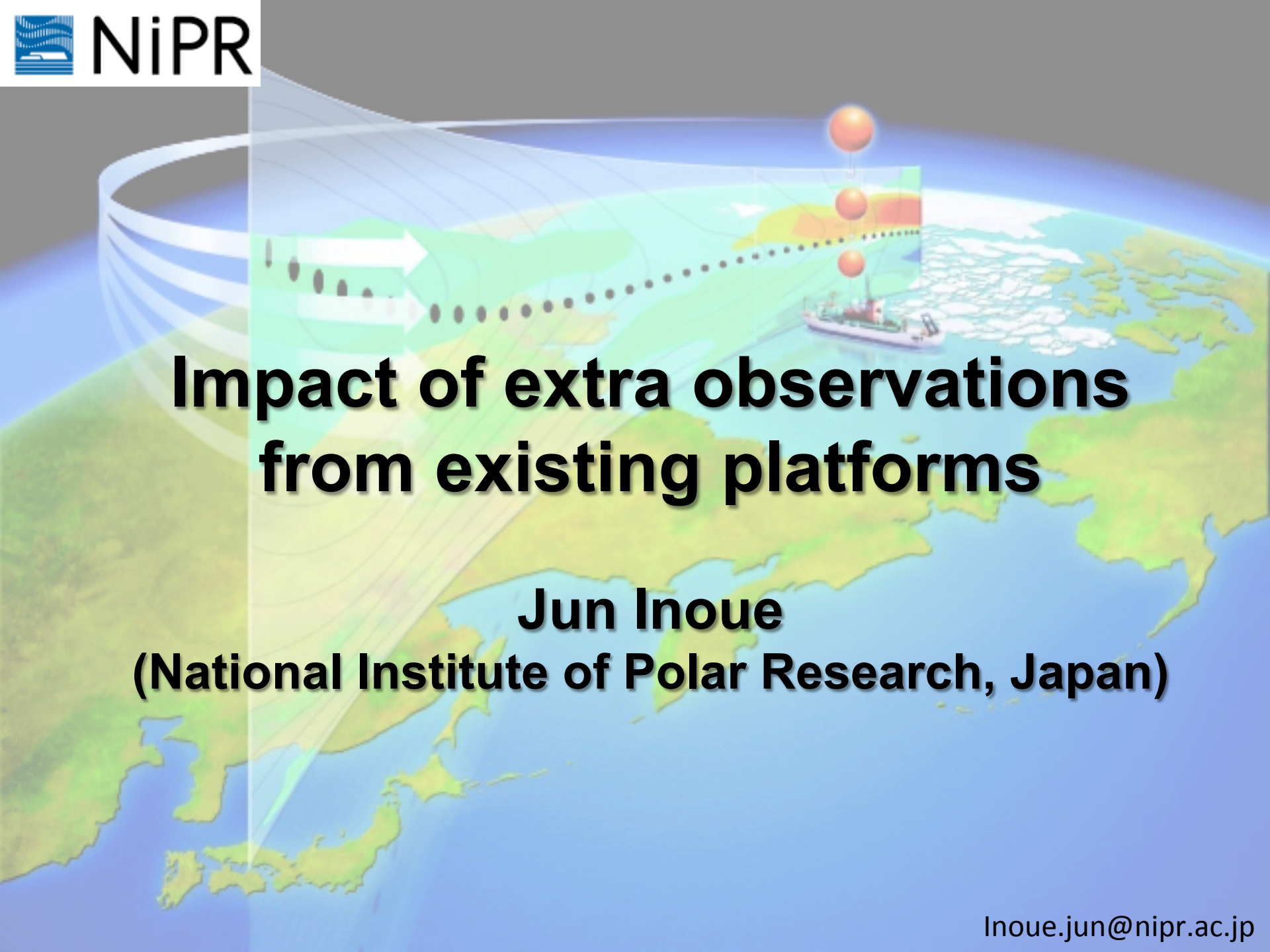

Impact of extra observations from existing platforms

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Why are Arctic radiosonde data important ?

