

Open Ocean Robotics

Oliver S. Kirsebom

P-ONE General Meeting 2025
Interdisciplinary Science
2025.06.24

Outline

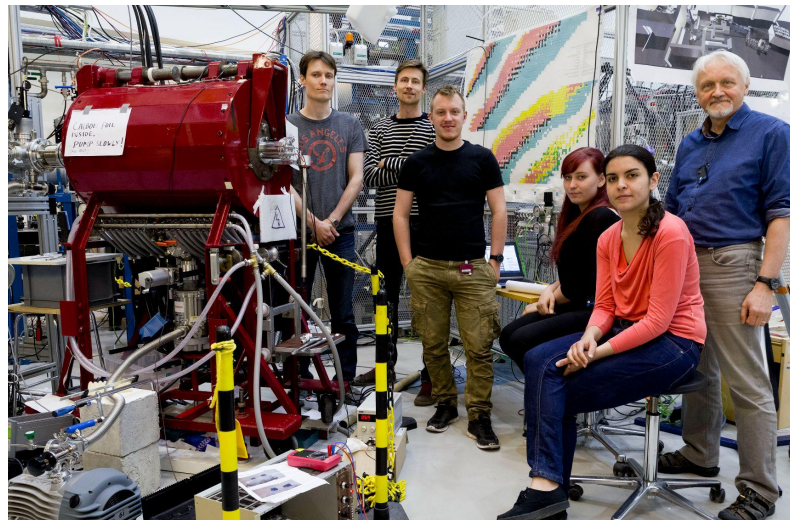
1. Nuclear astrophysics
2. Underwater acoustics & artificial intelligence
3. Uncrewed surface vehicles

Nuclear astrophysics (2010 - 2018)

Postdoc @ TRIUMF 2010-2013



Assistant Prof. @ Aarhus University 2013-2018



Kirsebom *et al.* PRL **123**, 262701 (2019)

"Discovery of an Exceptionally Strong beta-decay Transition of ^{20}F and Implications for the Fate of Intermediate-Mass Stars"

Kirsebom *et al.* PRL **121**, 142701 (2018)

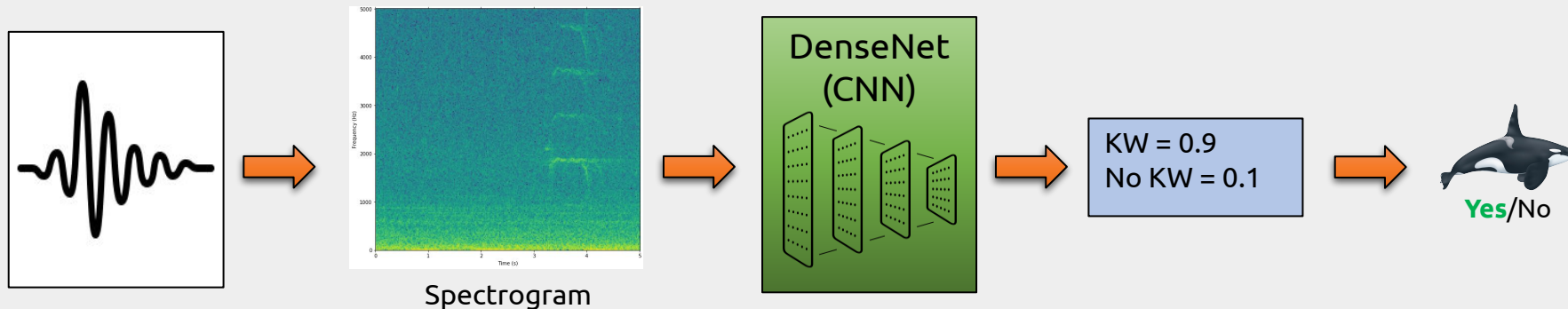
"First Accurate Normalization of the beta-delayed alpha decay of ^{16}N and Implications for the $^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$ Astrophysical Reaction Rate"

Kirsebom *et al.* PRC **83**, 065802 (2011)

"Precise and accurate determination of the ^8B decay spectrum"

