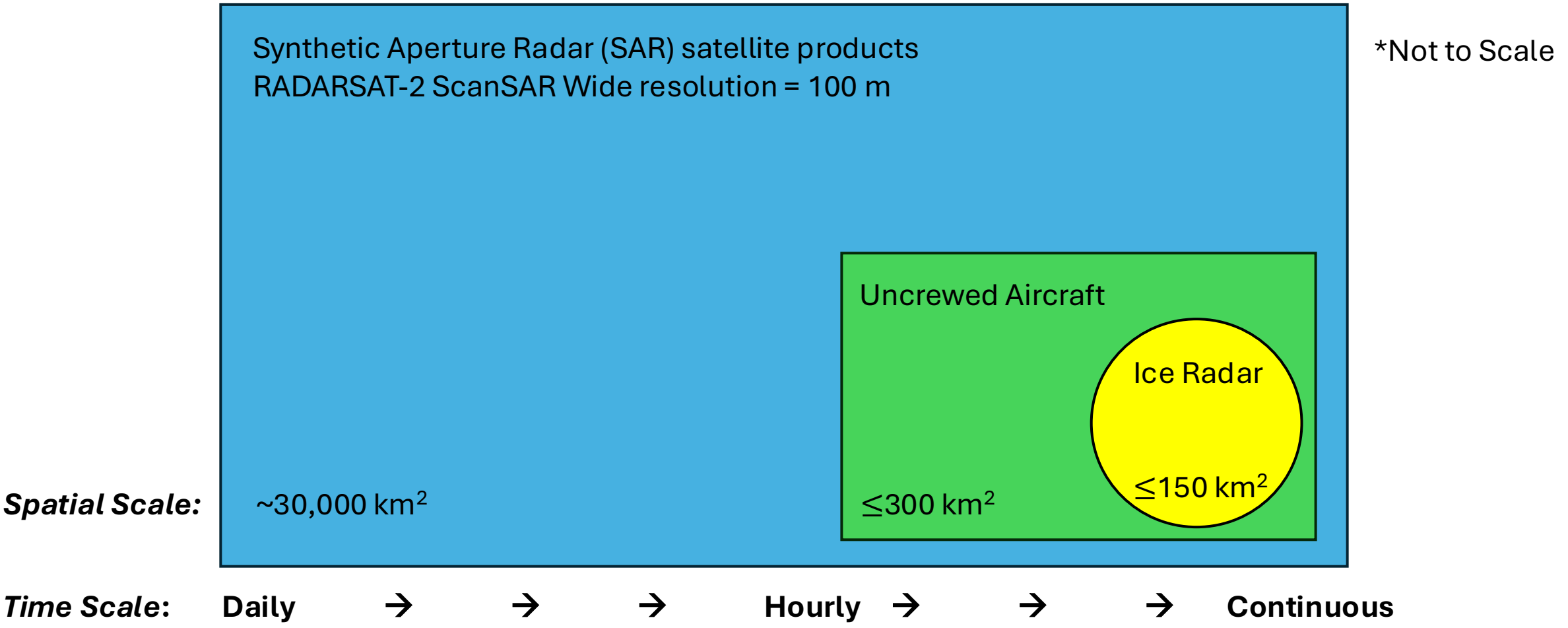
The benefits of augmented **Ice Radar** products for operational use

AICC Winter 2026, Coast Guard Base Seattle

Ethan Roth (ethan.roth@oregonstate.edu)

