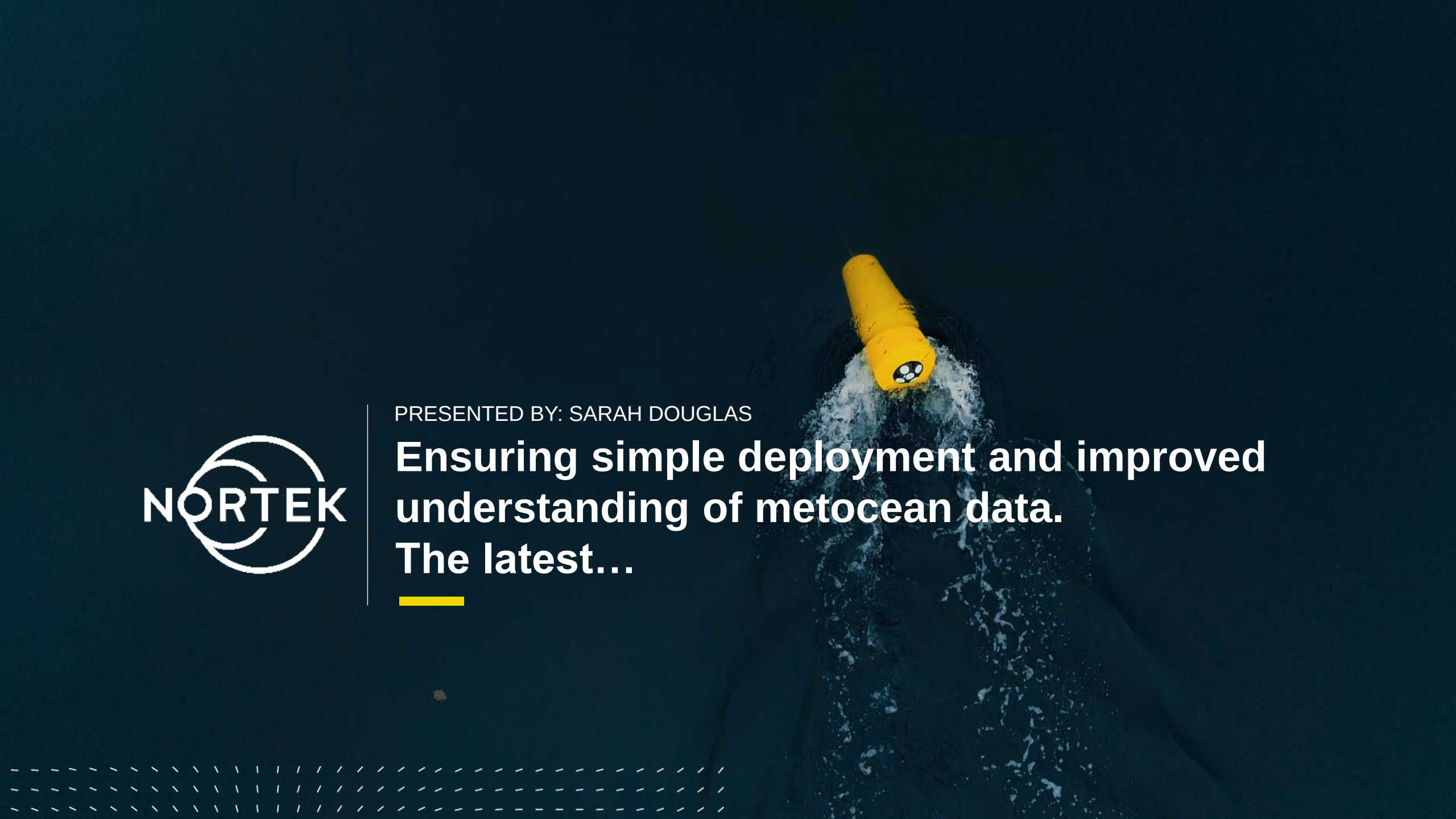


PRESENTED BY: SARAH DOUGLAS

Ensuring simple deployment and improved understanding of metocean data. The latest…

About Nortek

Nortek designs, develops and produces acoustic underwater sensors that are used to measure motion in our marine environment.

Our ocean technology is used in many applications, from understanding climate change impacts to providing navigation assistance for underwater vehicles.


NORTEK

Our Purpose

Supporting safe and sustainable use of essential coastal and ocean resources so future generations can learn from, and be inspired by, our marine environment.

