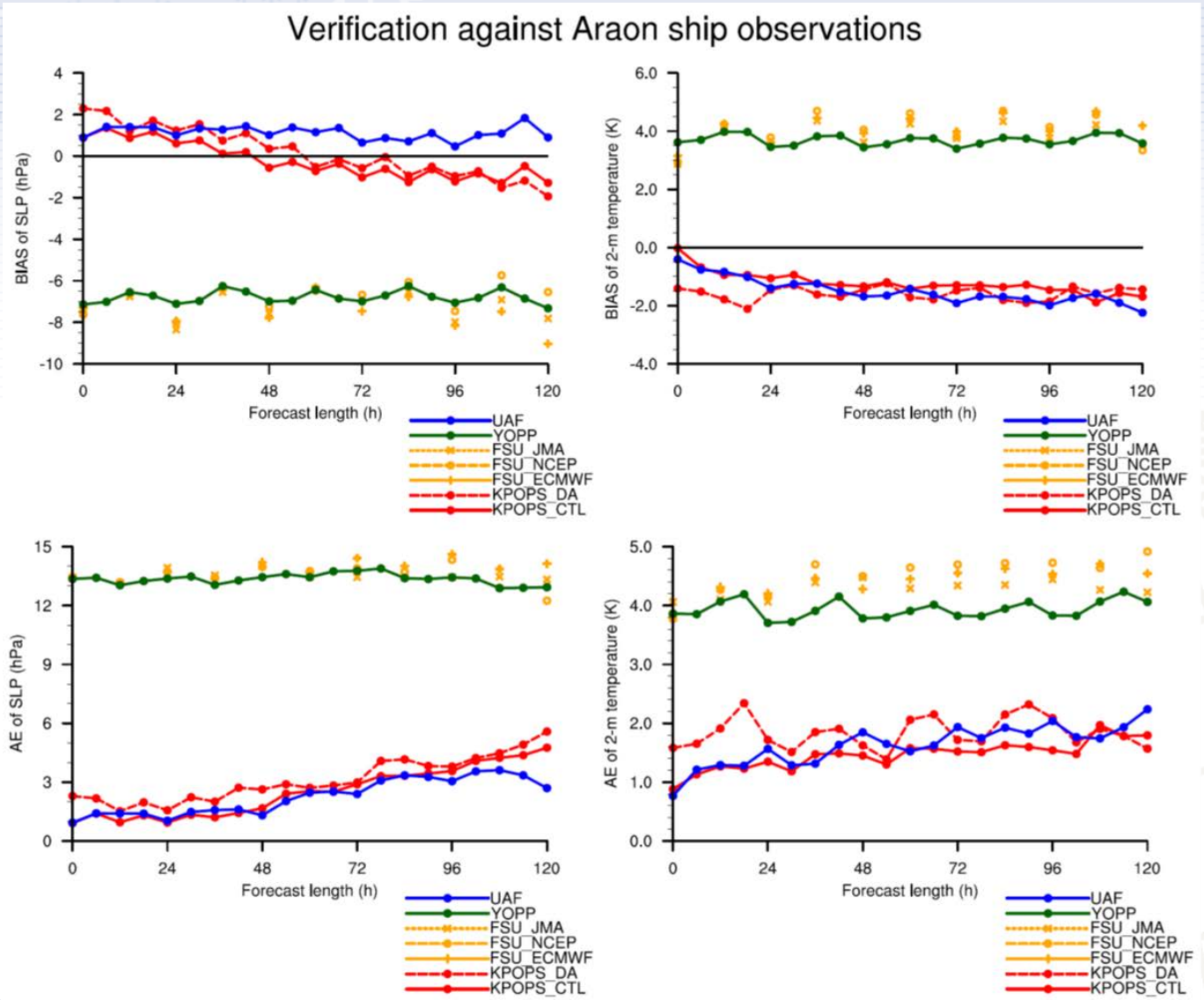
Forecast verification



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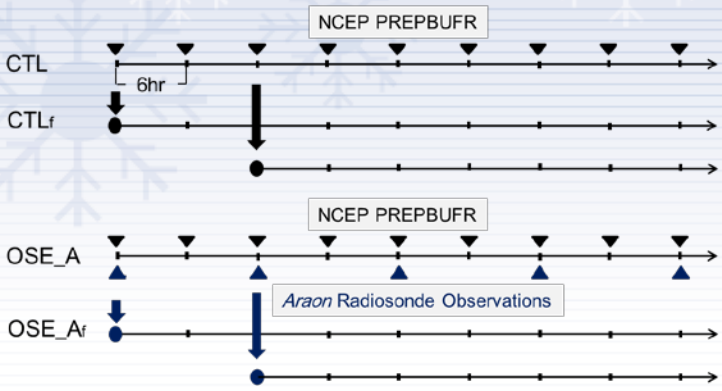
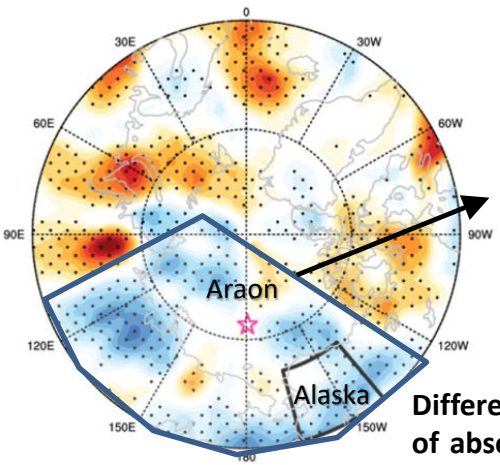
Y. Choi, J.-H. Kim (KOPRI), X. Zhang (UAF), DW Shin, S. Cocke (FSU)

Impact of extra Arctic radiosonde observations on predictability

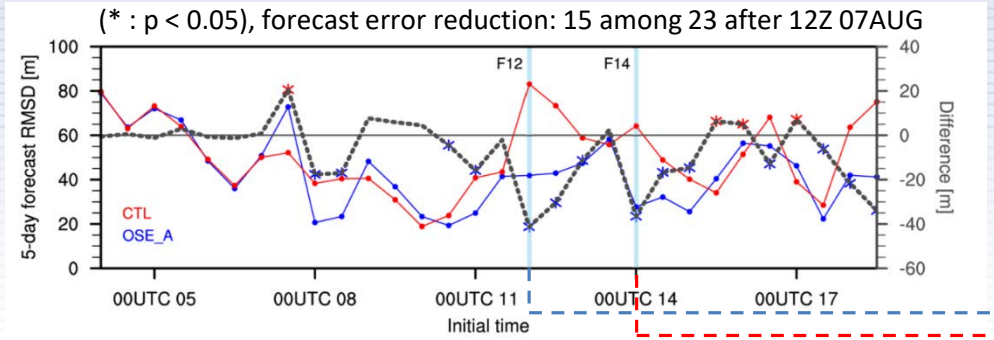


Schematic processes to produce the ensemble reanalysis (ALERA2) and forecast using the ALEDAS2.

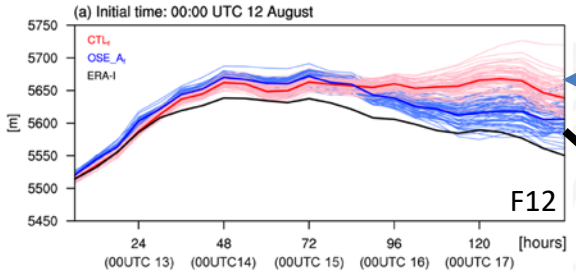


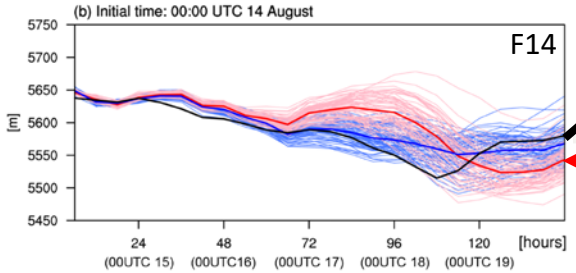
"Flow-dependent improved area"

Difference of the average of absolute errors of H500 **at forecast day 5** between OSE_A_f and CTL$_f$. Blue color means the region with reduced forecast errors.



Root mean square distances (RMSDs) of CTL$_f$ and OSE_A_f from ERA-I for H500, **at forecast day 5**, averaged over the Alaska domain, with the difference of the RMSDs (dotted line; OSE_A_f minus CTL$_f$).





Blue colored ensemble members (OSE_A_f) have a better skill in 5-day forecast over Alaska.