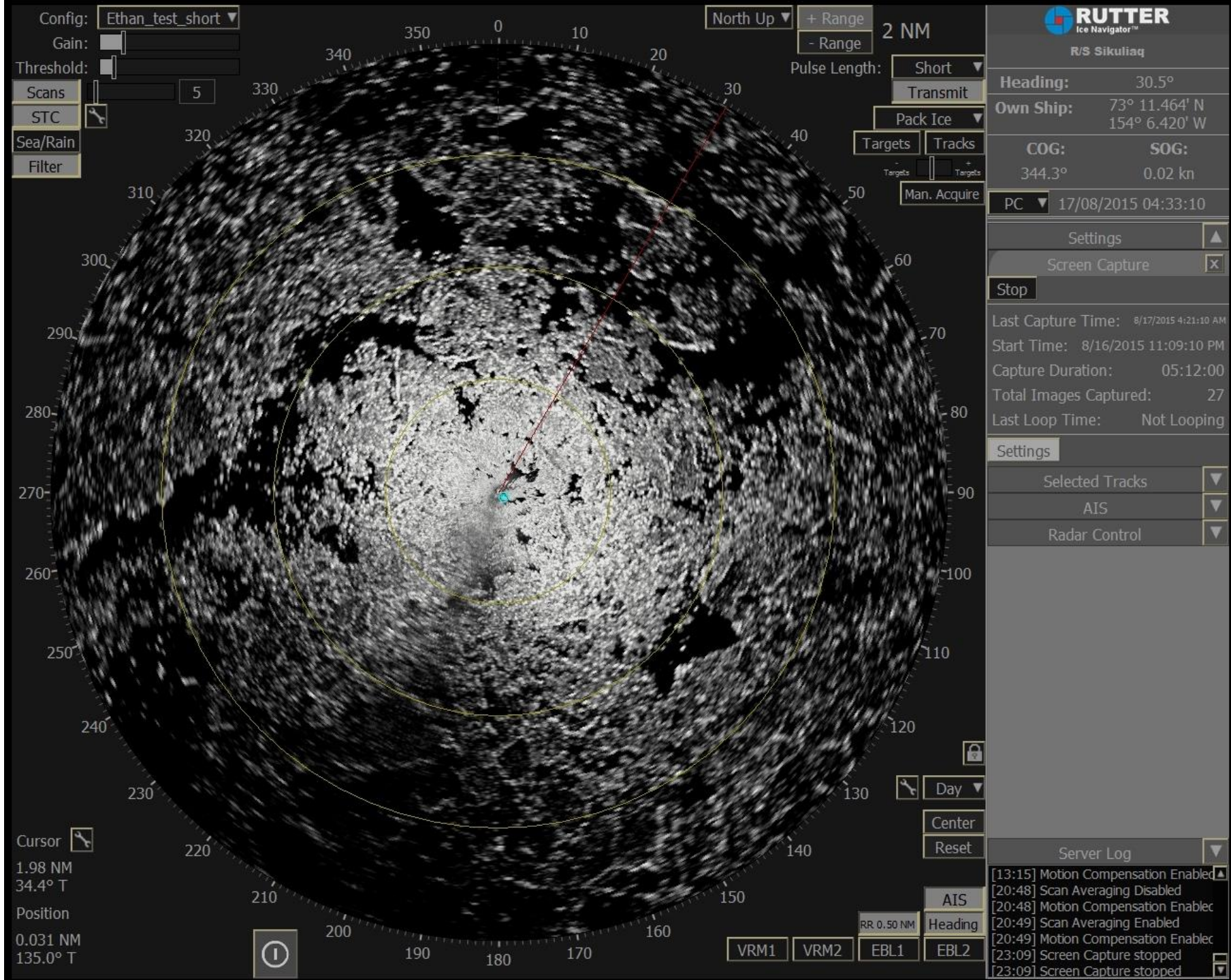
Björn Lund (blund@cstars.miami.edu)

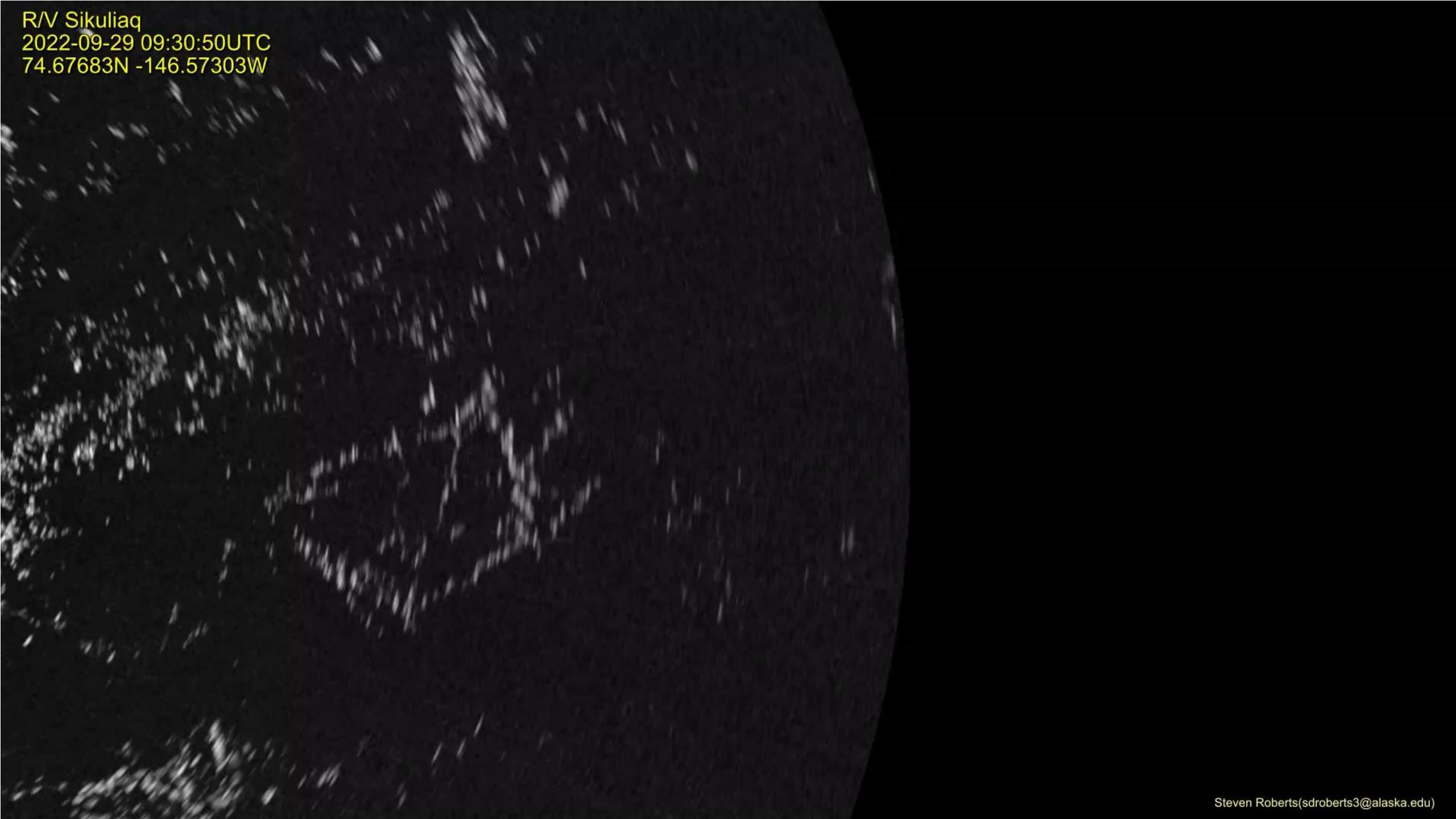
Remote Sensing for Situational Awareness & Operational Decision Making