Our Customers

Engineers

use our sensors to conduct offshore operations including construction, maintenance, and surveying

Robotics developers

use our sensors to provide new solutions that aim to increase safety and efficiency of these operations

Scientists

use our sensors to learn more about our marine environment and discover the unexplored depths of our oceans

Global Presence

KEY FIGURES

2200+
Instruments delivered in 2023

160+
Employees worldwide

550M NOK+
Turnover 2023

ISO 9001& 14001
Certified

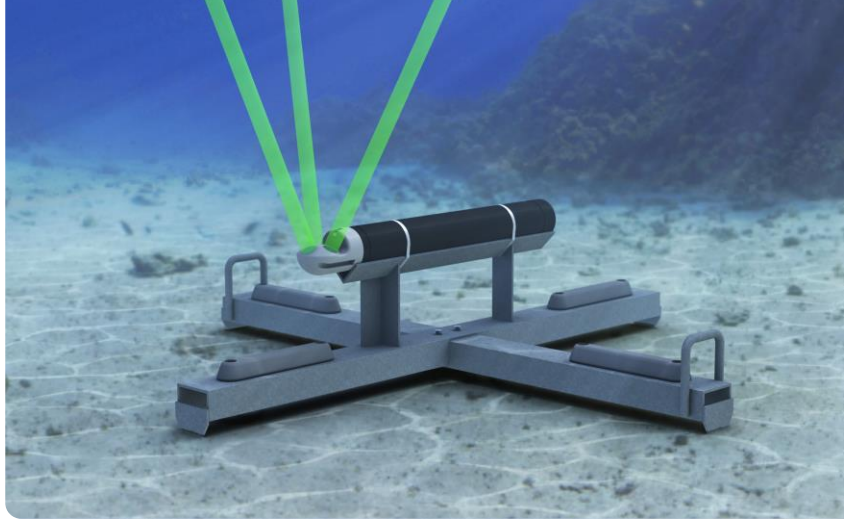
Aquadopp and AWAC: Nortek's Foundation

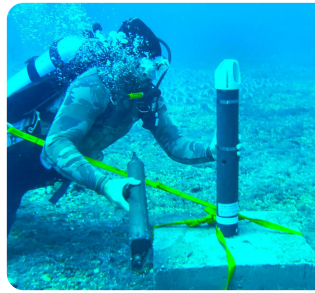
1998

Google

Aquadopp

- Our Aquadopps and Aquadopp Profilers are **robust and versatile current meters and profilers**. They are designed for simple and reliable deployment and data collection.
- Used in both **commercial operational** and **long-term scientific** applications to collect **current data** and **basic PUV wave data.**
- Aquadopp Profilers are available in 3 profiling ranges **(up to 90m).**
- Aquadopps are available for **500m and 6000m** depth ranges.