- ✓ improvements of weather & sea-ice forecasts over NSR
  - ➢ strong winds, high waves, icing caused by Arctic cyclones
- ✓ understanding the linkage between Arctic and mid-latitudes
  - ➢ extreme events over Eurasia (e.g. severe winter)

Arctic Research Collaboration for Radiosonde Observing System Experiment

Additional Observations

Modeling

Better predictions

Predictability studies for YOPP

- ✓ Frequent radiosonde obs. from ships & land stns.
  - RVs Mirai & Polarstern, Ny-Alesund, etc.
  - ➢ Improvements of NWPs and reanalyses
- ✓ Data assimilation (DA)
  - Observing System Experiment (OSE)
  - ➢ Evaluating the effect of intensive observations
  - ➢ Assessing the cost-benefit observing frequency
  - ➢ Proposing a future observing network

×

Each country has each policy for soundings …

Canada: Two additional soundings at Alert & Eureka during September 2014, and continuing several months
Soundings from ice breakers are also active (but offline data)

Norway: Two additional soundings at Bear Island & Jan Mayan during winter after IPY-THORPEX (Kristjansson et al. 2011 BAMS)

US: Two additional soundings at Barrow by ARM, but offline data

Russia: ARRI wans to increase the frequency, but shortage of resources. A new station, Cape Baranova has been open

Germany: Very active at Ny-Alesund and RV Polarstern (on-line data)

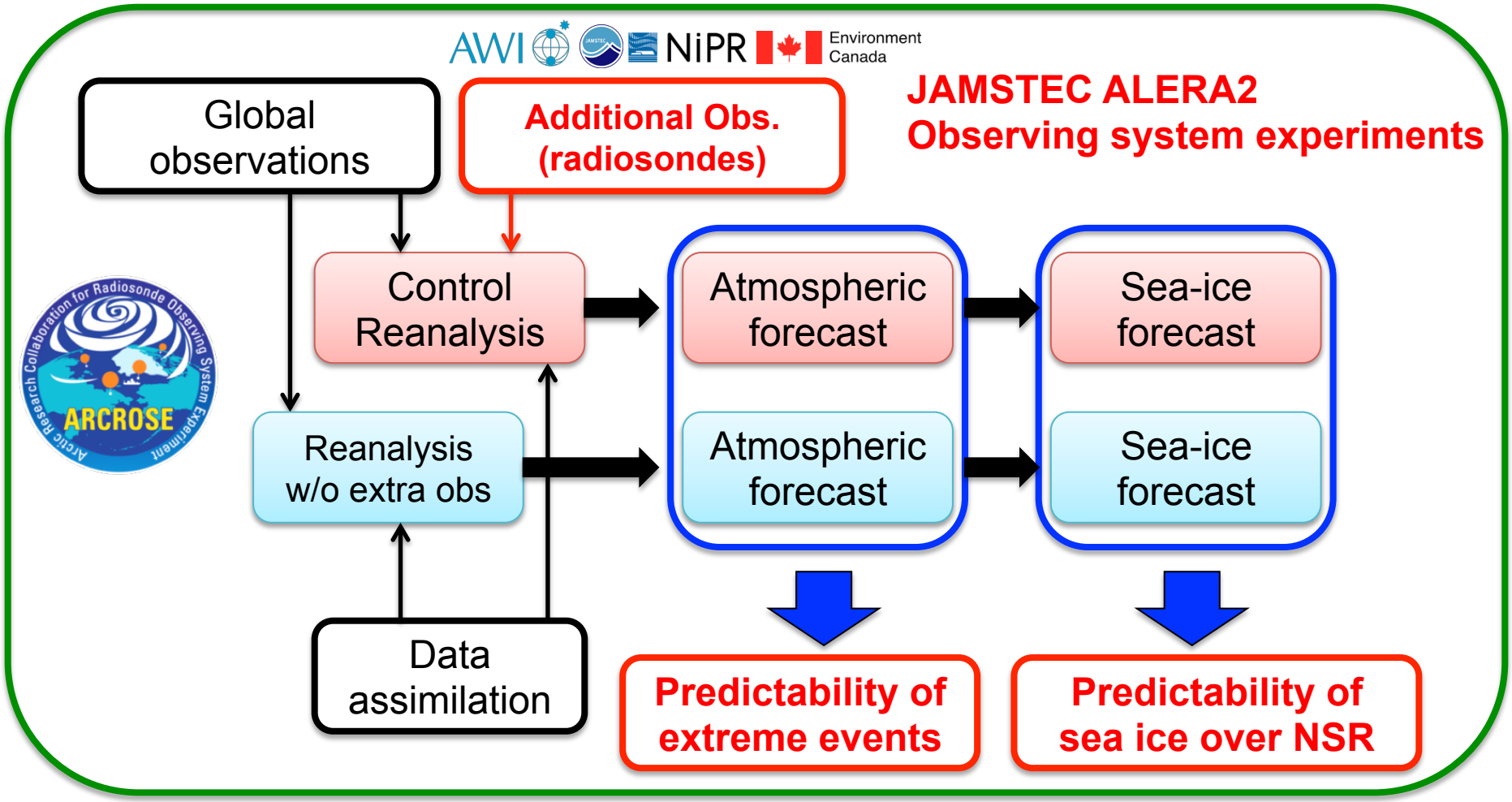
Sweden: RV Oden (partly on-line data)