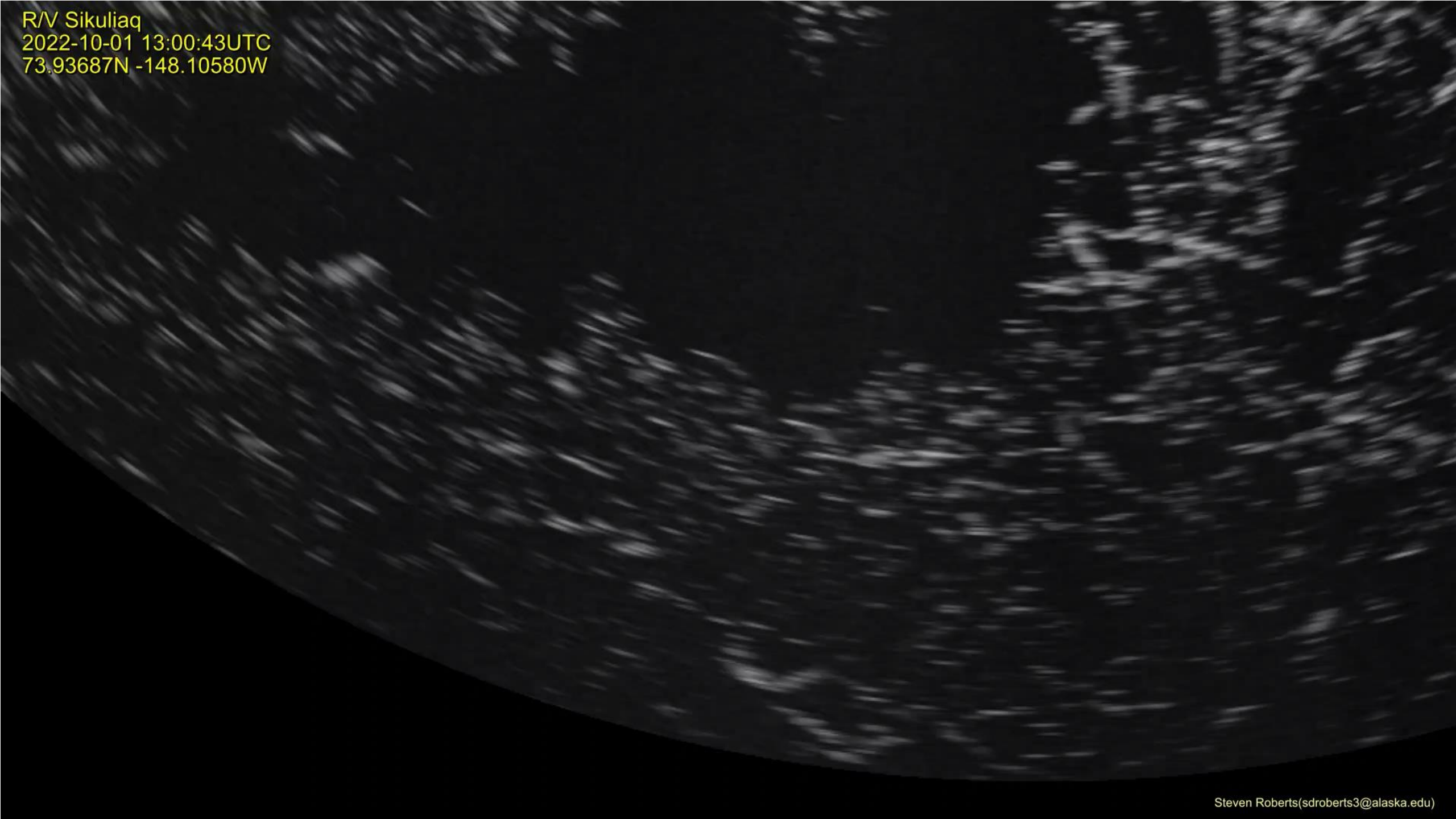
Rutter's ***sigma* S6** systems integrate with marine x-band radar to enhance situational awareness in maritime situations.

Ice Navigator™ Detection and Navigation System – identify open water leads, ice bergs and ridges in ice fields. Sea Ice Drift Analysis is now an optional feature.