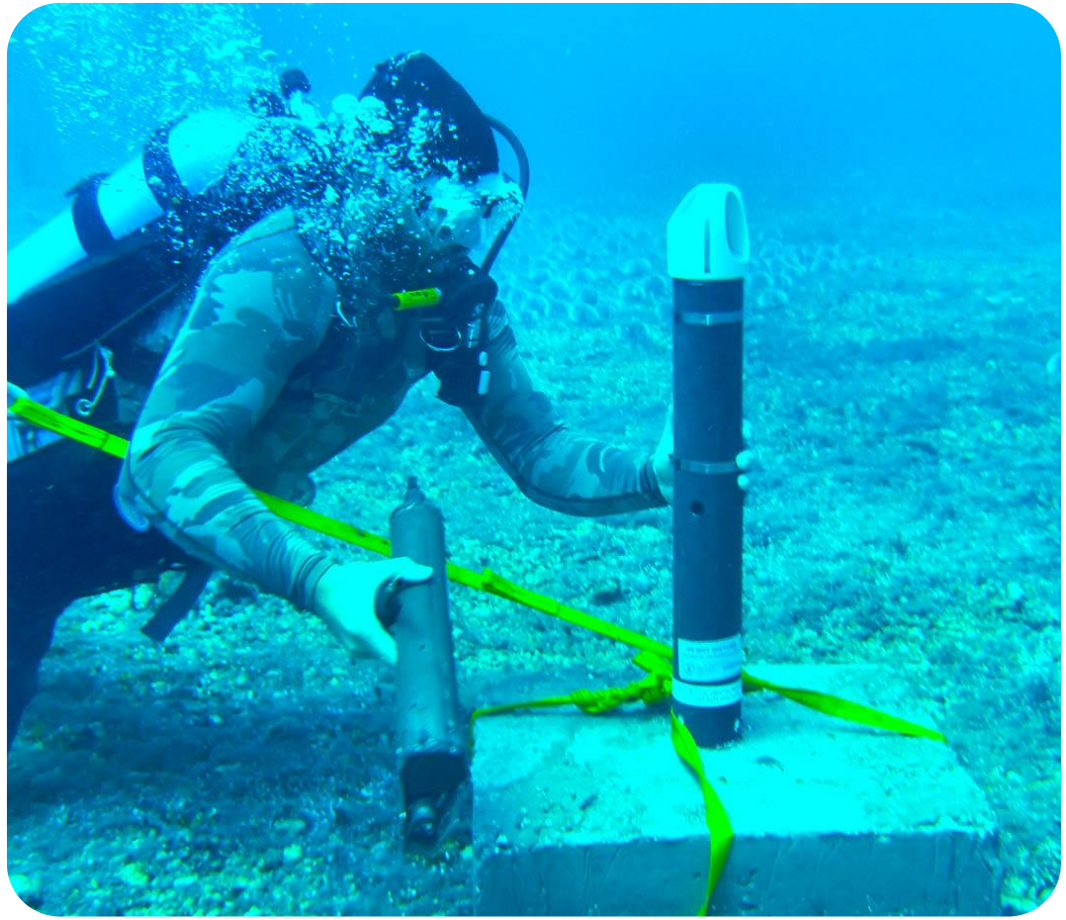


Aquadopp: Design changes

- Sleek new instrument design makes it easier to replace batteries without requiring any additional tools or screws.
- “Shallow water” versions of all Aquadopps are now rated to 500m.
- Blinking LED confirms instrument is functioning correctly before deploying.
- Innovative “battery cradle” design allows recharging of batteries without removal from the cradle.
- Modern, smaller electronics allow for more room for batteries in the instrument housing enabling longer deployments.

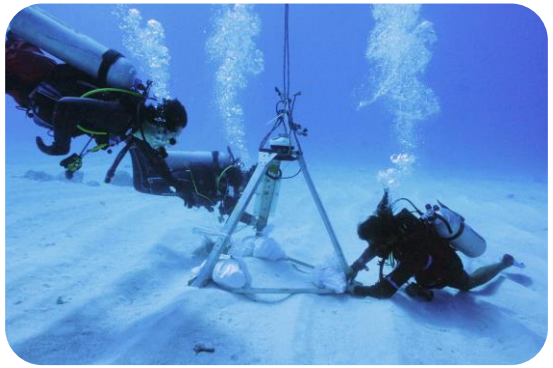
Aquadopp: Performance improvements

- Increased resistance to external electrical noise, improving signal-to-noise ratio for online applications.
- Improved single-ping precision through adjustable velocity range to better match your deployment conditions.
- New hibernation mode saves battery power through enabling true average intervals (e.g., a 10-minute average interval, with continuous pinging every second).
- New modern software with a user-friendly graphical interface for instrument configuration.



AWAC

- AWACs are renowned for their excellent **wave measurement capabilities,** particularly in **real-time applications.**
- A dedicated vertical beam performs Acoustic Surface Tracking (AST), resulting in **highly accurate long-range wave data**.
- Used in both **commercial operational** and **scientific** applications
- Either **mounted in fixed seabed frames or subsurface buoys** thanks to Nortek's unique SUV wave processing method.
- AWACs are available in 3 profiling ranges **(up to 100m).**



AWAC: New Features

- Concurrent measurement of waves and current profile
- Blinking LED confirms instrument is functioning correctly before deploying
- Continuous average and wave measurements
- Improved single-ping precision:
  - Adjustable velocity range to better match your deployment conditions
  - Reduced spread in the wave estimated
  - Lower power consumption
- Ethernet and serial port by default
- Double opening housing for easier assembly and service
- Change on the pressure sensor location
- New modern configuration software with a user-friendly graphical interface for instrument configuration

NORTEK

Why make a new generation?

- Technology including electronic components have improved greatly since the launch of these instruments
- Our own capability in ADCP technology has improved and we want to maximize instrument data quality
- Years of test deployments & customer feedback on challenges with deployment and instrument maintenance
- These instruments have been in your toolkit for 20+ years, we want to secure their position as useful, reliable current profilers for years to come