Korea: RV Araon (would be on-line data from 2015)

Japan: RV Mirai (on-line data)

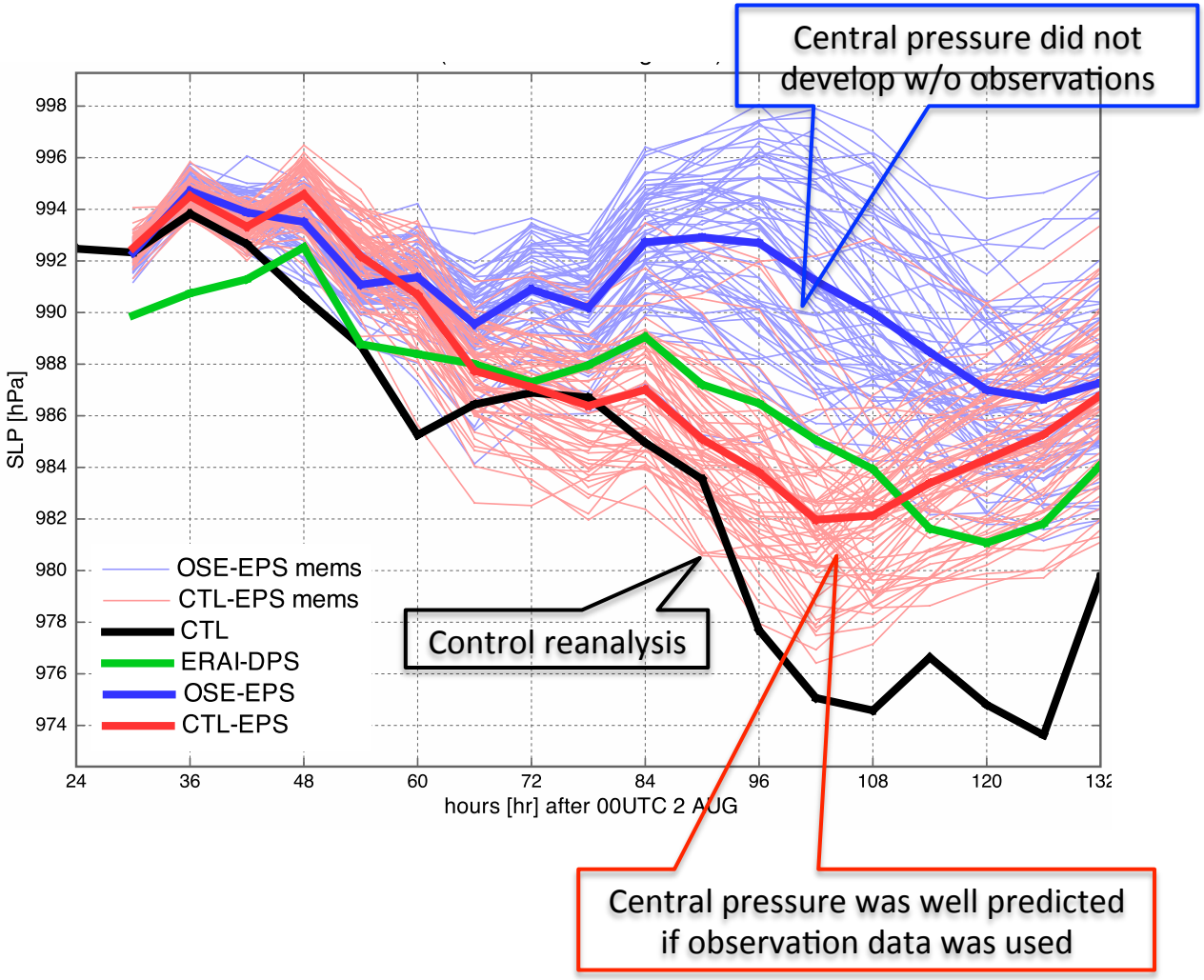
Pilot Studies for YOPP

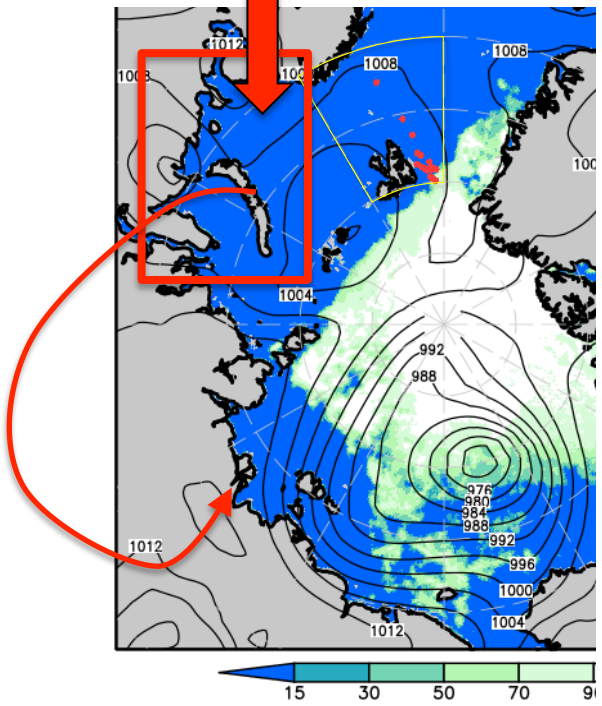
- Aug 2012 (RV Polarstern: a great cyclone case)
- Sep 2013 (RV Mirai, Ny-Ålesund, Alert & Eureka)
