

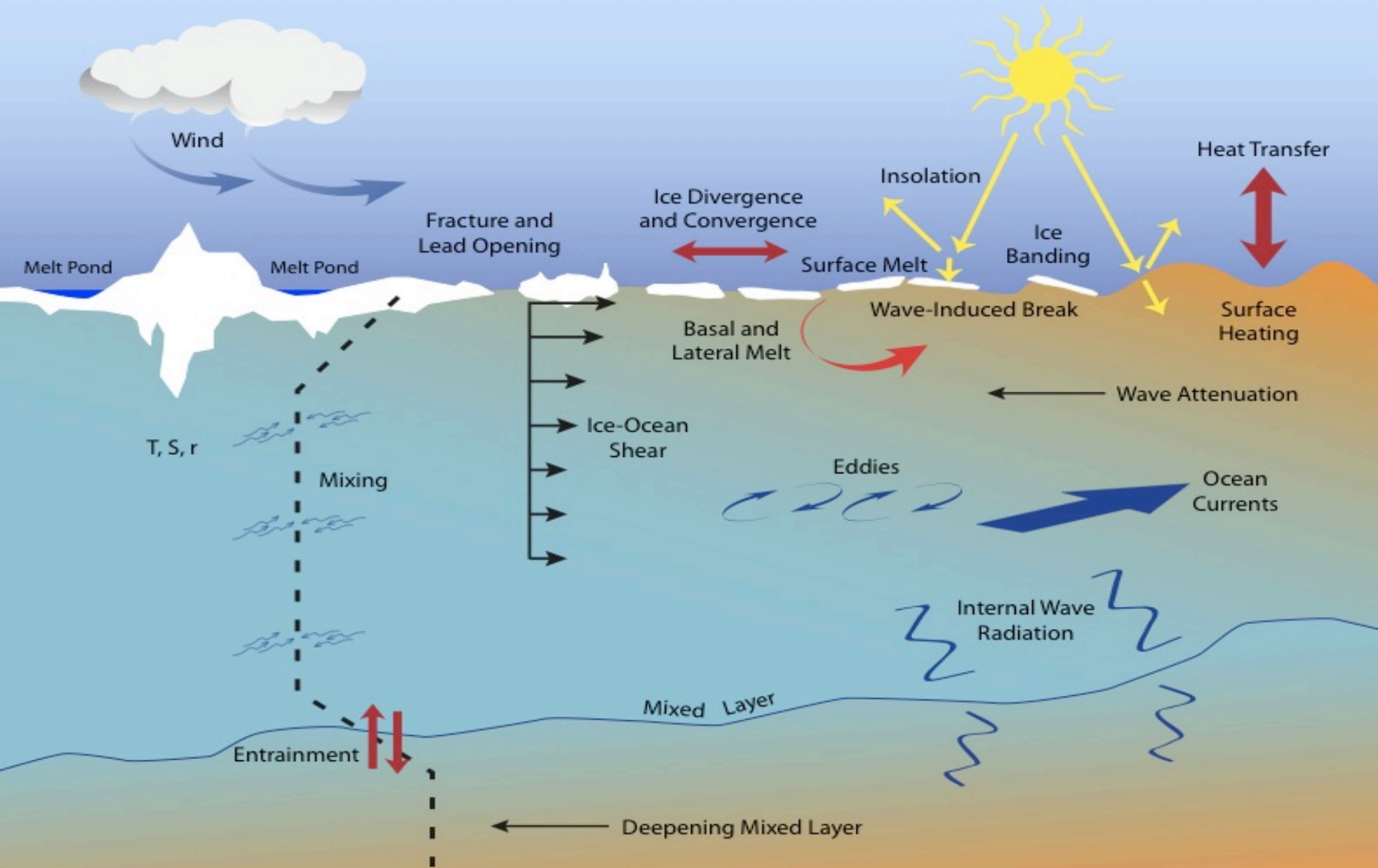


Arctic Sea State DRI



Jim Thomson, Applied Physics Lab, University of Washington

The Air-Sea-Ice System





Arctic Sea State DRI

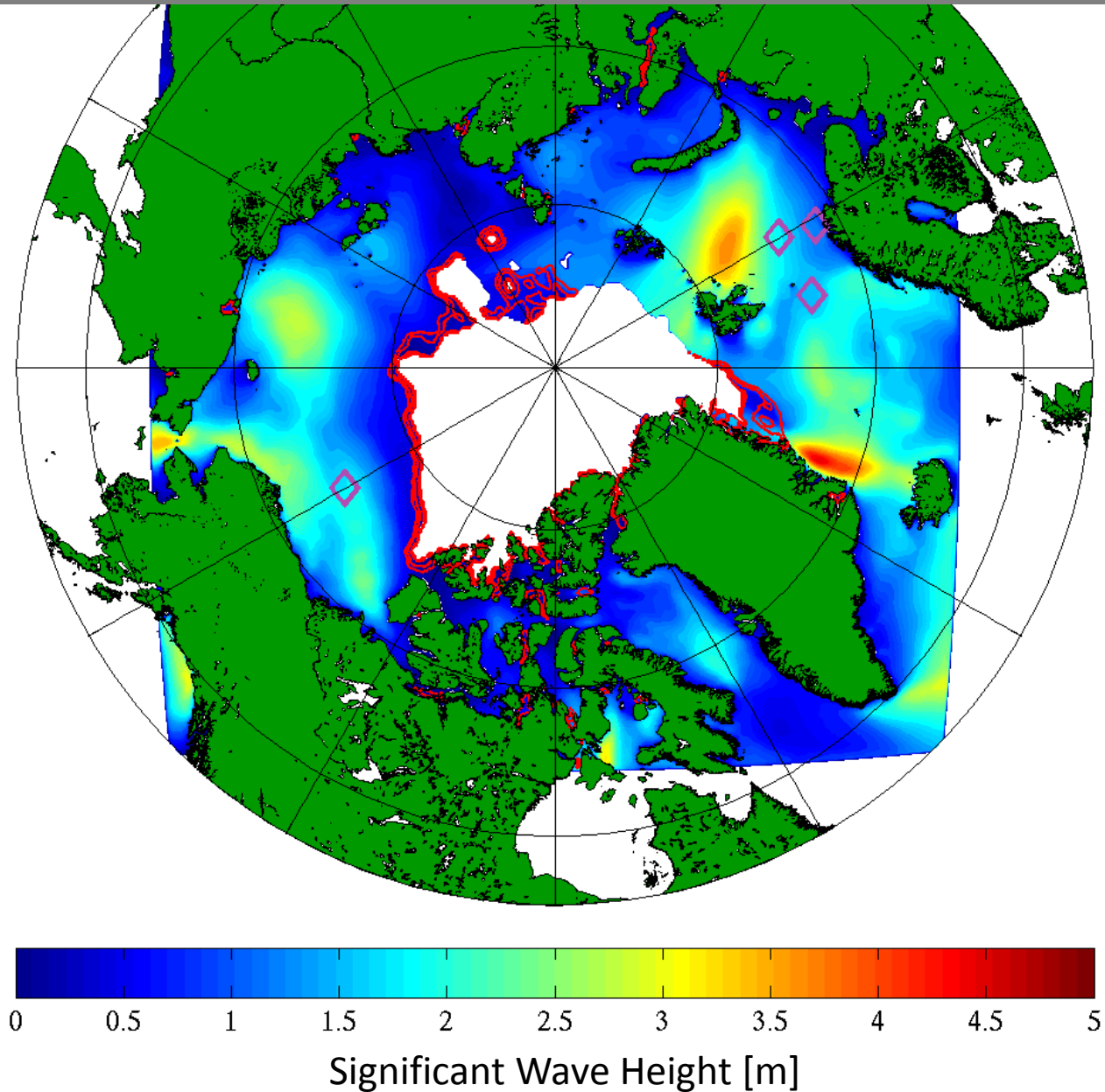


“Sea State and Boundary Layer Physics of the Emerging Arctic Ocean” DRI will use a combination of modeling, in situ observations, and remote sensing to address the following science objectives:

1. Develop a sea state climatology for the Arctic Ocean
2. Improve wave forecasting in the presence of sea ice
3. Improve theory of wave attenuation/scattering in the sea ice cover
4. Apply wave–ice interactions directly in integrated arctic system models
5. Understand heat and mass fluxes in the air–sea–ice system

