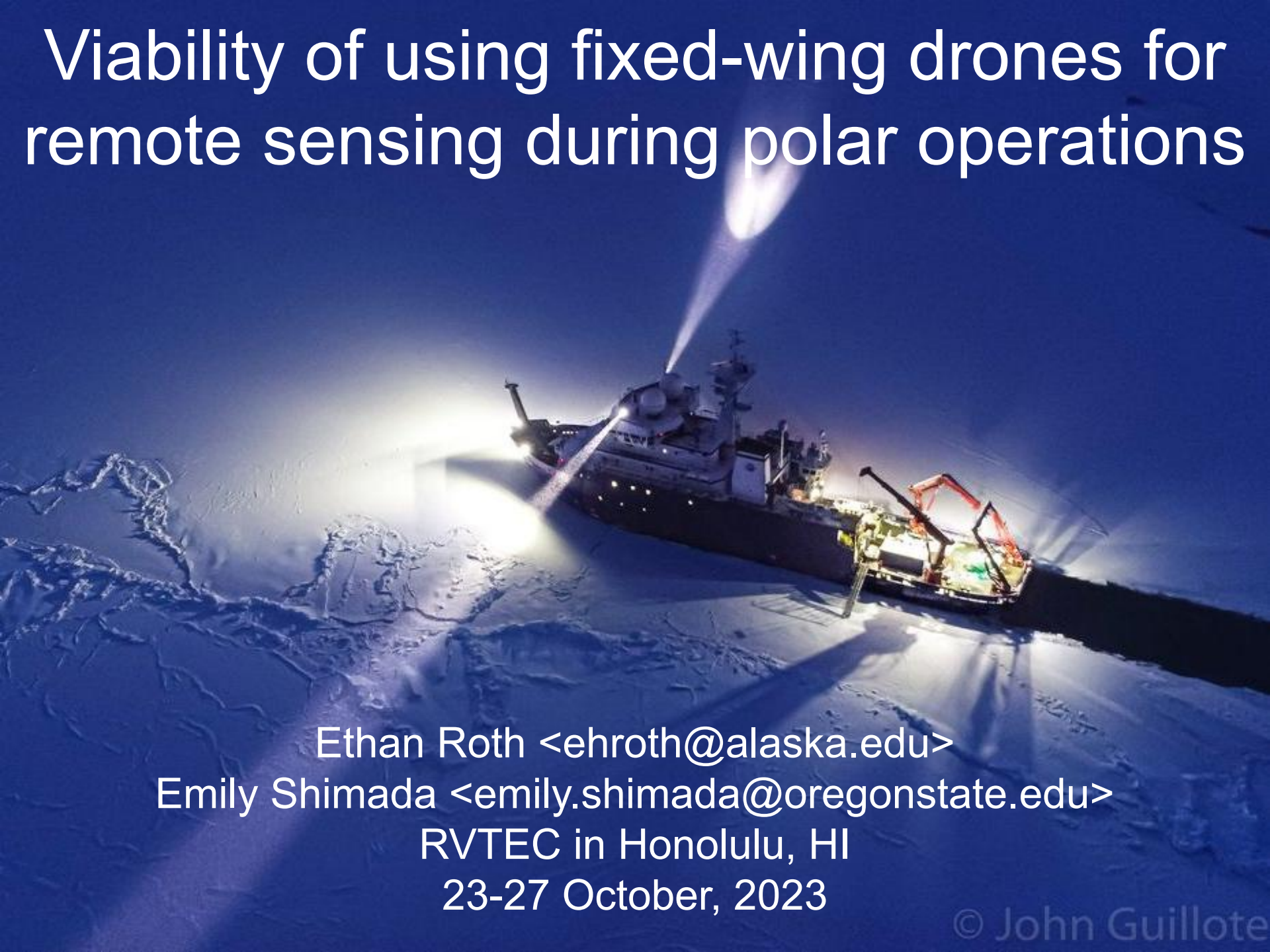
Viability of using fixed-wing drones for remote sensing during polar operations