- Sep 2014 (RVs Polarstern, Mirai, & Oden; Ny-Ålesund, Alert & Eureka)



Application to forecasting Arctic cyclones

Special observations from RV Polarstern improved the forecast skill of the great Arctic cyclone on Aug. 6, 2012.

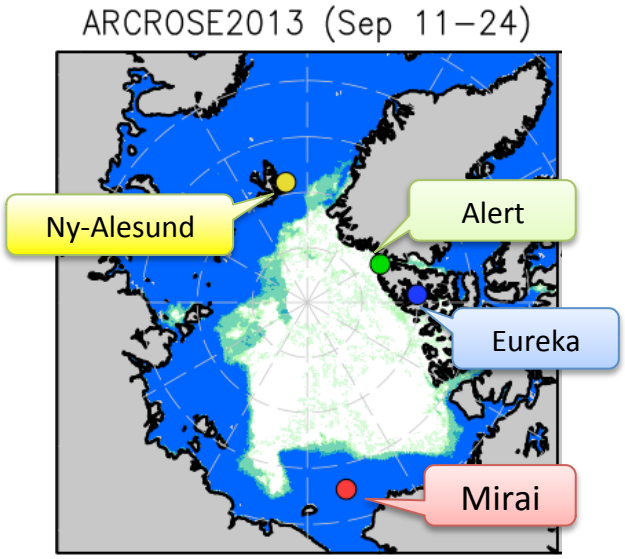


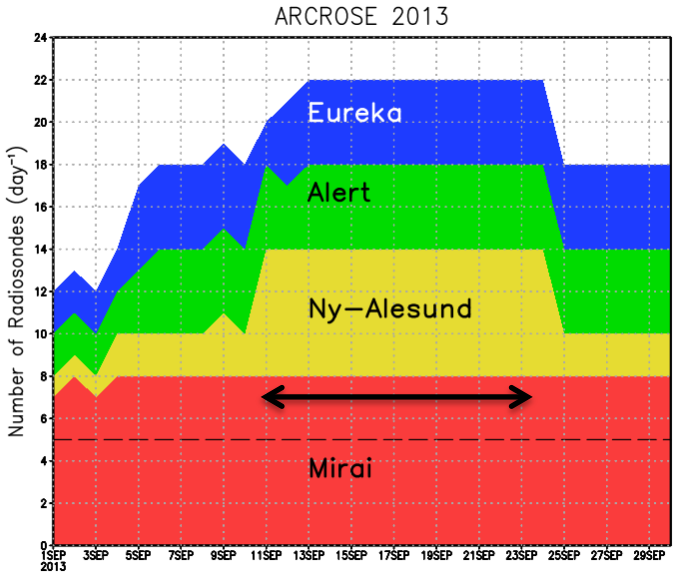


Yamazaki et al. (2015 JGR-A)