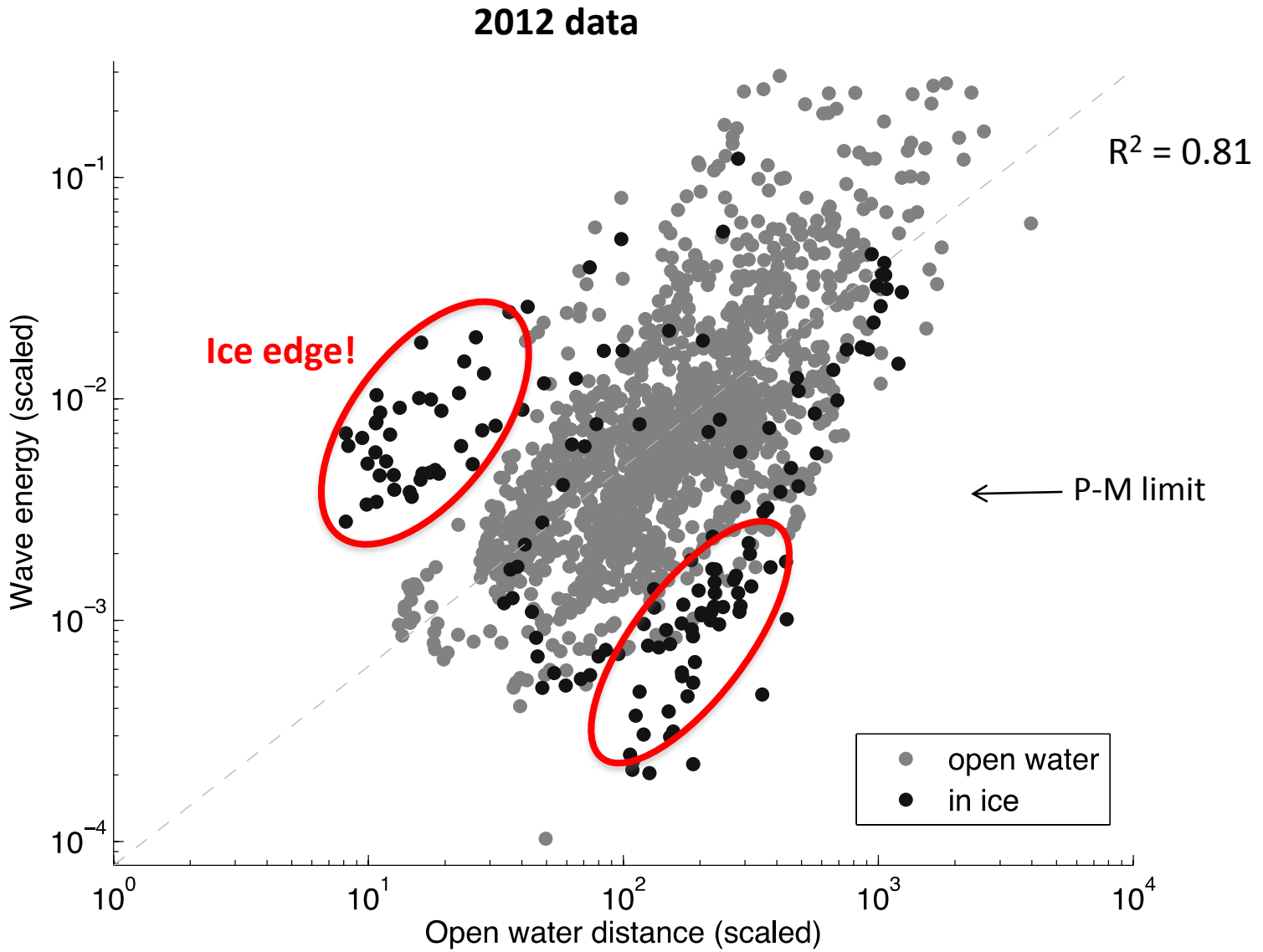


Waves are getting big



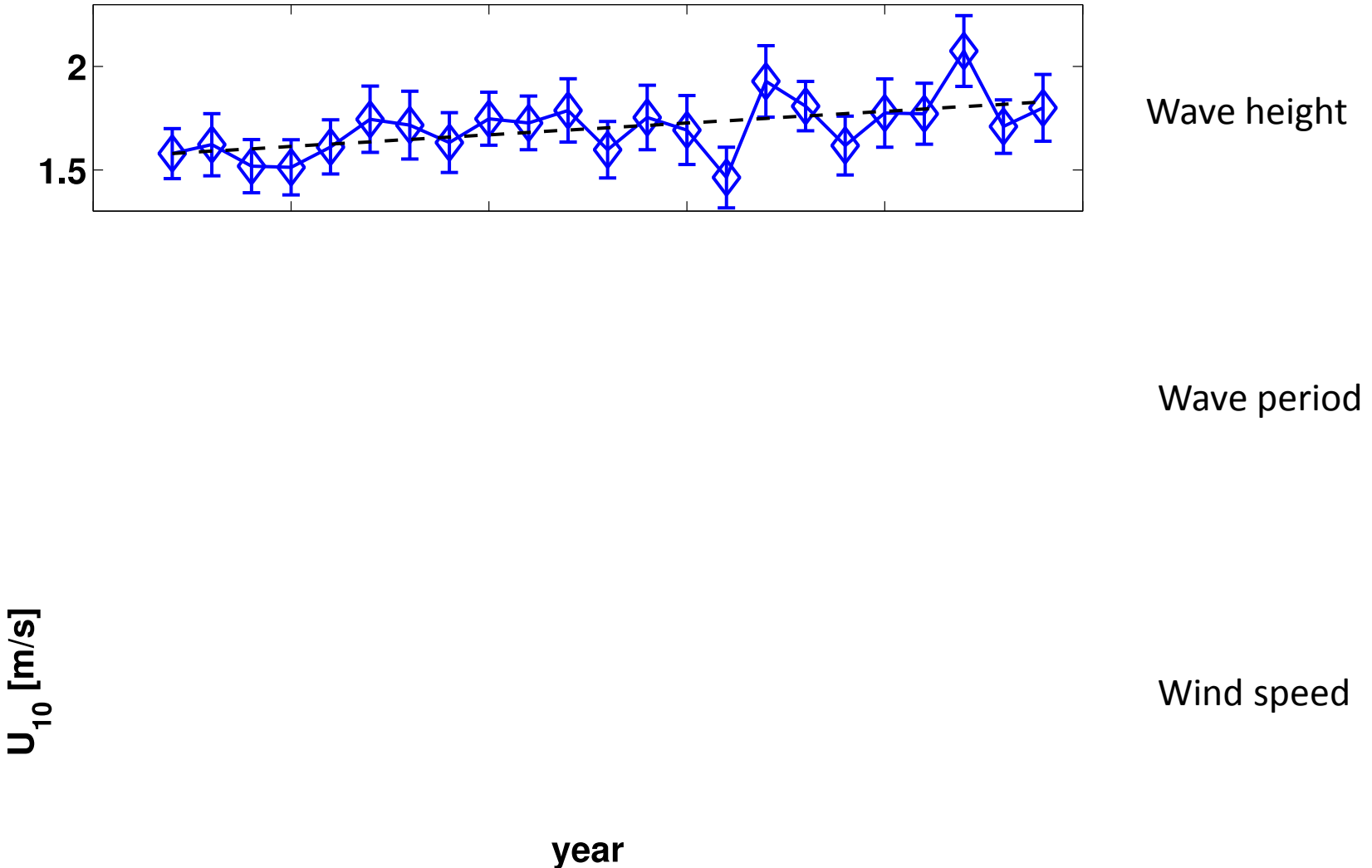


Fetch controls the waves





Wave trends are significant



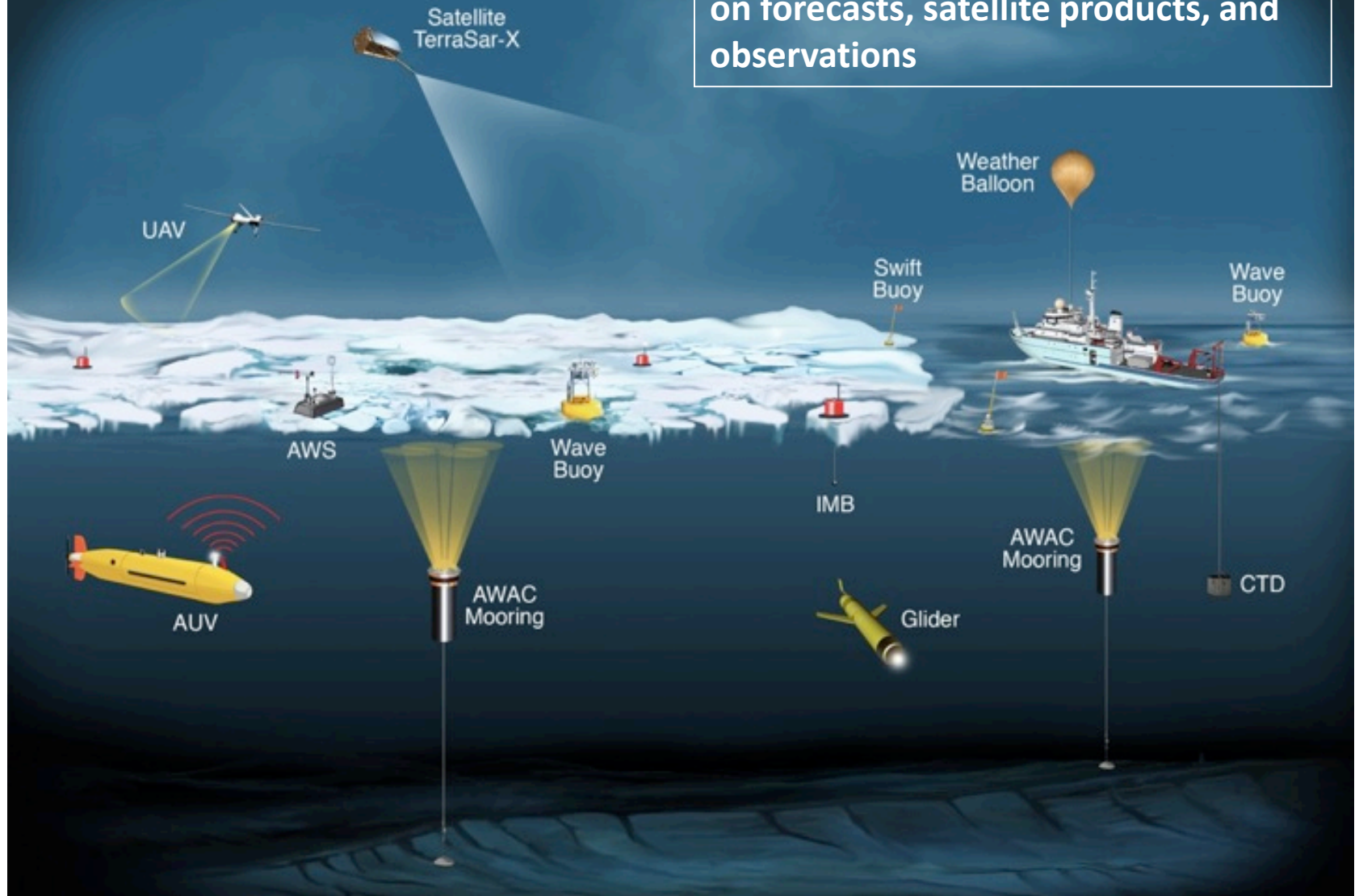