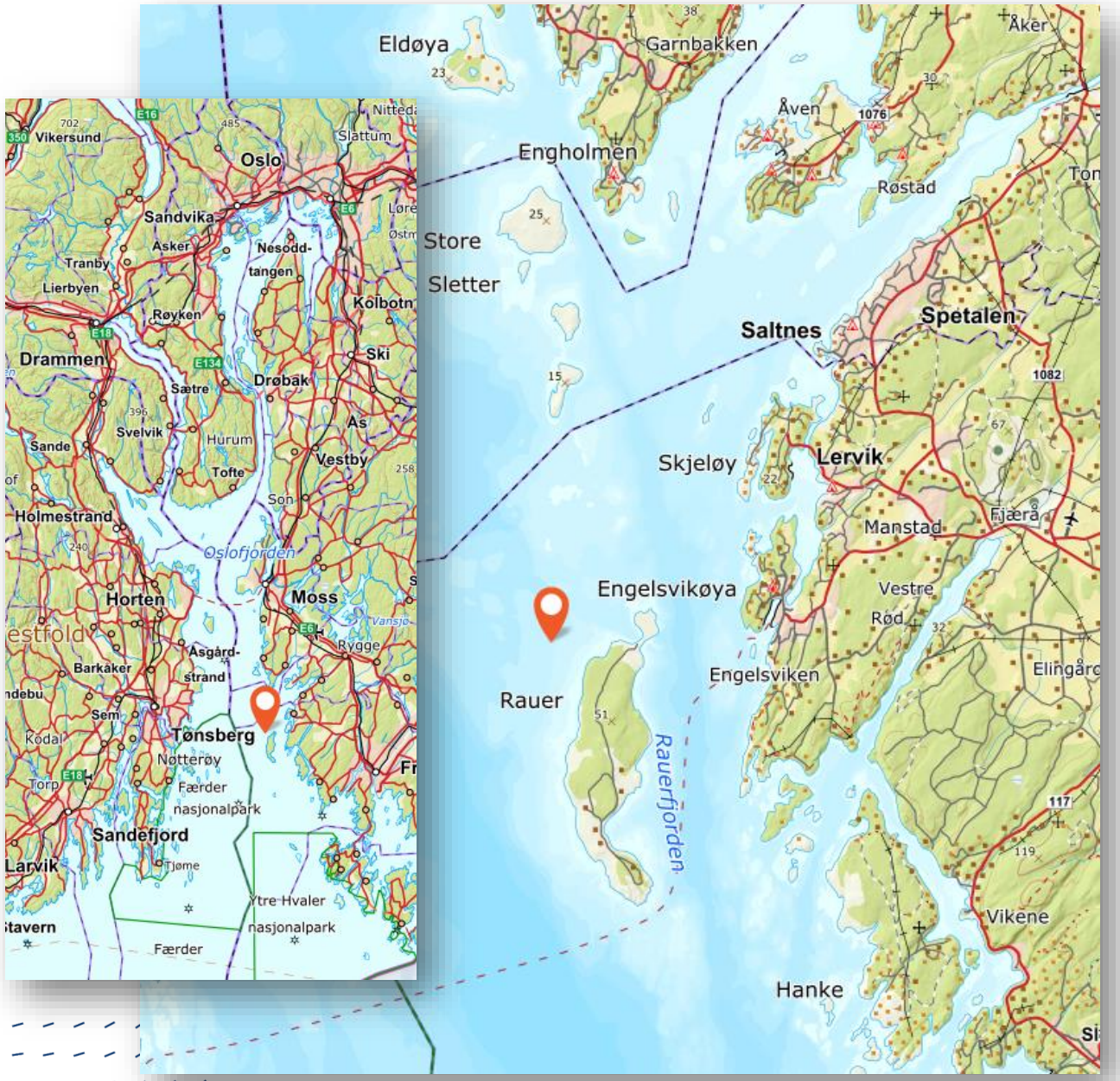
Testing

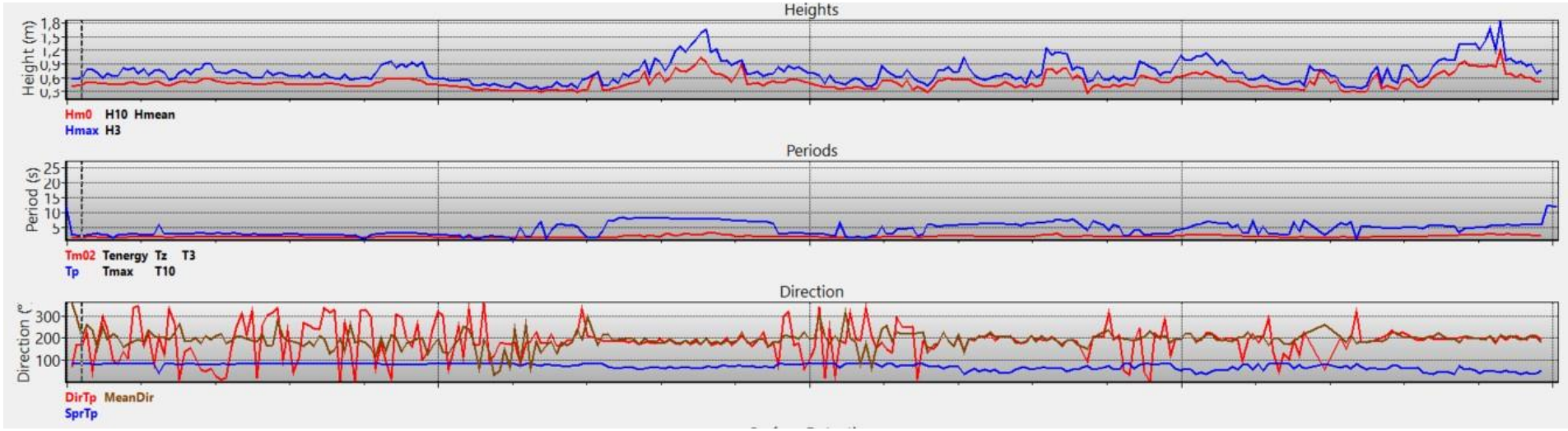
- Dedicated testing team with weekly visits to the location
- Function load testing - local, easily accessible locations, done with acoustic releases
- Deep water testing (Oslofjord) - currents and waves
- Nortek France - more system level testing and tests in the open waters of the Mediterranean