Ethan Roth <ehroth@alaska.edu>
Emily Shimada <emily.shimada@oregonstate.edu>

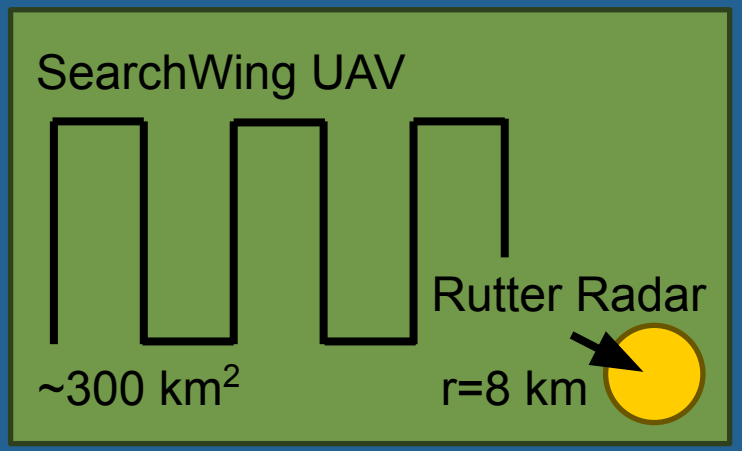
RVTEC in Honolulu, HI
23-27 October, 2023

Remote Sensing

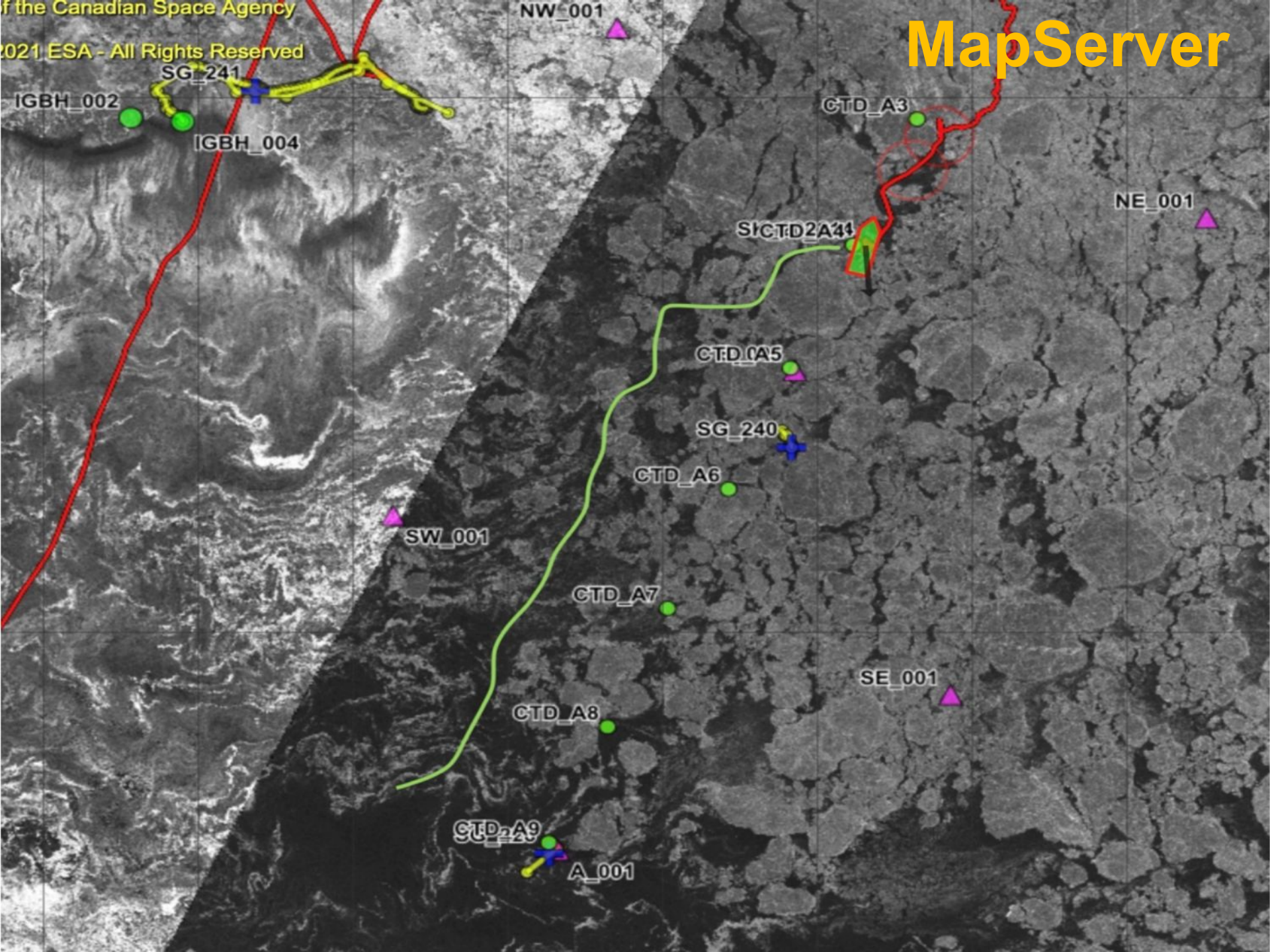
Situational Awareness & Operational Decision Making