What are the effects of an increasing sea state in the Arctic?



Observational plan



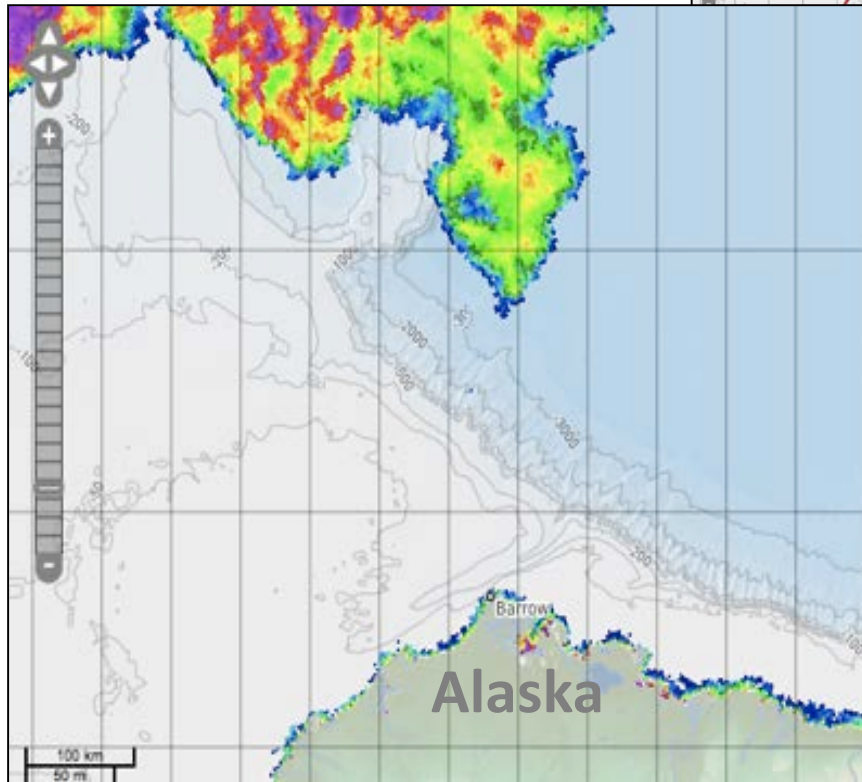
3-Day rolling "Plan of the Day" based on forecasts, satellite products, and observations