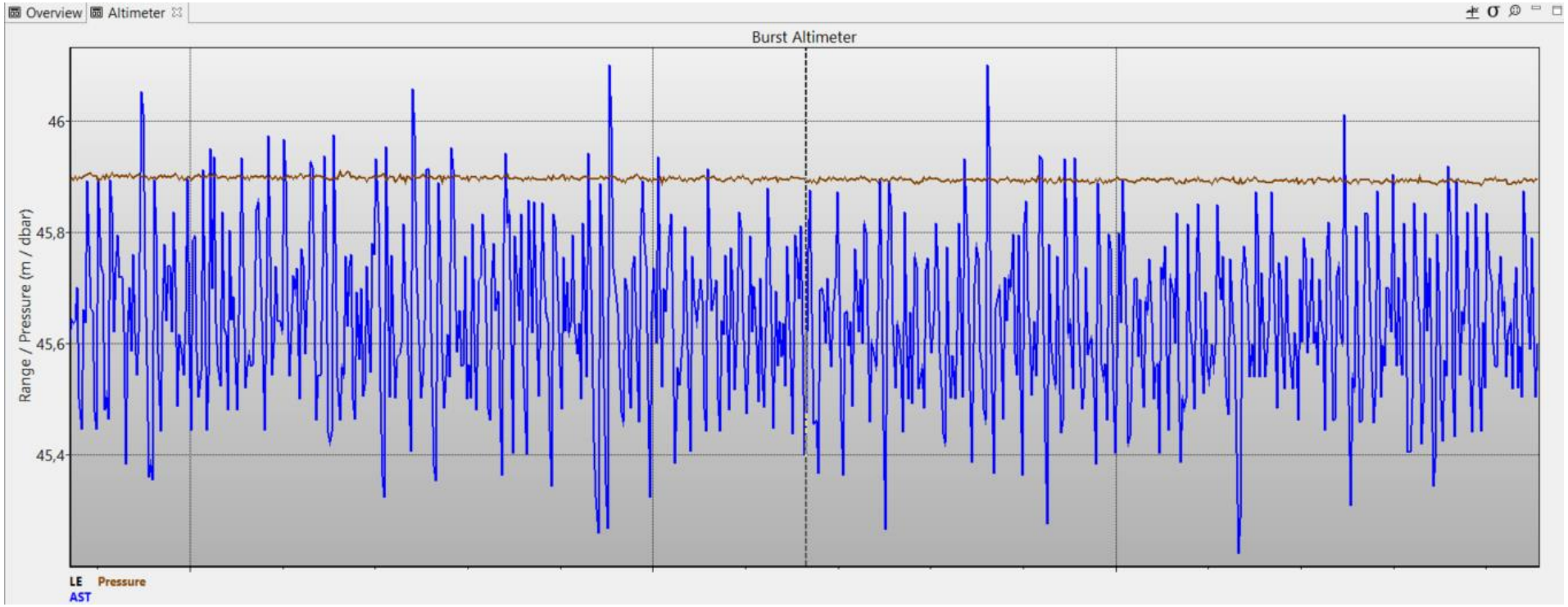
January 2024

AWAC Deployment: Oslofjorden

59°14'48.5"N
10°40'43.1"E




Heights
Height (m)
1,8
1,5
0,9
0,6
0,3
Hm0 H10 Hmean
Hmax H3
Periods
Period (s)
25
20
15
10
5
Tm02 Tenergy Tz T3
Tp Tmax T10
Direction
Direction (°
300
200
100
DirTp MeanDir
SprTp