The forecast time evolutions of area-mean H500 over Alaska for two outperformed cases of OSE_A_f

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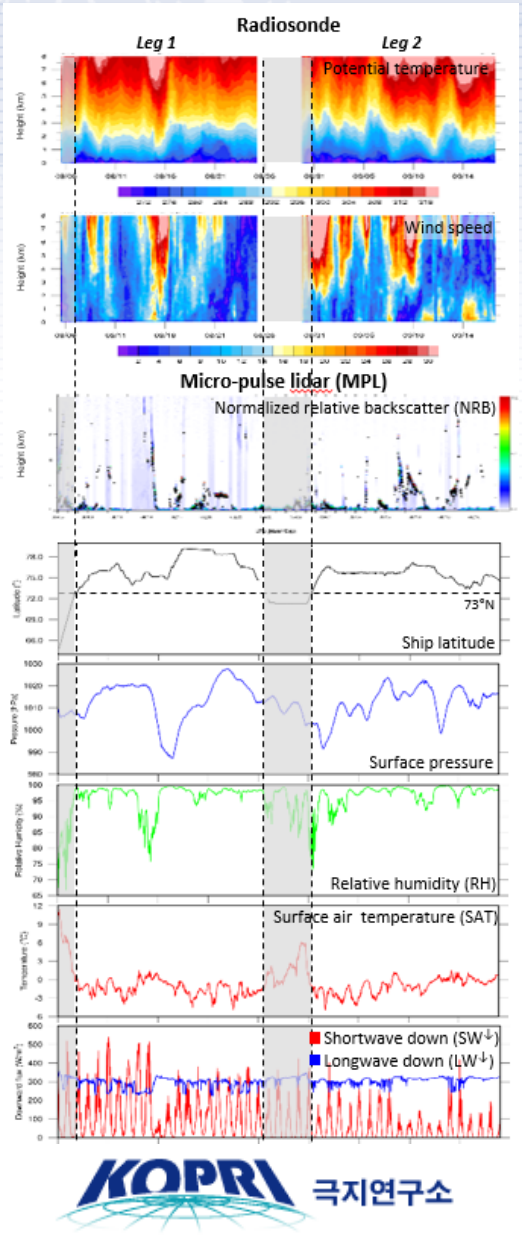
Polar Science, ISAR-5 Special Issue

M.-H. Lee, J.-H. Kim (KOPRI), J. Inoue (NIPR), K. Sato (Kitami) et al.

Arctic surface cloud radiative effect in summer



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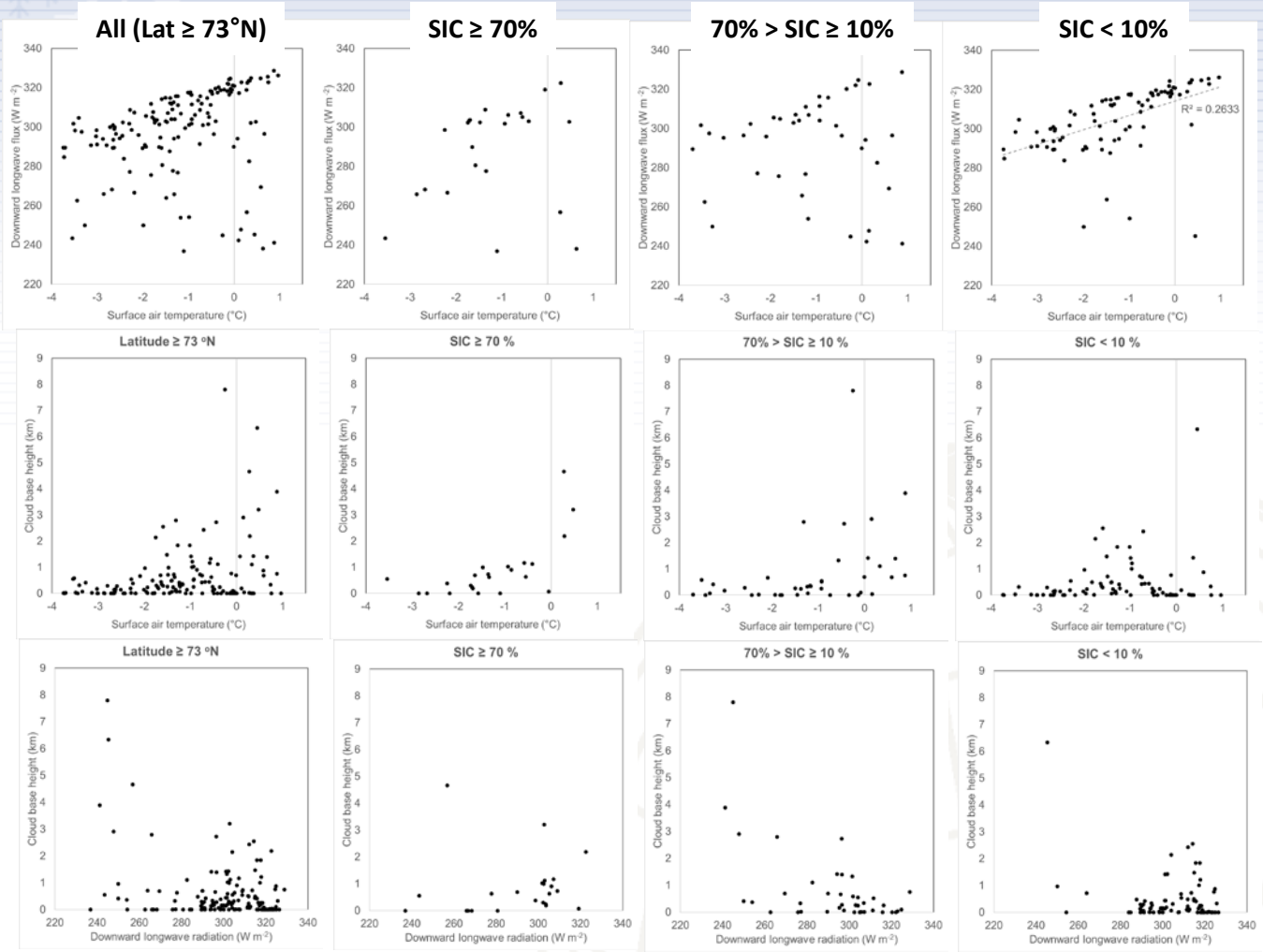
Conditional Relationships (SAT, LW↓ and CBH) by SIC (in 2018)