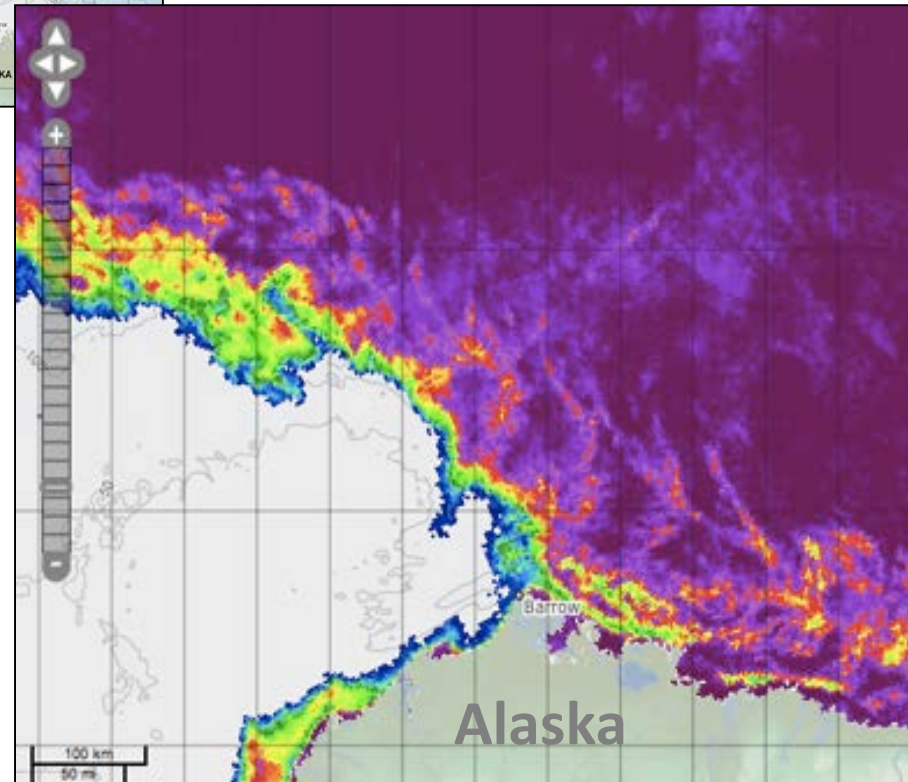
Fall freeze-up



Sikuliaq cruise track
fall 2015
ONR Sea State DRI



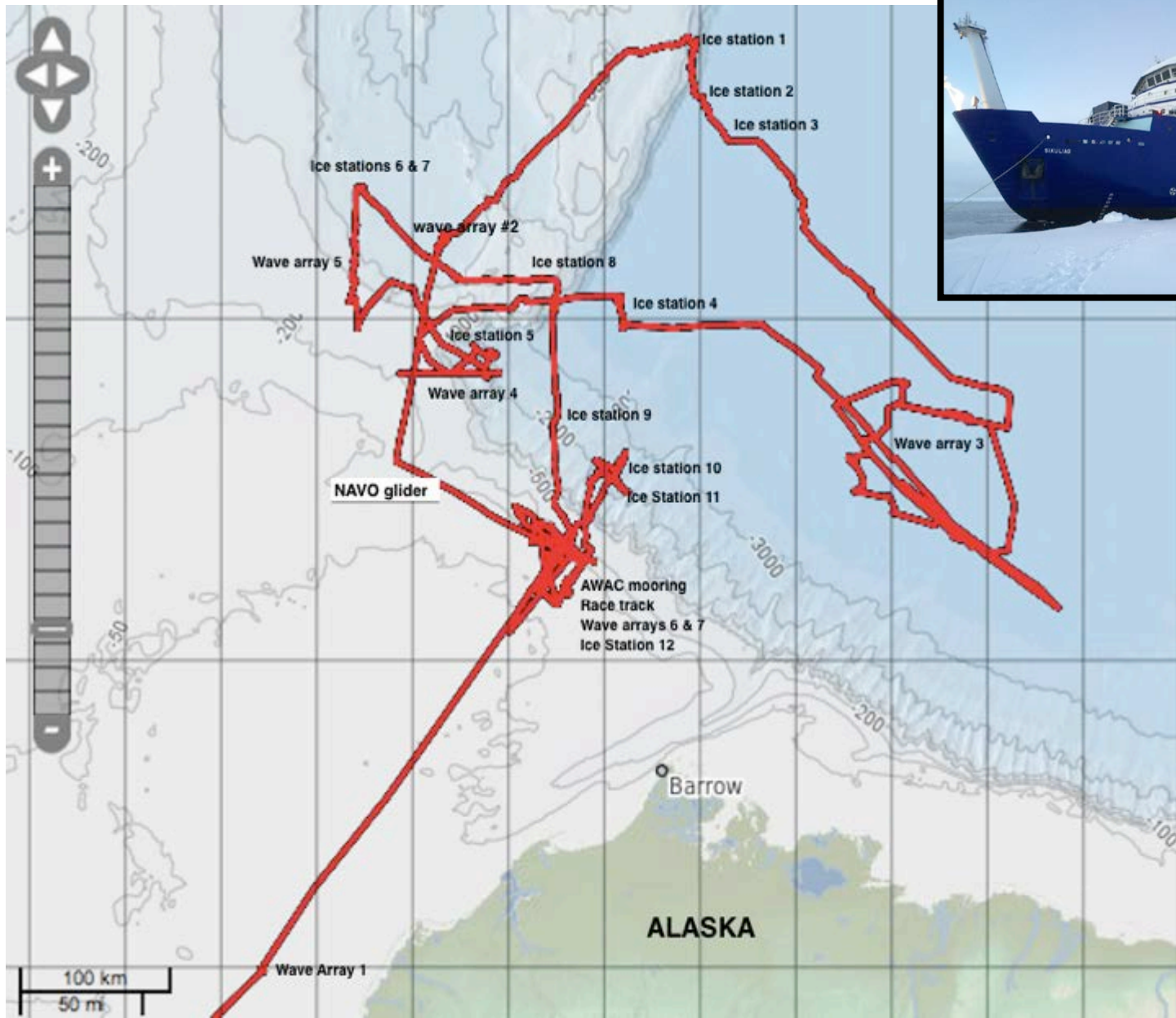
AMSR2 ice conc. on 1 Oct 2015



AMSR2 ice conc. on 1 No 2015



Track (October 2015)