Steven Roberts(sdroberts3@alaska.edu)


R/V Sikuliaq
2022-10-01 13:00:43UTC
73.93687N -148.10580W
Steven Roberts(sdroberts3@alaska.edu)

Operational support for wave & ice radars

UNIVERSITY OF MIAMI
ROSENSTIEL SCHOOL of MARINE, ATMOSPHERIC & EARTH SCIENCE

UNIVERSITY OF MIAMI
CSTARS
CENTER FOR SOUTHEASTERN TROPICAL ADVANCED REMOTE SENSING

- Provide vessels with radar processing & storage servers and software.
- Calibrate radars' heading/range/time biases and significant wave height.
- CSTARS radar processing system collects radar raw & ancillary data to produce:
  - Sea surface (and sea ice) mean roughness images,
  - Near-surface current maps,
  - Wave measurements,
  - Sea ice drift maps, …
- Improve products' visibility through web viewer on ship network.
- Remotely monitor radar operations with error notification and status emails.

NSF

Office of Naval Research
USN ONR
Science & Technology

System requirements & best practices

- Interface processing server directly with radar acquisition server.
- Store data onboard with pairs of Synology NAS servers (~96 TB capacity per unit).
- Record GPS and accurate heading data at high temporal resolution (>1 Hz) via serial feed.
- Enable regular radar calibrations by recording radar raw data while departing from and returning to port.
- Synchronize the radar acquisition server with the ship’s time server.
- Include in the cruise distros & archive to the R2R catalog

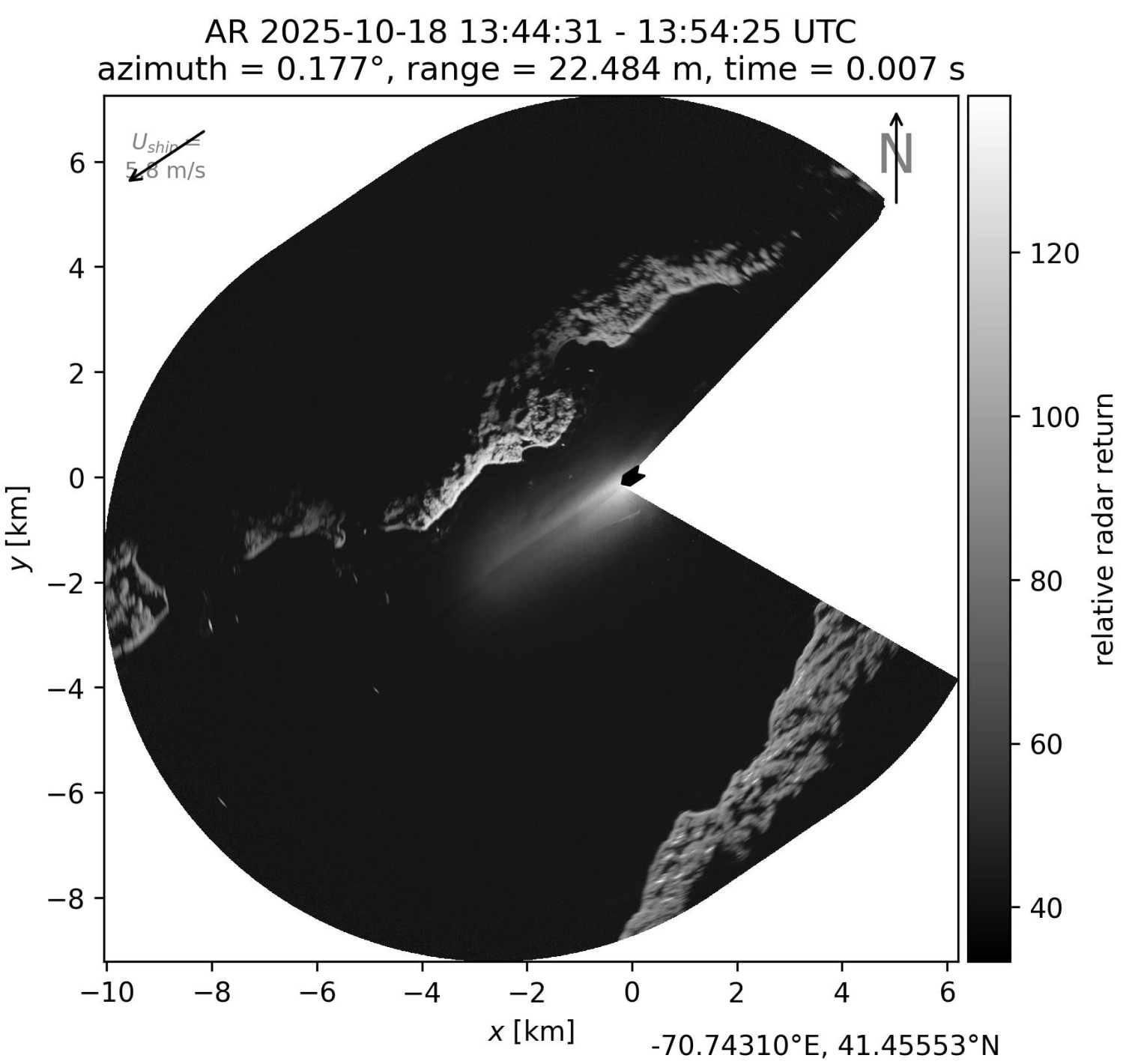
Radar calibration

Finds the radar azimuth, range, and time offsets that maximize the image sharpness.