SAR & GINA satellite products

~30,000 km^2



Daily □ □ □ □ **Hourly** □ □**Continuous**


f the Canadian Space Agency
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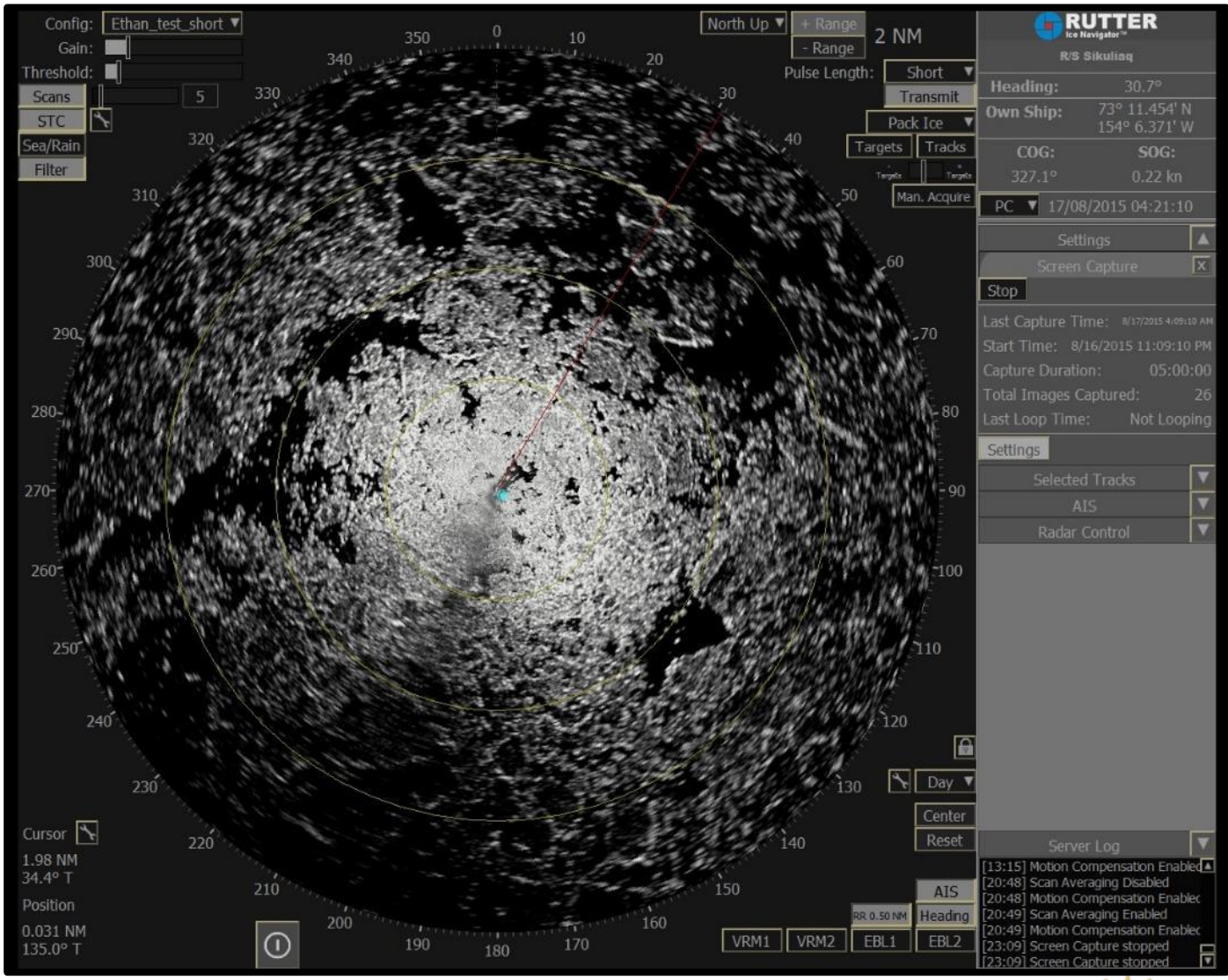
MapServer
NW_001
SG_241
IGBH_002
IGBH_004
CTD_A3
NE_001
SI CTD2A44
CTD_A5
SG_240
CTD_A6
SW_001
CTD_A7
SE_001
CTD_A8
CTD_A9
A_001