And more ... <https://oliskir.github.io/>

Underwater acoustics & AI (2018 - 2022)



Kirsebom *et al.*

Performance of a Deep Neural Network at Detecting North Atlantic Right Whale Upcalls

The Journal of the Acoustical Society of America 147, 2636 (2020)

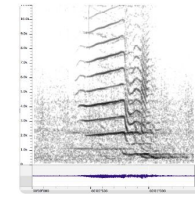
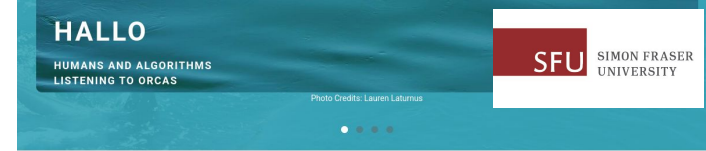


<https://docs.meridian.cs.dal.ca/ketos/>

Uncrewed surface vehicles



Senior data scientist at Open Ocean Robotics
(2022 - present)

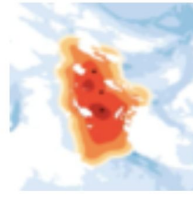


CALL CATALOGUE



BIOACOUSTICS WORKSHOP

We hosted a Bioacoustics Workshop in August of 2022. Topics discussed range from whale sightings and conservation to the application of deep learning models to identify whale calls.



FORECAST MODELS

Adjunct Professor
School of Environmental Science, SFU



Council member
Ocean Networks Canada



About OOR

Team	25 people
Fleet Size	12 DataXplorers
Operational	4,700+ hours on 3 oceans
Impact	2,400 tonnes GHG emissions avoided
IP	Granted patent, trade secrets
Space	Victoria, BC (12,000 sq ft), Halifax subsidiary

<https://www.openoceanrobotics.com/>

DataXplorer™ Models



Maritime Domain Awareness

Core sensors:

- Weather conditions
- Ocean surface currents
- Wave height
- Water depth
- Water temperature
- 360-degree camera
- LWIR camera
- AIS transceiver

- 360-degree thermal cameras
- Radar
- Radio direction finder
- Passive acoustic array

Applications:

- ISR
- IUU fishing enforcement
- Border security

Meteorology & Oceanography

- Multibeam
- Sidescan sonar
- Echosounder
- Passive acoustic array
- eDNA sampler

Applications:

- Seafloor mapping
- Marine mammal monitoring
- Environmental monitoring

DataXplorer Technical Specifications

Length	3.6 meters (11.8 ft.)
Beam	0.9 meters (2.9 ft.)
Draft	0.5 meters (1.5 ft.)
Height (abv WL)	1.3 meters (4.3 ft.)
Dry weight*	132 kg (291 lbs)
Payload weight	65 kg (144 lbs)
Hull material	Fiberglass composite
Communications	Satellite, cellular, radio
Solar power	300 watts
Batteries	10.5 kWh (*dry weight above), 17.5 kWh opt.
Sensor spaces	Under- & in-hull, in air
Propulsion	Electric motor-pod
Speed through water	6 kts max., 2 kts cruise
Mission duration	>1 month, depending on solar input
Sea state & wind	Up to force 10 storm conditions
Deployment	Ramp, beach, ship