Requires fixed targets observed from a moving vessel.

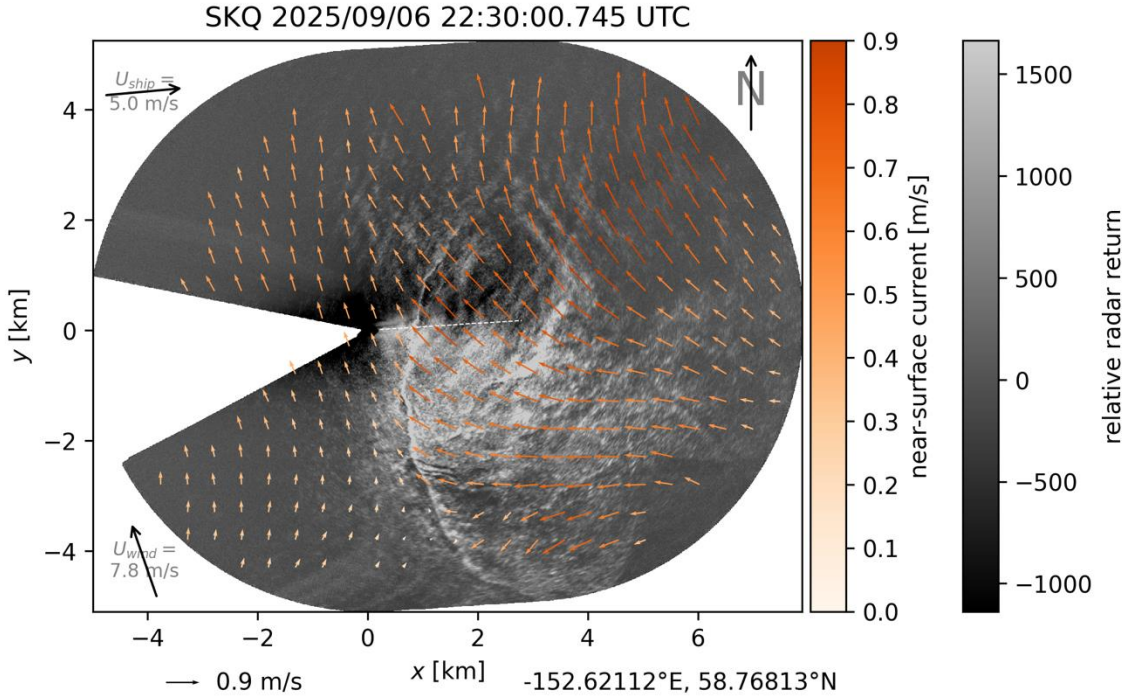
Calibrations are repeatable within 0.1° and 0.1 s.

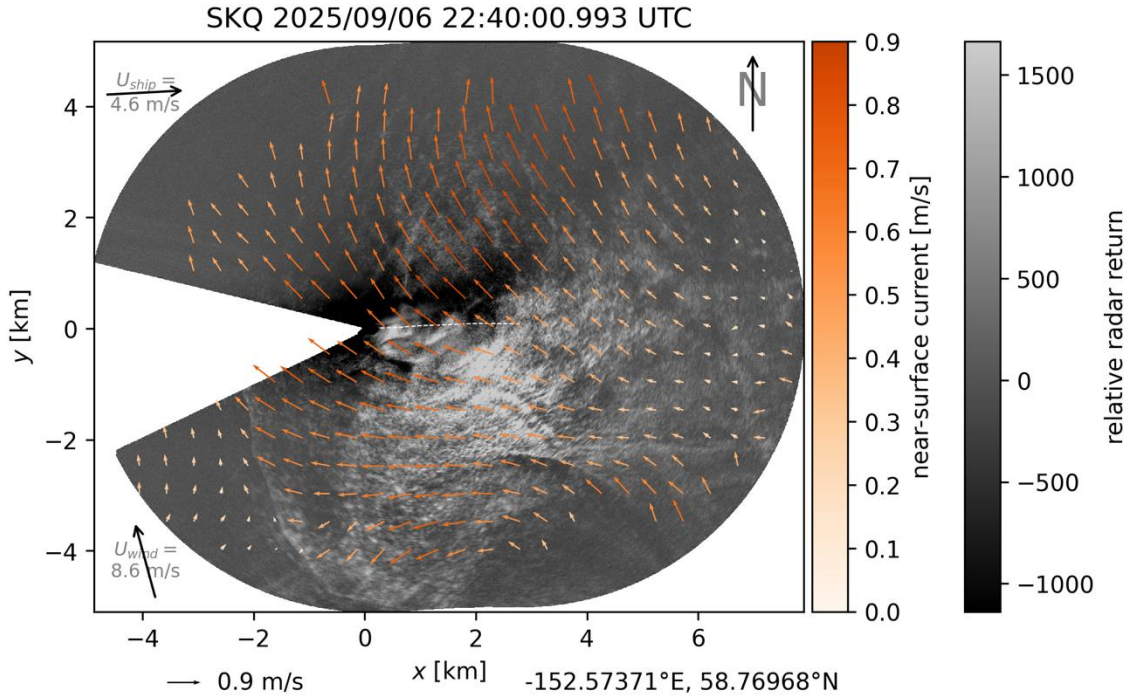
Following McCann & Bell (2018).