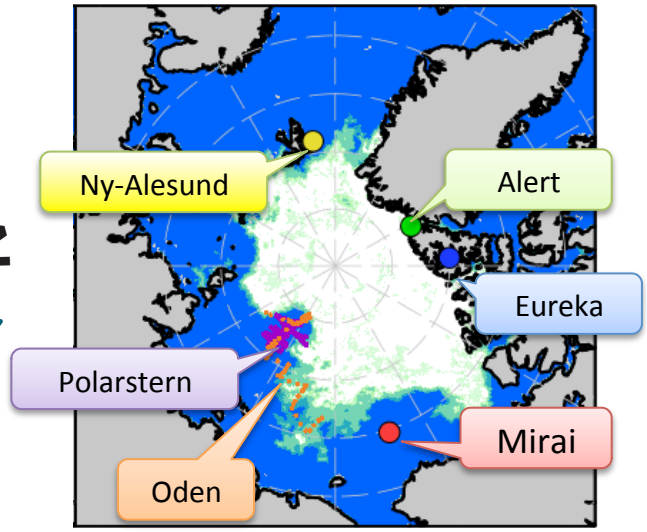
ARCROSE 2013 & 2014

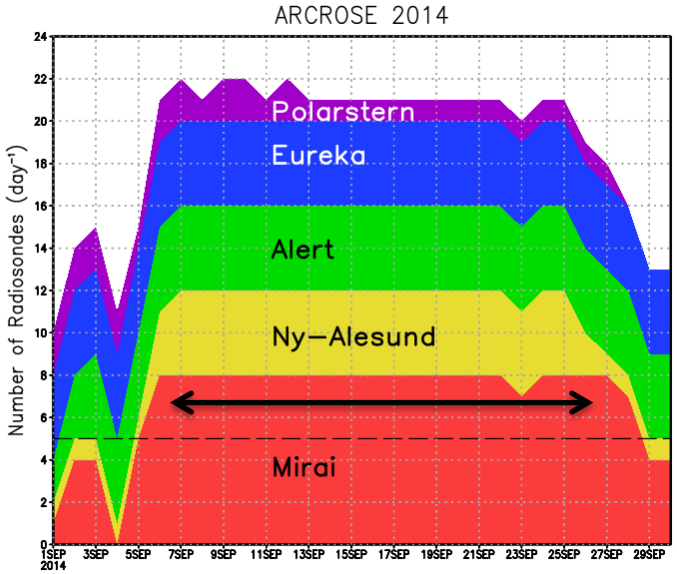
Sep. 2013





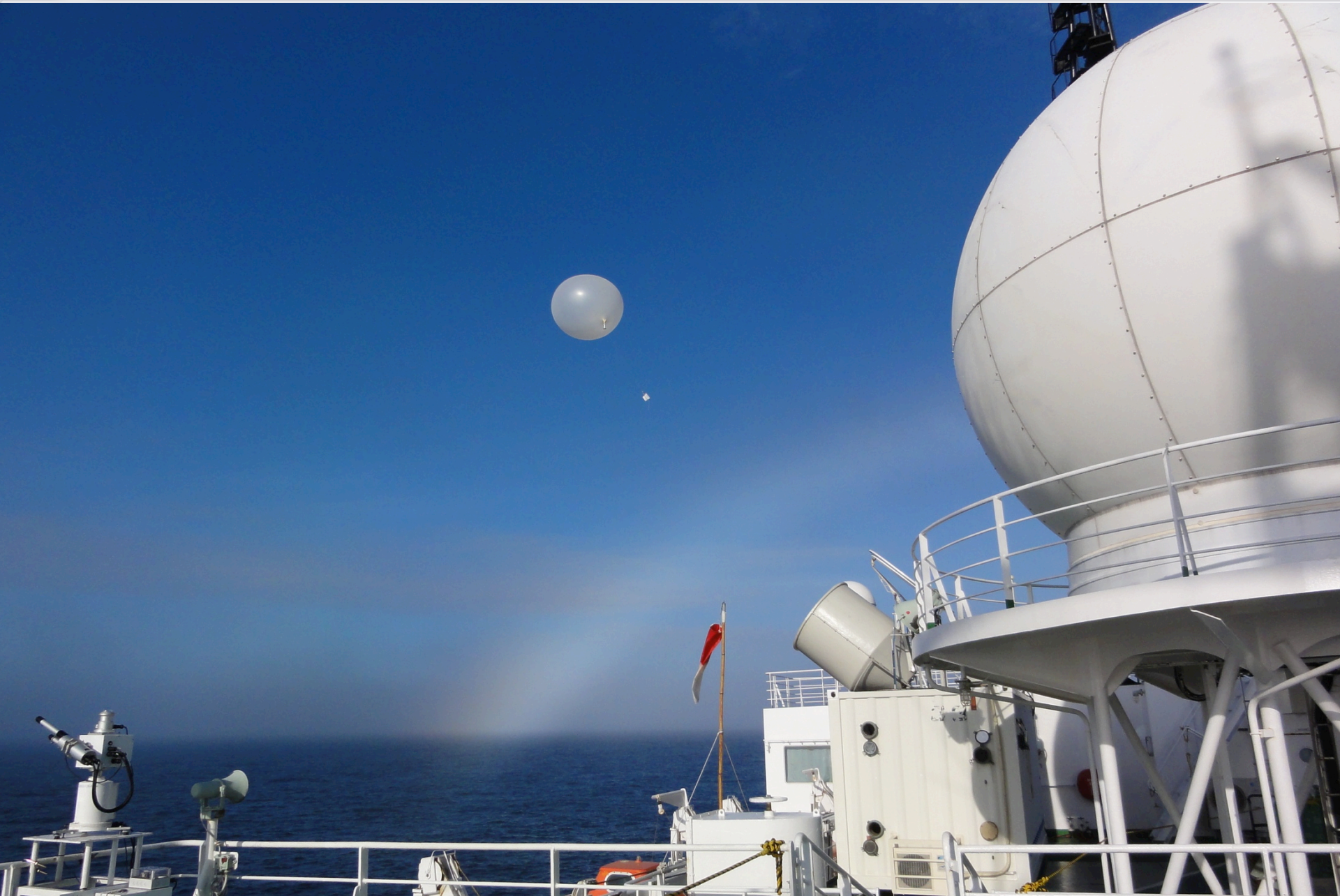