Stations & Measurements



- **12 Ice Stations**

- 6 AUV missions (under-ice)
- 7 ice buoy deployments
- 12 UAV mosaics
- 10 LIDAR scans

- **7 Wave arrays**

- 70 wave buoy deployments
- 18 hours of stereo video

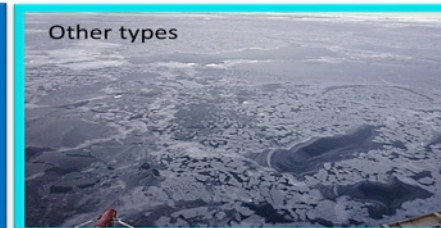
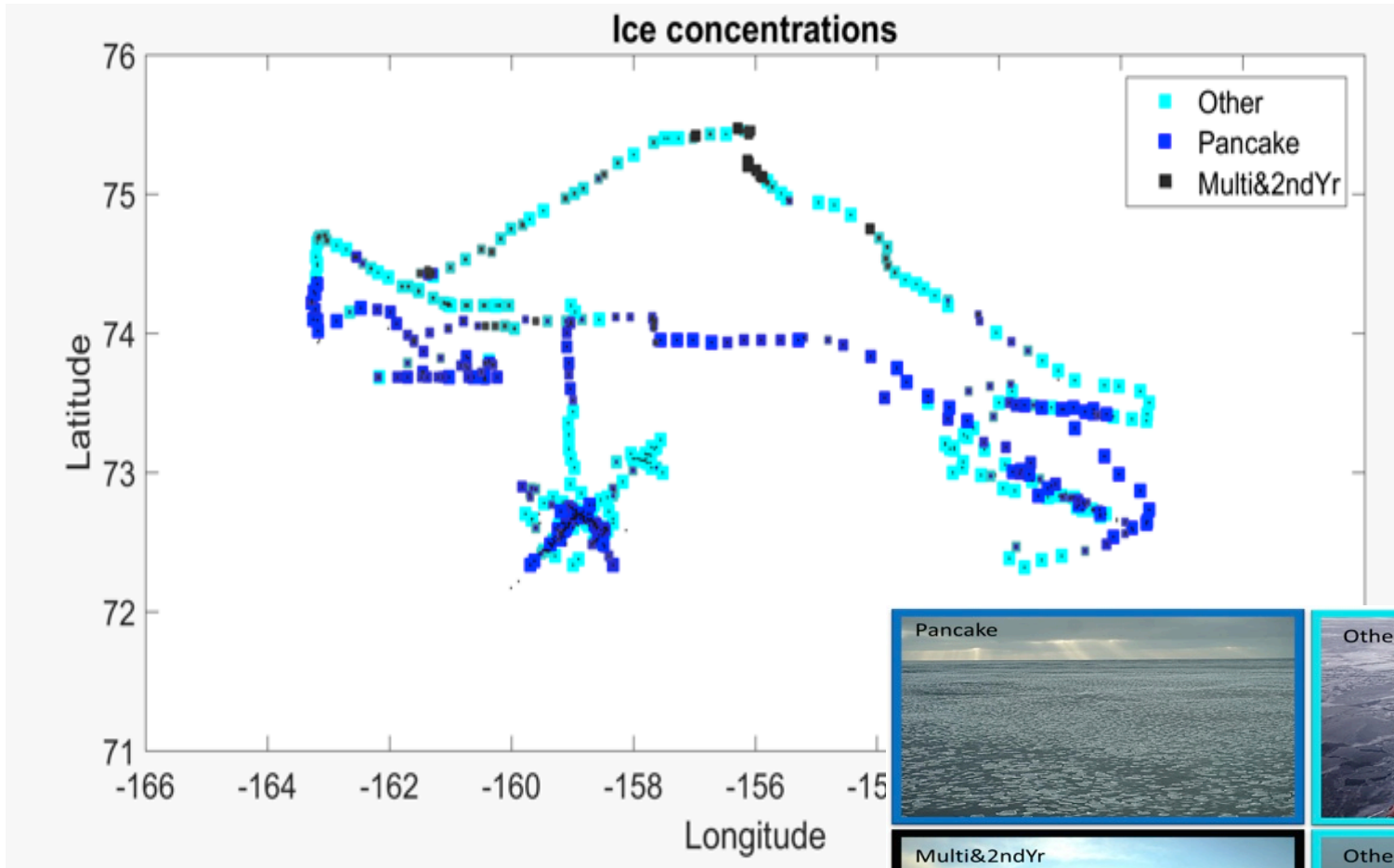


- **Underway, including race track w/ 95 flux stations:**

- 32 days (559 hours) of visual ice observations (ASSIST & ASPeCt protocols)
- 228423 ice camera images
- 467 physical ice samples
- 1520 nm of SIMS (Sea Ice Measurement System) transects
- 2,325,000 Rutter radar (wave and ice) images
- scanning LiDAR measurements of waves and ice
- 4292 casts of the underway CTD (underway Conductivity, Temperature, Depth)
- 169 weather balloon (radiosonde) launches
- continuous radiative energy fluxes, temperatures, and ceilometer