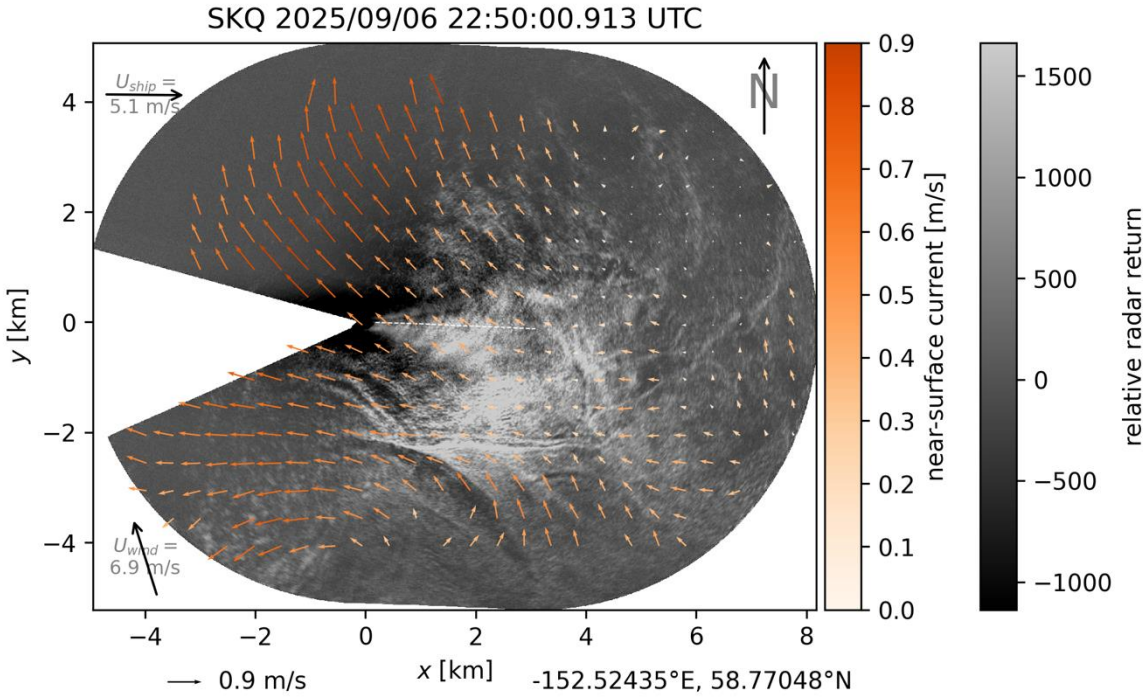


Near-surface current maps & radar image mosaics

Time series of radar near-surface current maps from R/V Sikuliaq (6 Sep 2025) over radar image mosaics with ship tracks as white dashed lines