Sep. 2014





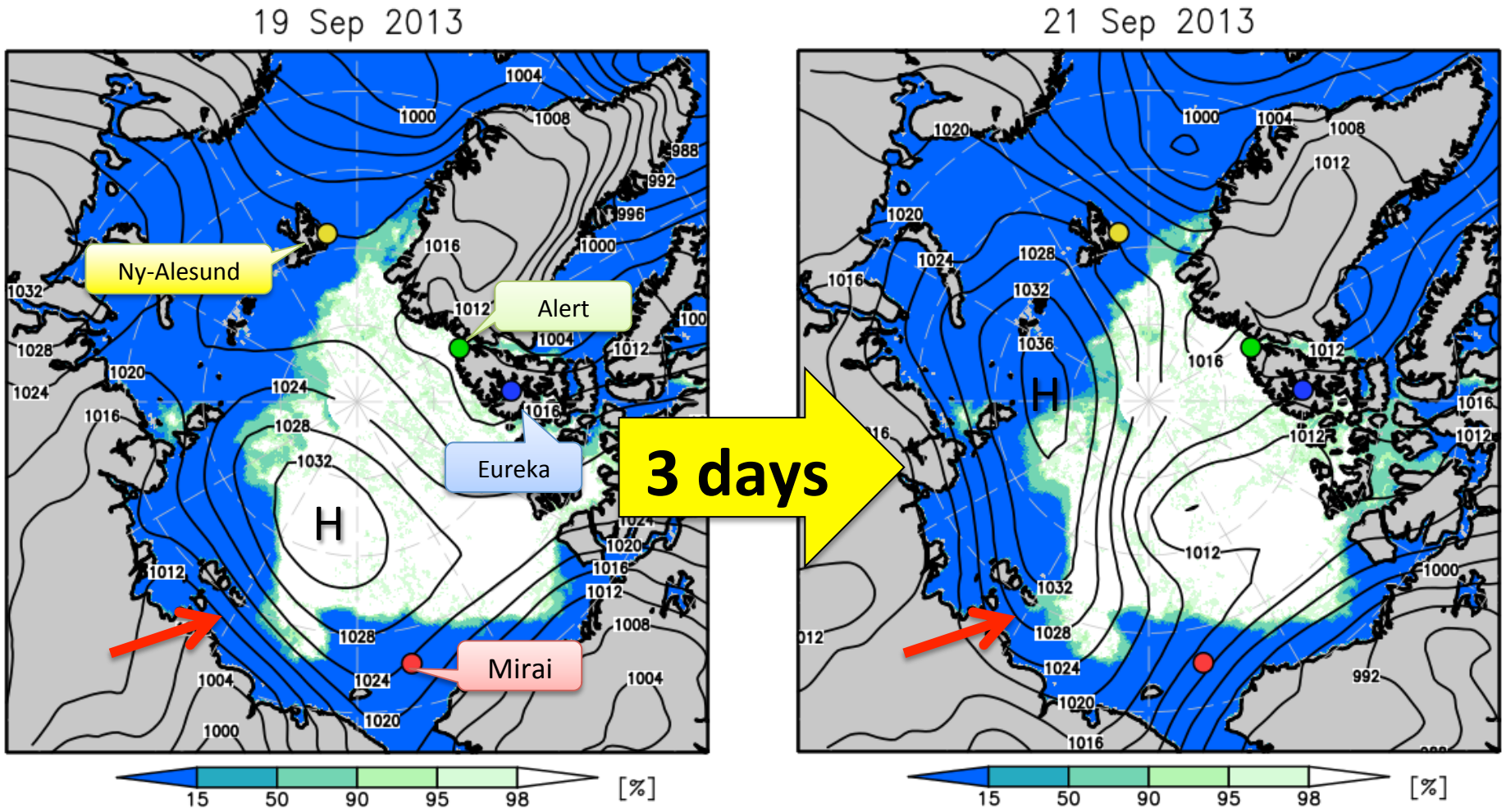
GTS status in NCEP ADP Global Upper Air Observations
→**22 launches per day** during ARCROSE