- The relationships between SAT, LW↓ and CBH using the 6-hour averaged data (north of 73 °N)
- 1st row: Major direction of the relationship between the SAT and LW↓ is positive regardless of the SIC range, but the warm temperatures observed in clear days obscure the linear relationship
- 2nd row: The higher CBHs and the warmer air temperature
- 3rd row: A general tendency of higher LW↓ at lower CBHs (but data lack at higher CBHs)

Arctic summer storms

Storm-induced air-ice-ocean interaction

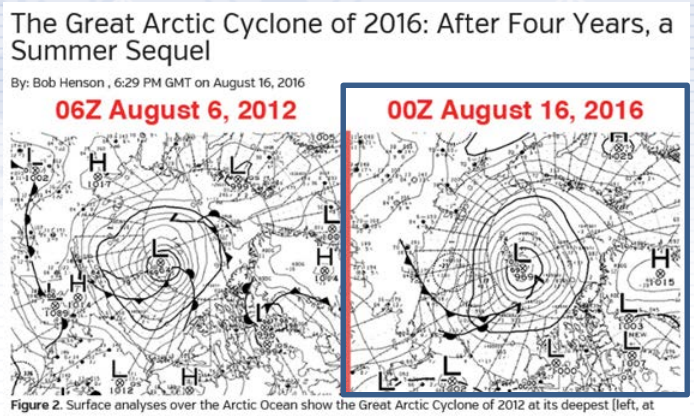
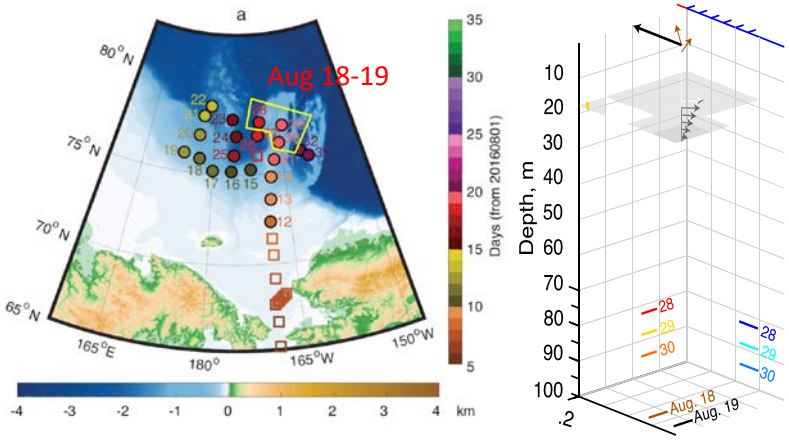


Figure 2. Surface analyses over the Arctic Ocean show the Great Arctic Cyclone of 2012 at its deepest [left, at 06Z August 6, 2012] juxtaposed with the current cyclone [right, as of 00Z Tuesday, August 16, 2016]. The initial
Image credit: Environment Canada.