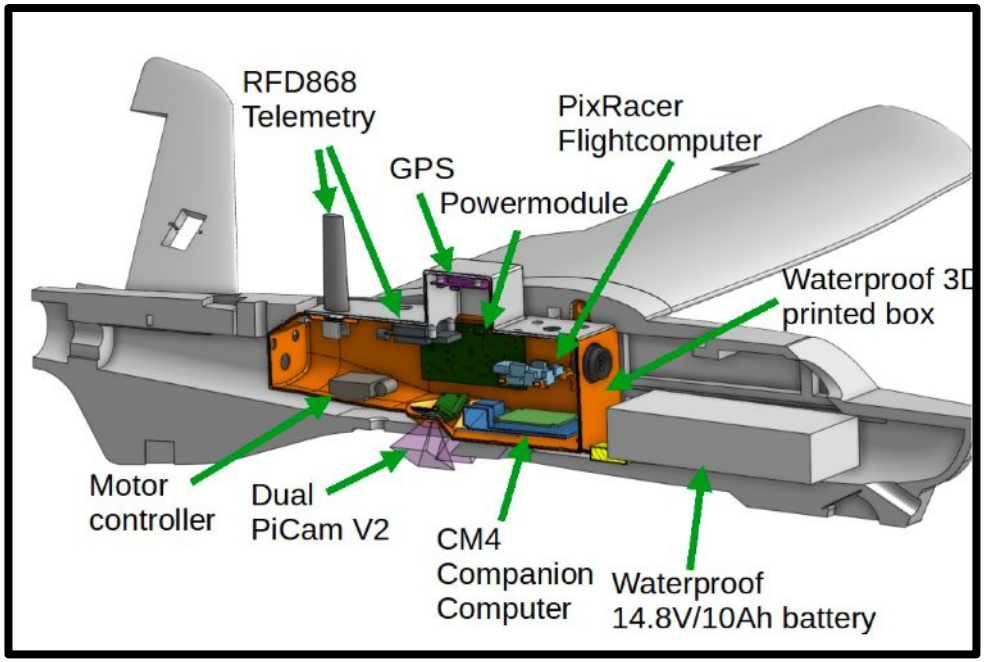
Rutter X-band Radar

Ice Navigator and Wave Monitoring System (WaMoS)