Radiosonde observations from R/V Mirai



Northern Sea Route was closed during ARCROSE2013

- A good case to investigate the impact of ARCROSE data on the predictability of high pressure system



Setting for Observing System Experiments (OSE)

- Control reanalysis (63 members) was made by assimilating all ARCROSE data
- Observing System Experiment (OSE) reanalyses were made
- Ensemble forecast runs were conducted by using each reanalysis

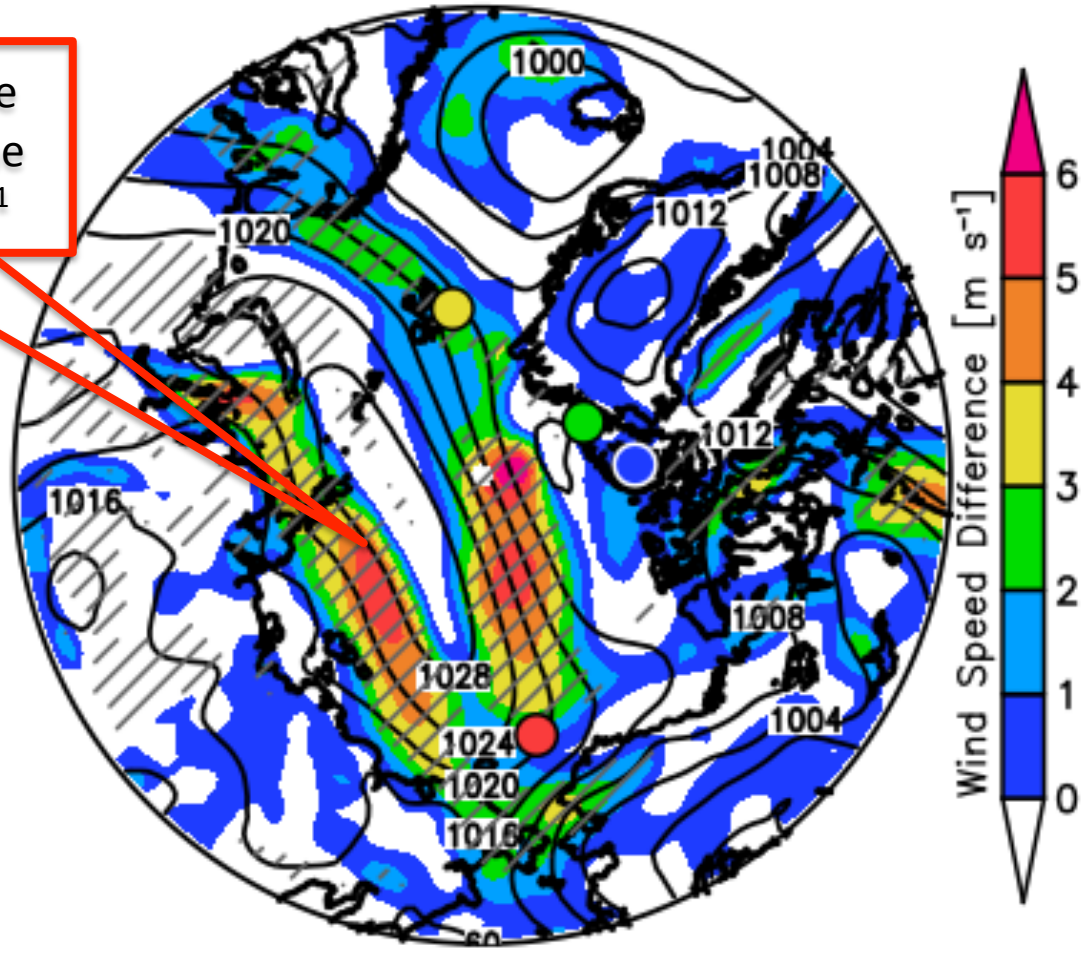
	Mirai	Eureka		Alert		Ny-Alesund	
	IOP	IOP	Routine	IOP	Routine	IOP	Routine
CTL	8	2	2	2	2	5	1
OSE_{MEAN}	0	0	2	0	2	0	1
OSE_{M0}	0	2	2	2	2	5	1
OSE_{M1}	1	2	2	2	2	5	1
OSE_{M2}	2	2	2	2	2	5	1
OSE_{M4}	4	2	2	2	2	5	1
OSE_{EA}	8	0	2	0	2	5	1
OSE_{N}	8	2	2	2	2	0	1