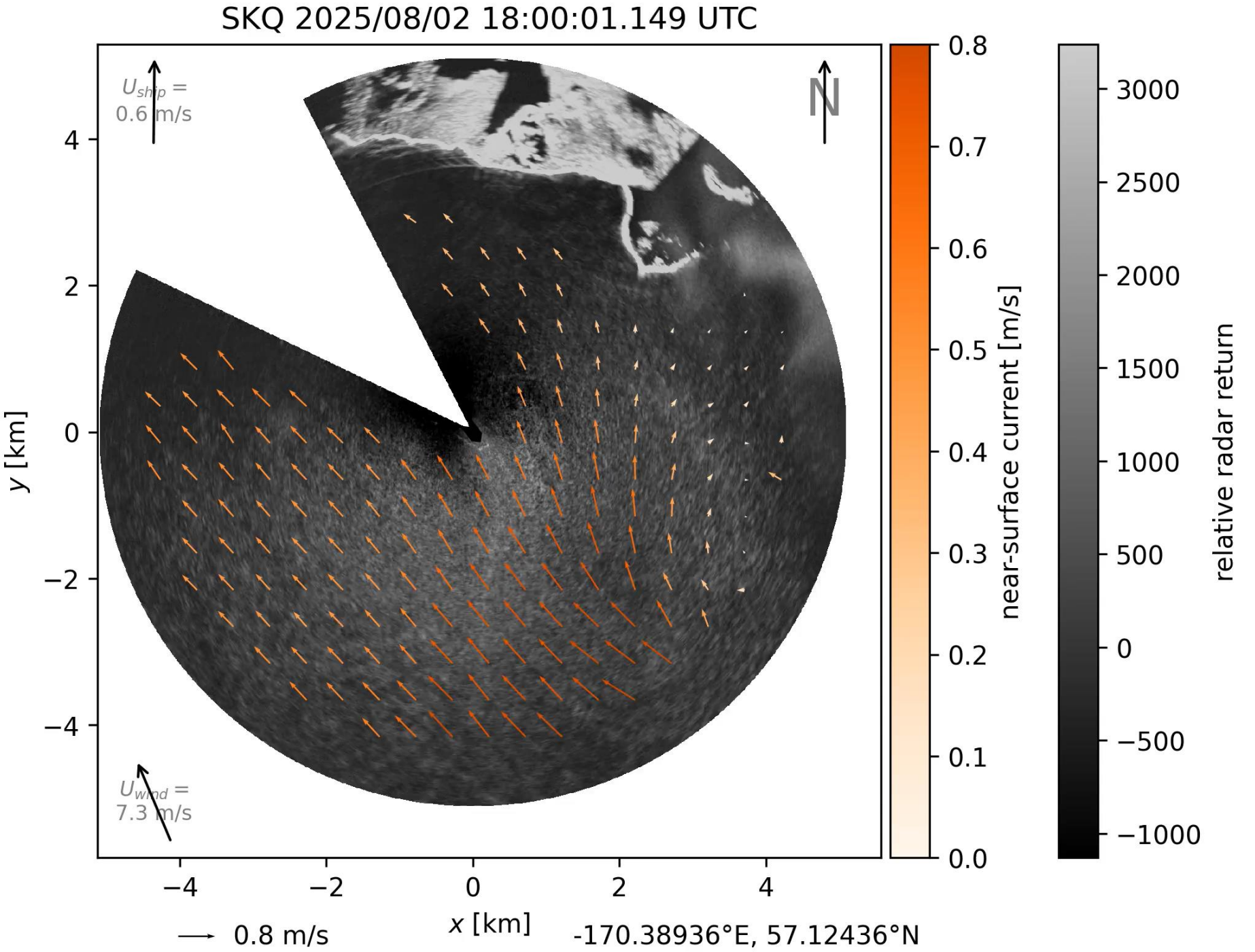






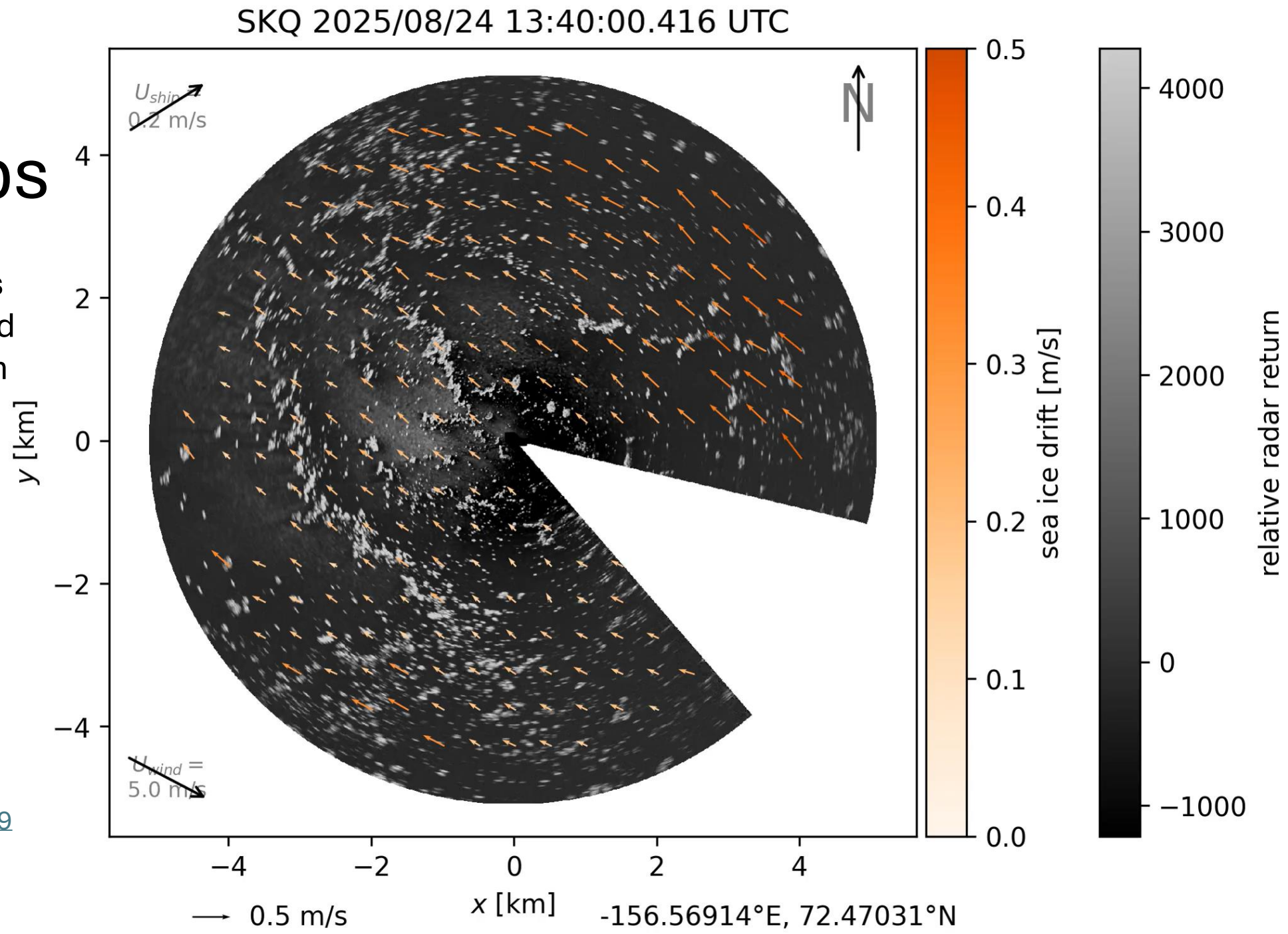
Near-surface current maps

Near-surface current maps from R/V Sikuliaq (2 August 2025) over 30-s averaged radar images with current fronts and small-scale eddy