L. Peng, X. Zhang (UAF), J.-H. Kim, K. Cho (KOPRI)

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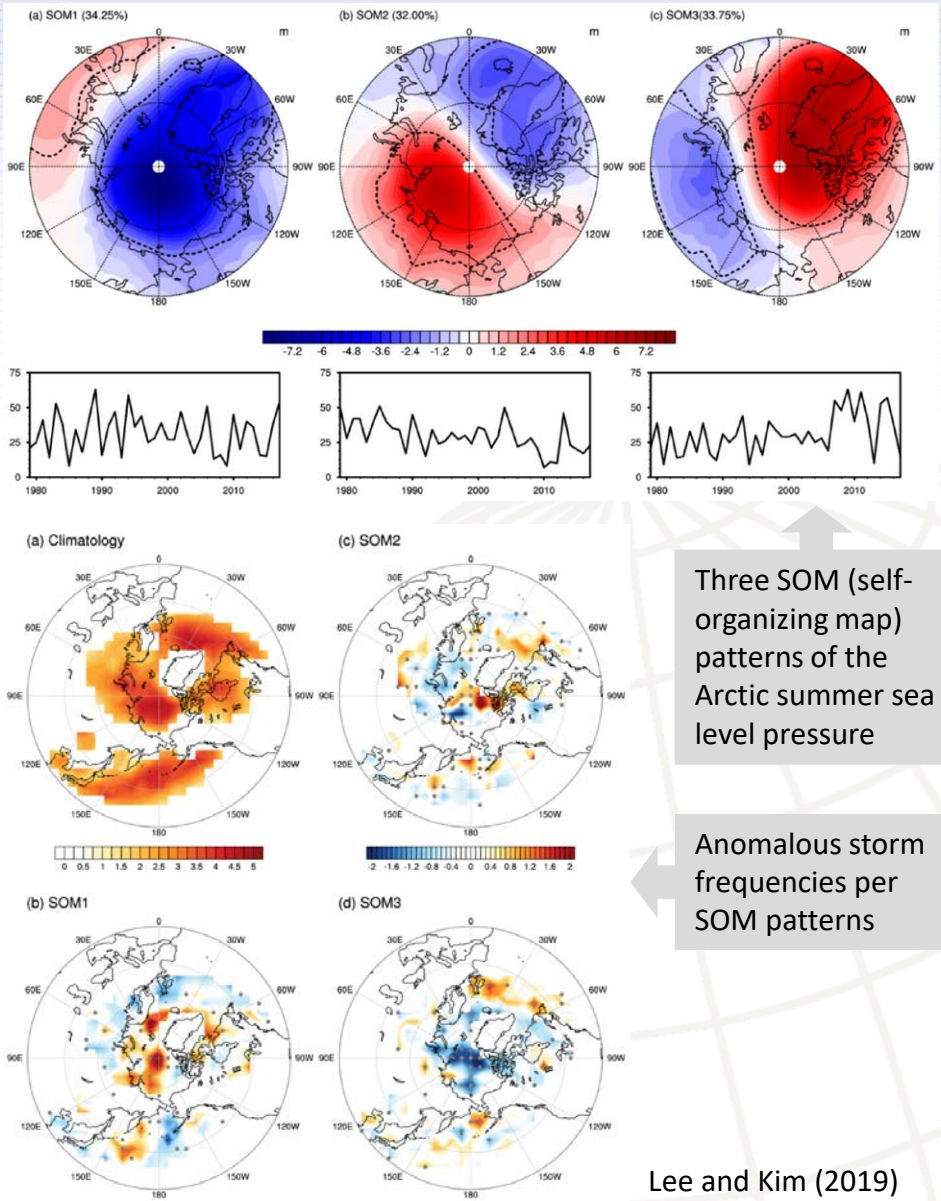
Storm's role in forming Arctic summer circulation patterns



Three SOM (self-organizing map) patterns of the Arctic summer sea level pressure

Anomalous storm frequencies per SOM patterns

Lee and Kim (2019)


Thank you for your attention!
earth