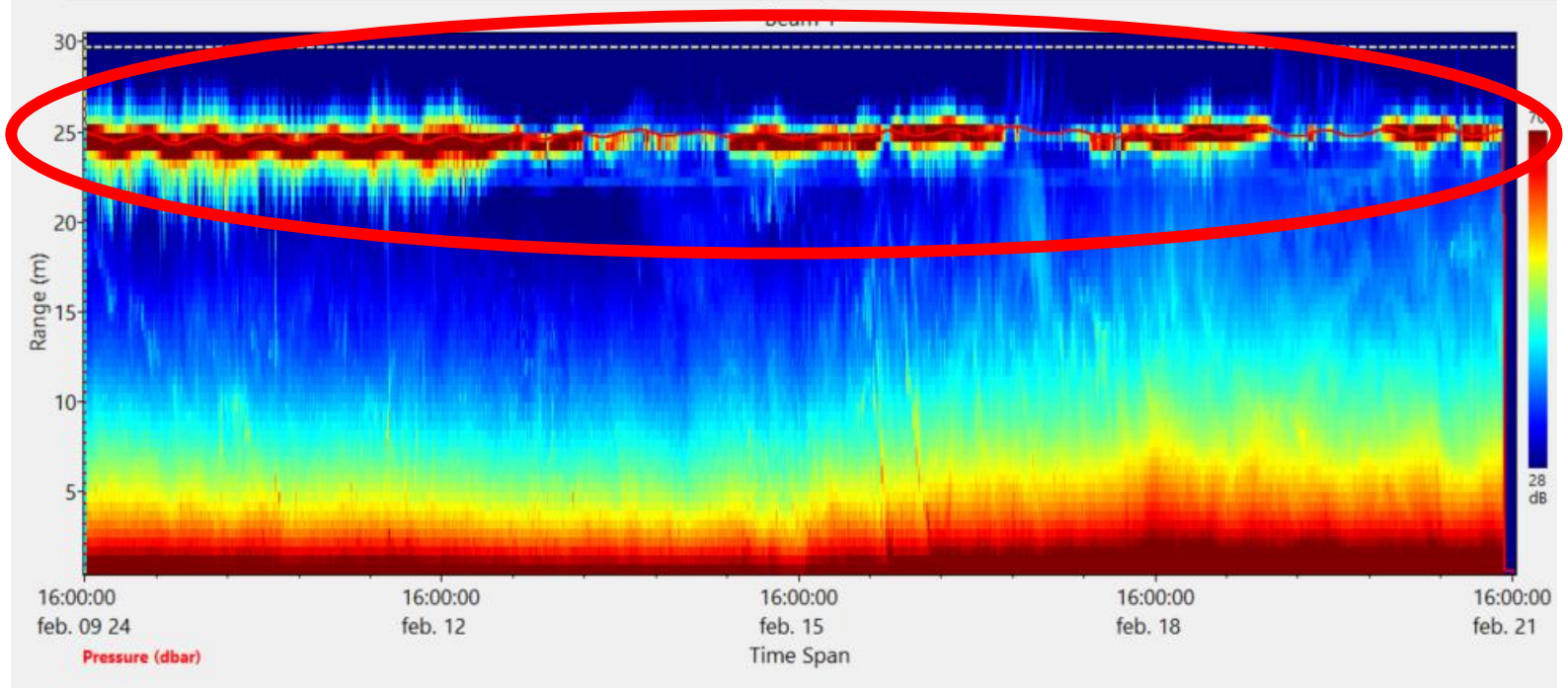

Overview
Altimeter
Burst Altimeter
Range / Pressure (m / dbar)
46
45,8
45,6
45,4
LE Pressure
AST