Science applications - examples



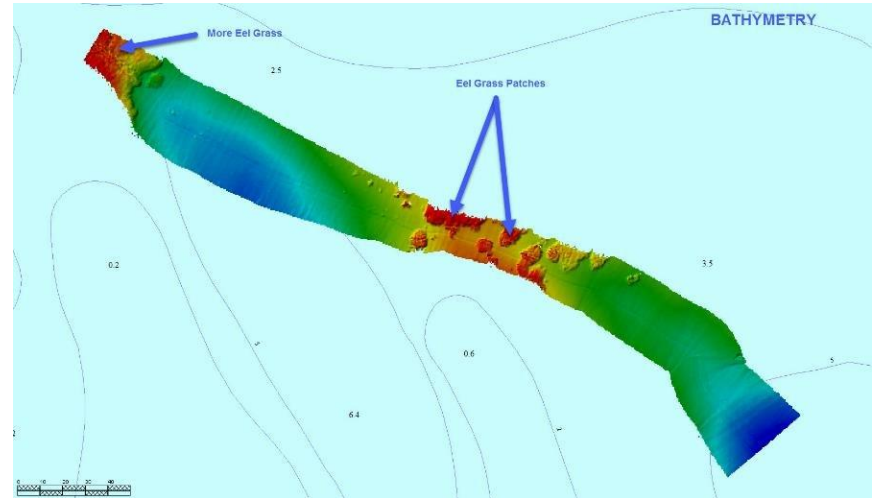
1. eDNA collection in shallow-water bay



3. Ocean alkalinity enhancement studies



2. Marine mammal monitoring with towed, passive acoustic array



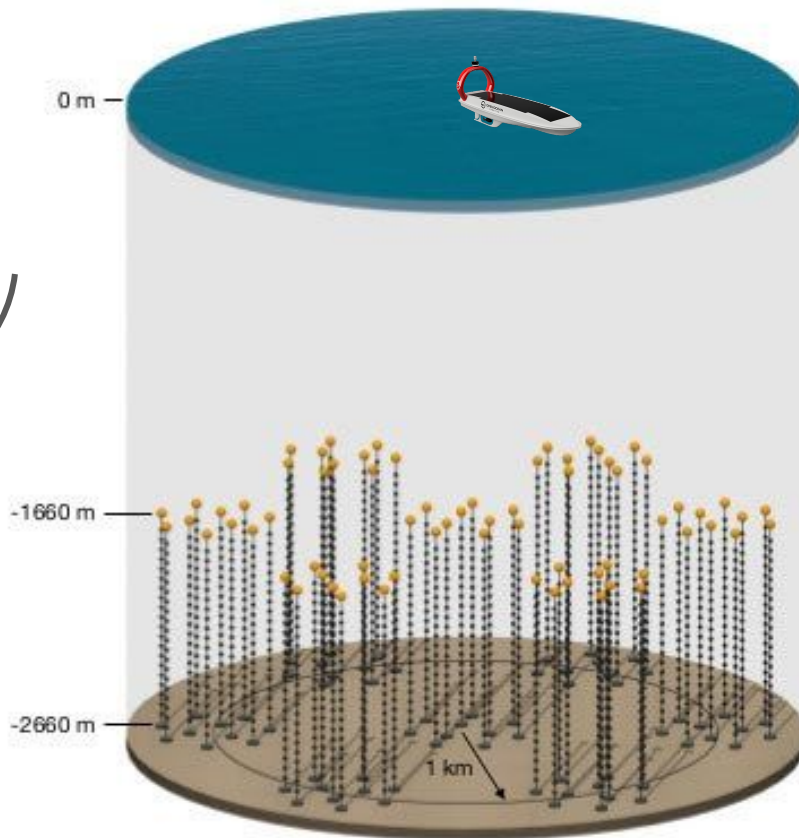
4. Seagrass and habitat mapping

Connections to P-ONE

Noise from surface waves and rain ...

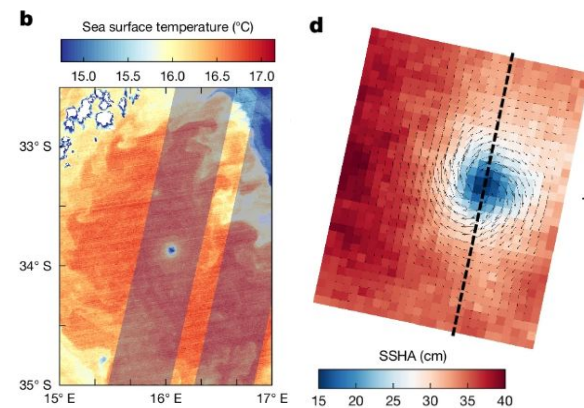


Effects of ship noise on deep-sea biology ?



Tomography of sub-mesoscale eddies ?

[Archer *et al.*, Nature **640**, 691–696 \(2025\)](#)



Other ideas ?

Thank you