- GeoTIFF output
- Wave spectra
- MapServer overlay
- Surface Currents & Sea Ice Drift Maps (U of Miami CSTARS)



SearchWing UAV



- Range: 80 - 120 km
- Flight time: 1 - 1.5 hours
- Max. area covered: 160 - 240 km^2
- Image resolution: ~ 20 cm / pixel at 550 meters altitude

- IP67 (waterproof)
- Telemetry range: 25 km
- Wind resistance: 20-25 knots

Sensors:

- Visible light cameras
- GPS
- Barometer
- IMU / Gyrometer
- Internal humidity

COLLEGE OF FISHERIES AND OCEAN SCIENCES
University of Alaska Fairbanks

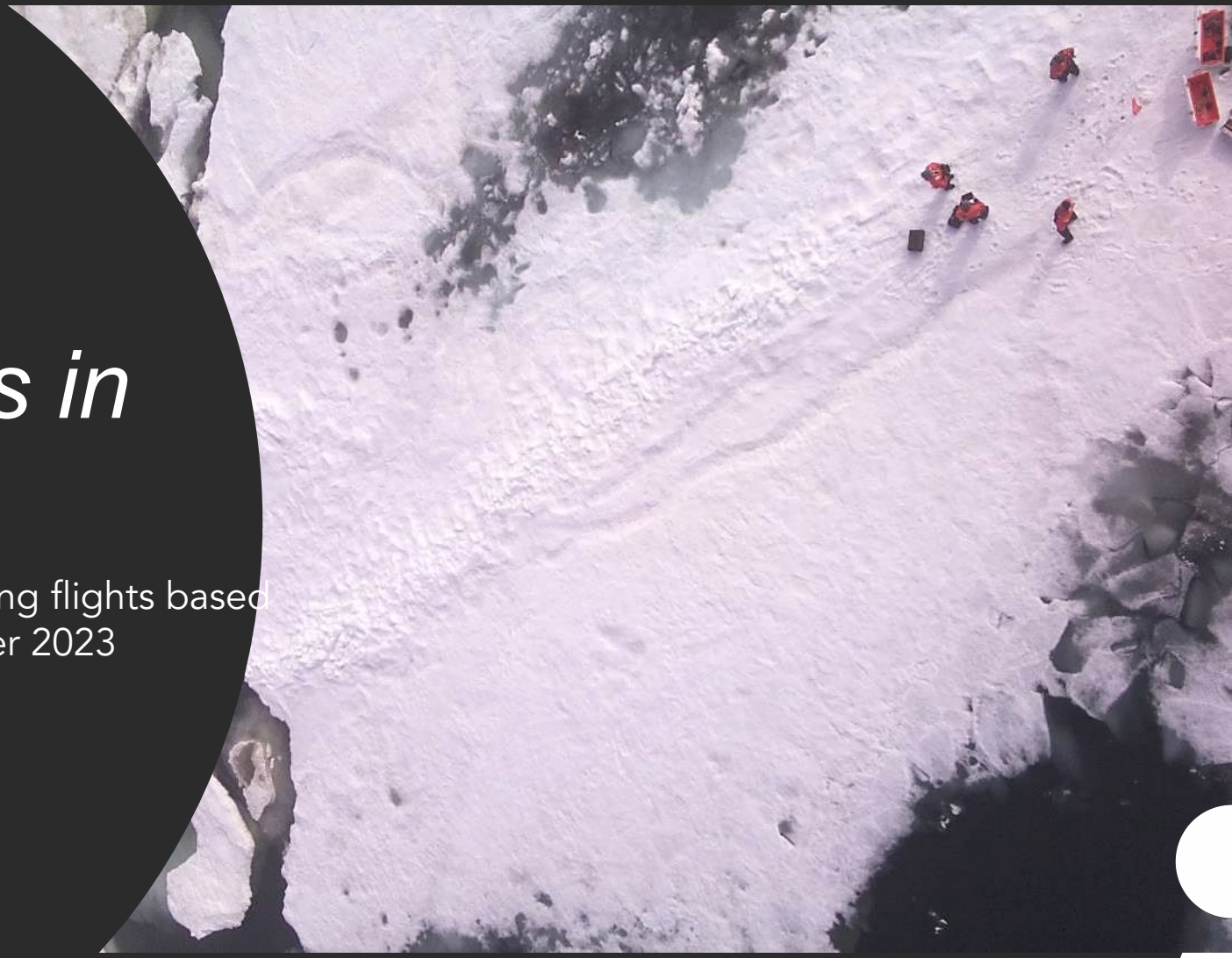
What's needed to operate

- Drone vehicle with sensor payload
- Spare drone + parts & trainer drones
- Remote controllers
- Batteries (lithium) & containment
- Part107-certified pilots
- Training for pilots
- RF antenna & ground station for telemetry
- Tablet for mission planning & programming
- PC for data download & processing