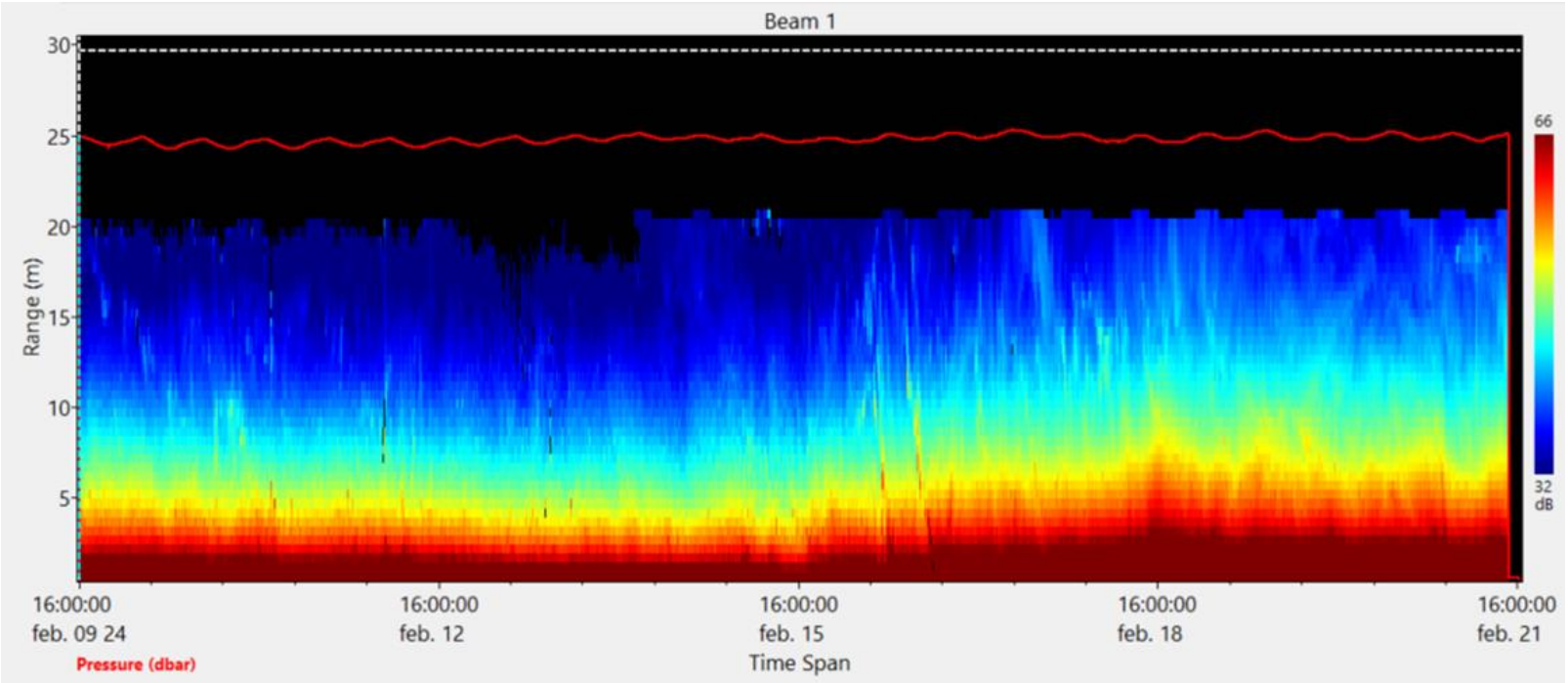
Built in Quality Control

These instruments offer the added benefit of built-in data quality control filters:

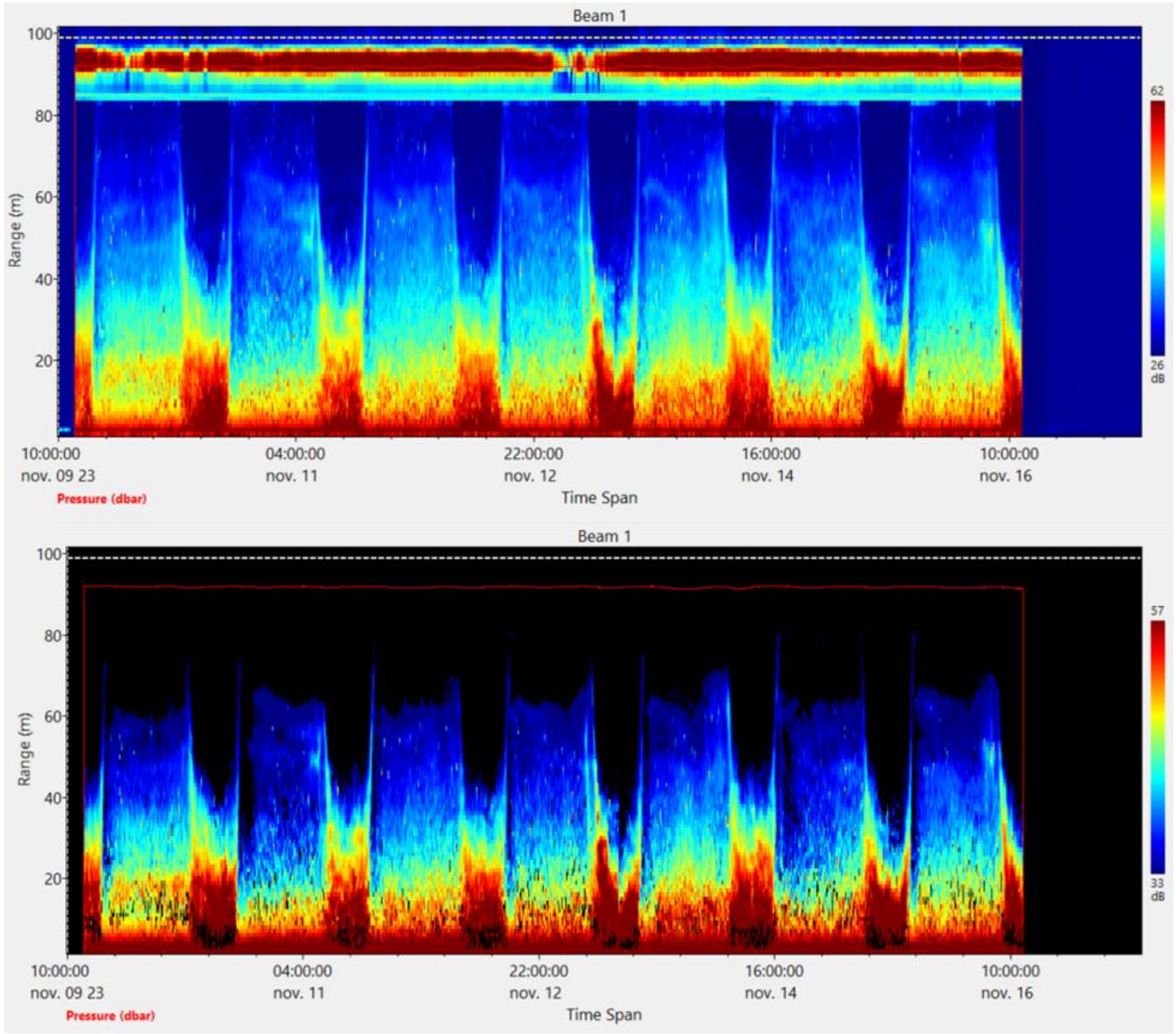
- optionally applied to your data
- done by the instrument, not post-processing software
- data is screened for the quality controls and “masked” if they don’t meet the required quality criteria
- Some criteria are applied to individual pings (e.g. the correlation filter), and some are applied to an entire cell (e.g. the “percent good” filter)
- While the filters for the individual pings are always applied, it is the user’s choice whether to use the filters to remove certain cells from their data
- Information on which mask(s) were applied to the data is always available