Sea ice drift maps

Sea ice drift maps over 30-s averaged radar images from R/V Sikuliaq (24 August 2025)



See Lund et al. (2018) for details on the method and a buoy-based validation: https://doi.org/10.1029/2018JC013769

Control Panel

CSTARS MR Viewer

Controls

Dark Mode: Automatic

Orientation: North Up

Live Tracking

Speed in Knots

Update Rate: 30 sec

Vector Range (m/s): 0 0.5

Data **Map History**

Vessel Info: 10 hr

Sea Roughness:

Current/Sea Ice Vectors:

Data **Graphs History**

Current: 20 min

Sea Ice Drift: 20 min

Waves: 20 min

Info

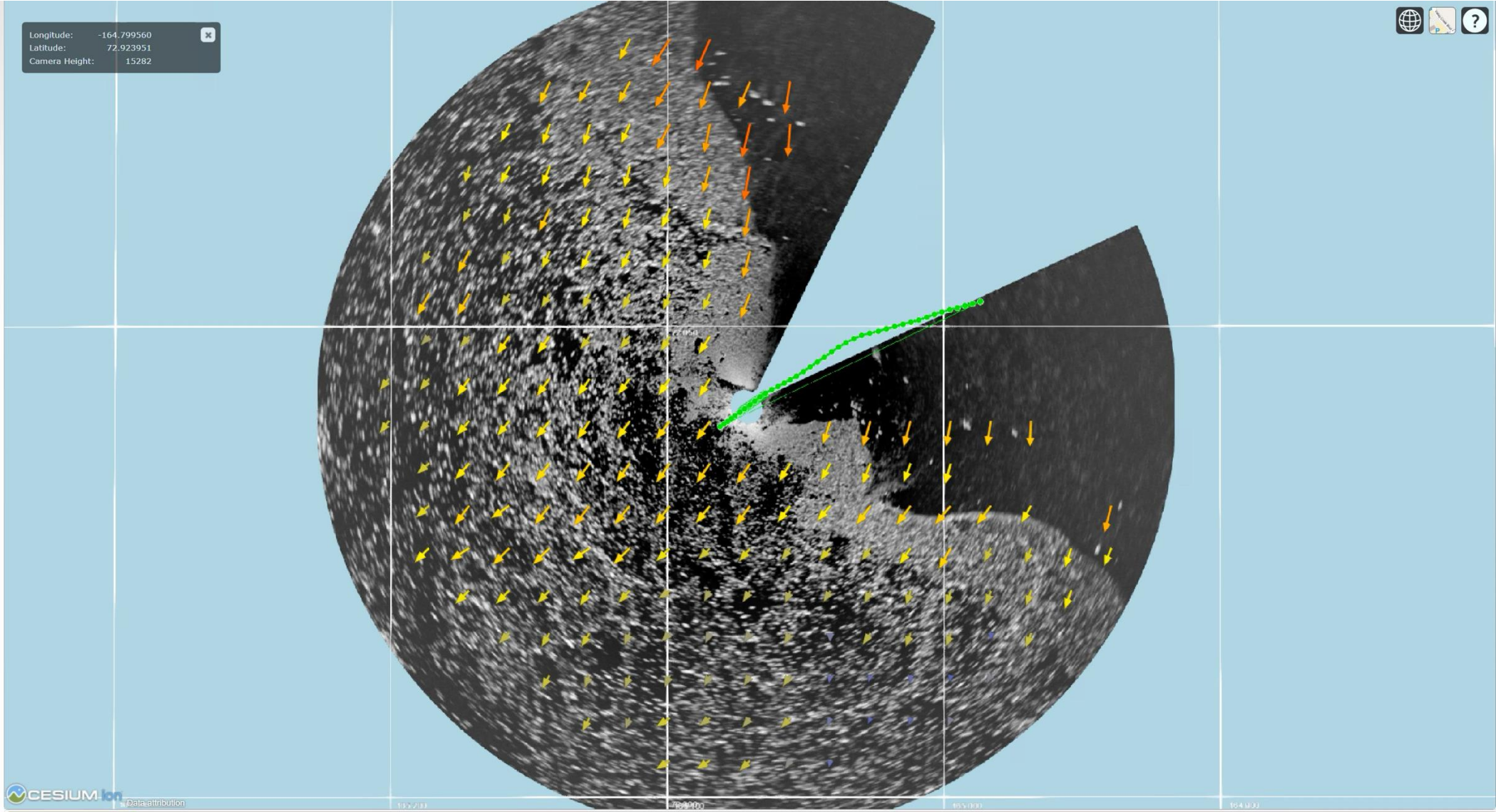
Last Update: 2024-09-05 21:06:01
Location: -165.070170, 72.942205
Bearing: 235.00 degrees
Current: -
Sea Ice Drift: 0.22 m/s, 210.00 degrees
Peak Waves: -

Plots

Select data to plot | Pop-out

MarineRadarViewer 2.1.0

Longitude: -164.799560
Latitude: 72.923951
Camera Height: 15282



Sea Ice Drift Graphs