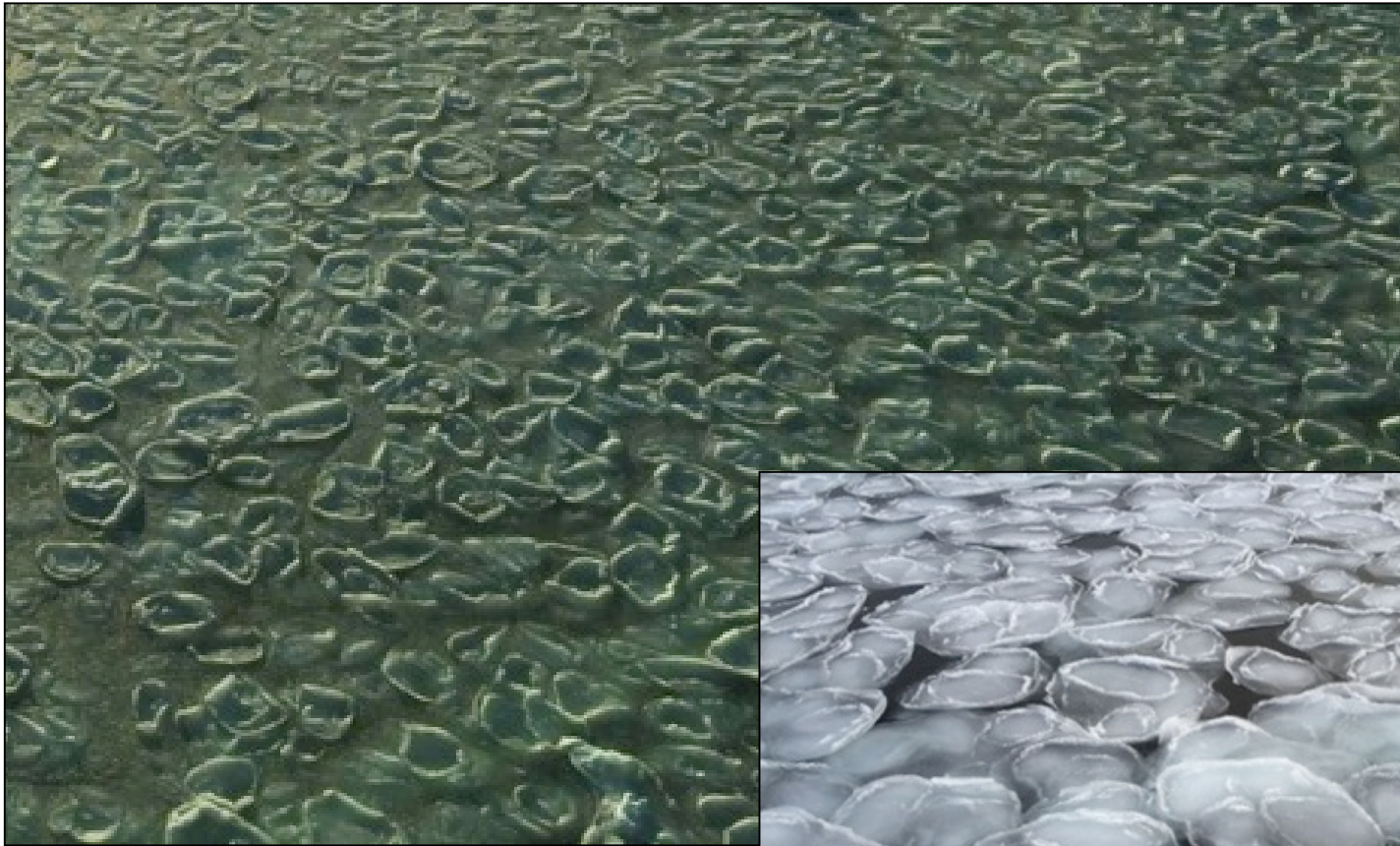


Ice Observations





Pancake Ice



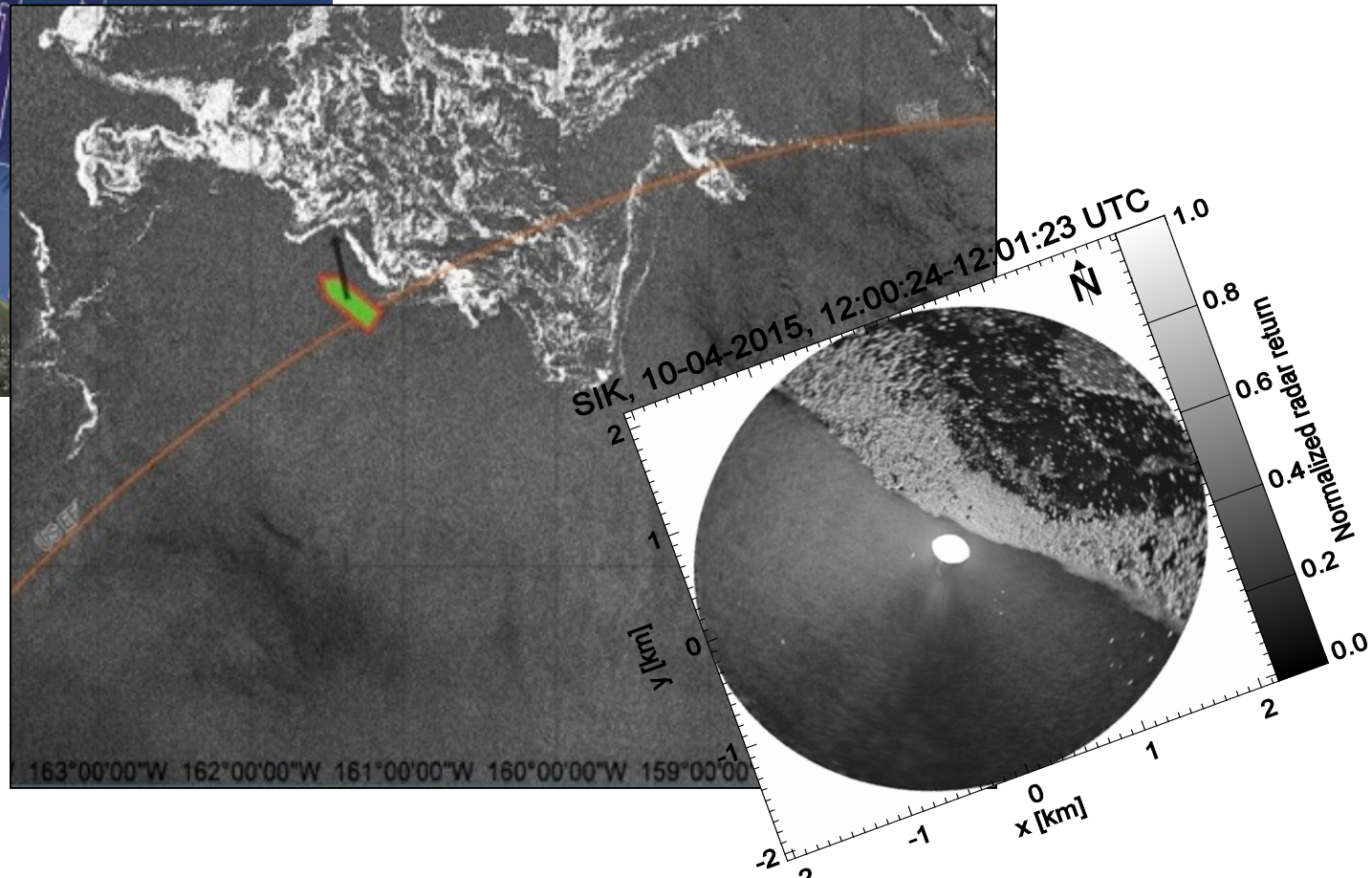
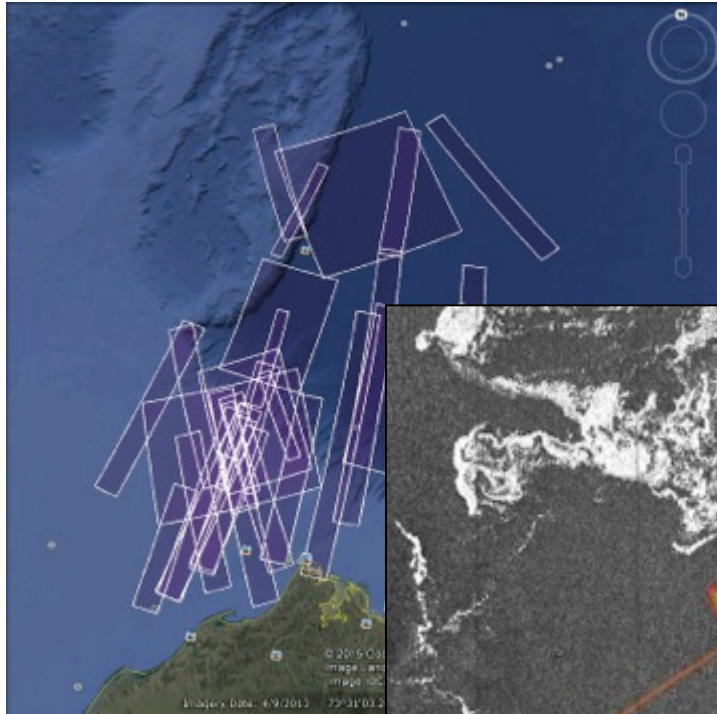


Pancake Ice





Remote sensing

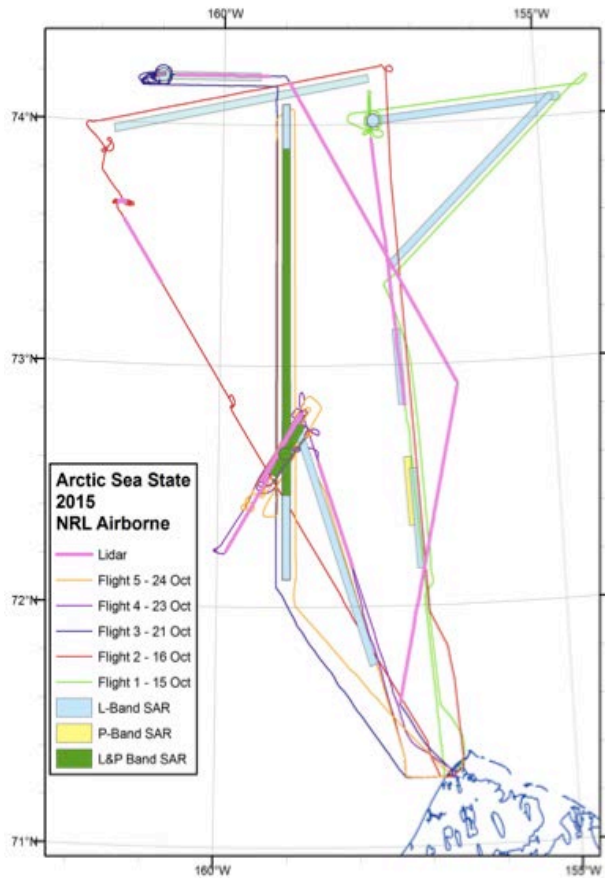




Aircraft sampling



NRL aerial survey plane (Twin Otter)





Summary



Summary:

- Less ice, more waves → pancake ice
- variability is huge, time scales can be short
- satellites are of crucial importance
 - interpretation is challenging

Future:

- Data availability subject to DRI policy
- Lots of results to come... journal special issue

<http://www.apl.uw.edu/arcticseastate>



Thank you