- Ceilometer for determining survey altitude

Drone operations in the ice

Considerations for planning flights based on experiences in Summer 2023

Emily Shimada
OSU Marine Technician



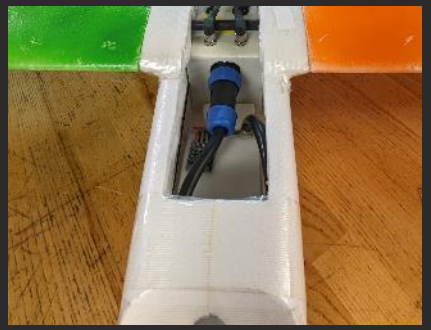
The Setup

Mounting the antenna and ground station

Network and telemetry checks

Pre-flight checks

Battery life limitations



The Conditions

Ice station vs. open water

Movine ice floes

Visibility

Temperature and wind chill

The Operators

Need trained pilots, drone launchers, and observers

Finding flight times

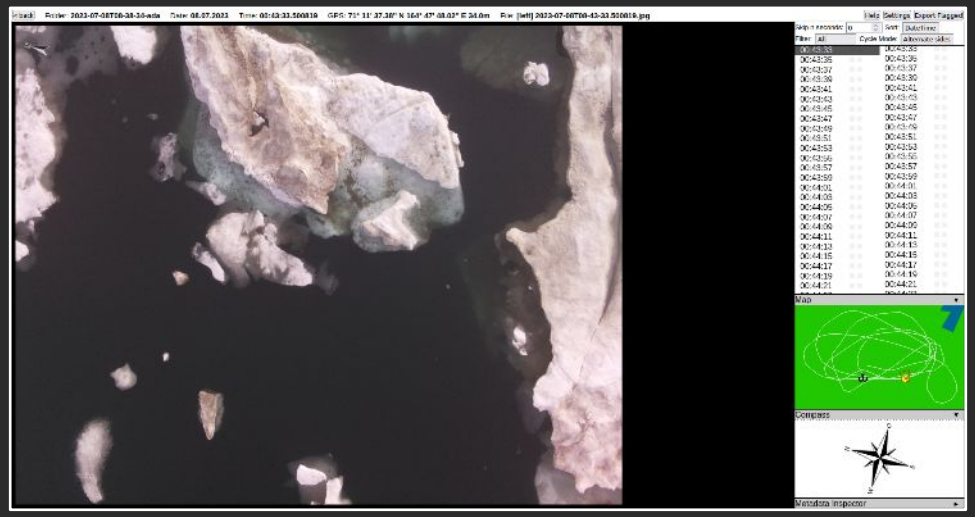
Consider recovery crew operations

The Data

Post-flight downloads

Image processing and geolocation

Using data for navigation and ops



Alaska Center for UAS Integration (ACUASI)

3 ingredients for successful ops in the future –

- Dedicated professional drone pilot
- Hybrid fixed-wing/VTOL design
- Synthetic Aperture Radar