Environment Canada

Environment Canada

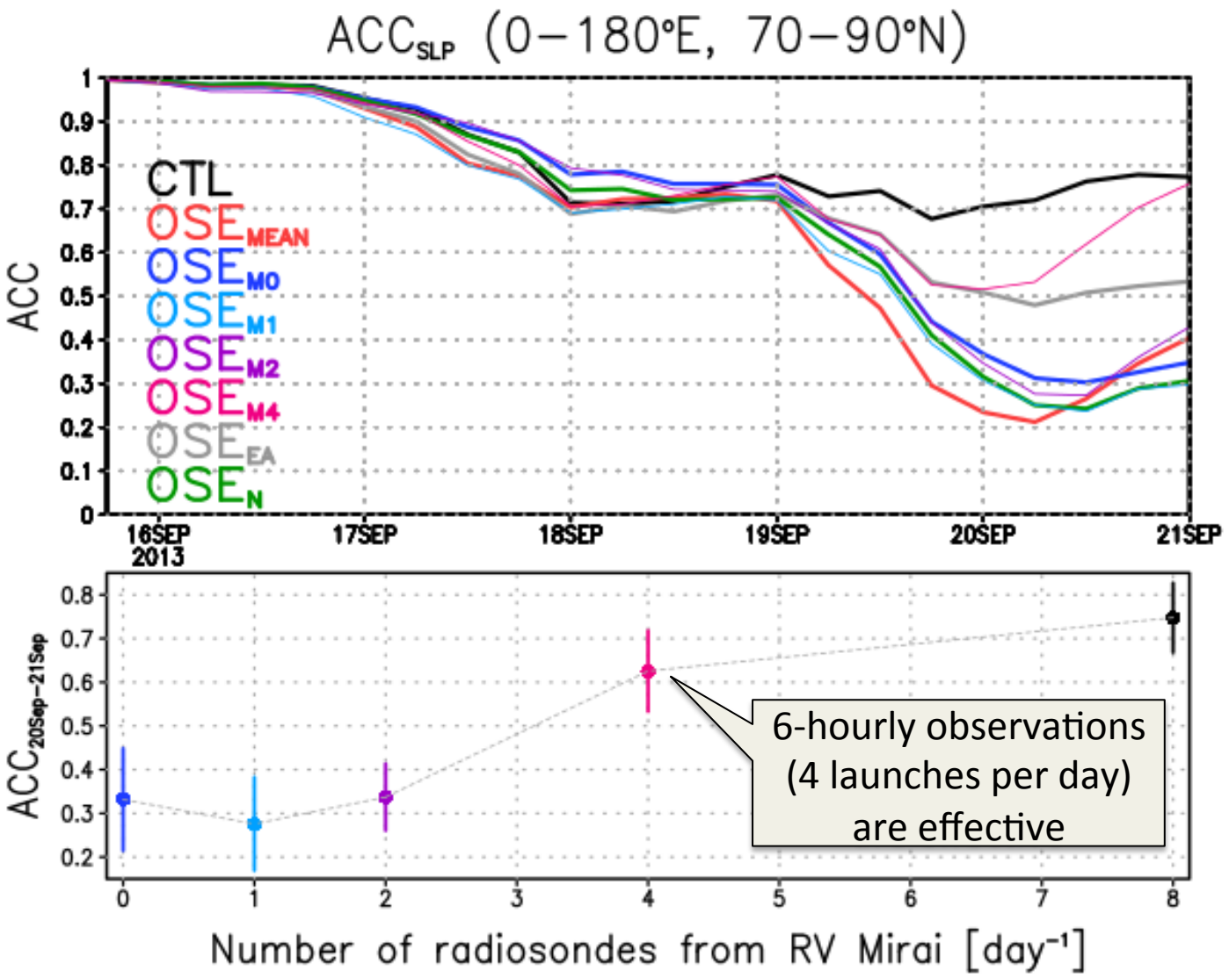
Wind difference between CTL and OSE_{MEAN}

Difference in surface wind speed along the NSR exceeds 4 m s^{-1}



Inoue et al. (2015 submitted)

Estimation of cost-benefit observing frequency



Inoue et al. (2015 submitted)

Challenges towards YOPP

- ✓ Understanding seasonality in particular winter
  - ➢ predictions of extreme cold winters
  - ➢ Early winter research cruise (RV Mirai) is scheduled in 2018
- ✓ Collaboration with operational agencies (ECMWF, NCEP, etc)
- ✓ Coordination of coastal land stations
  - ➢ Arctic (US, Canada, Norway, Russia, etc)
  - ➢ Antarctic
- ✓ Impact of atmospheric forecasts on sea-ice forecasts
  - ➢ More applied challenging works