Raw data



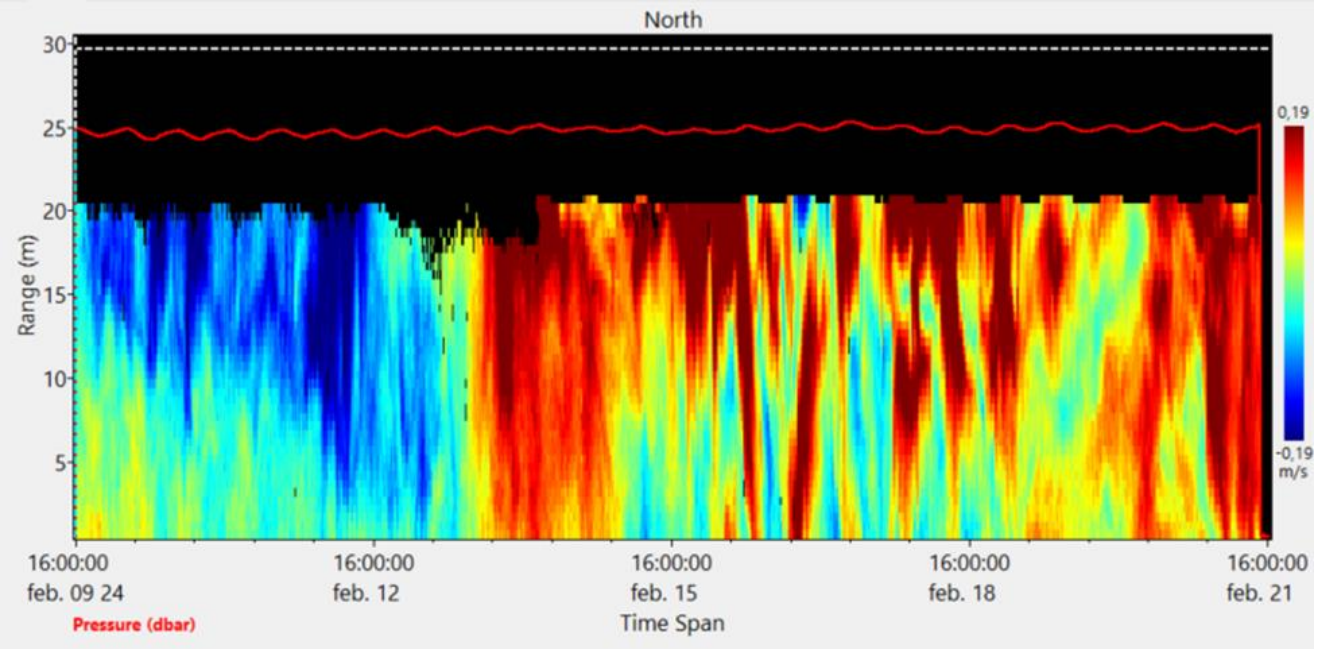


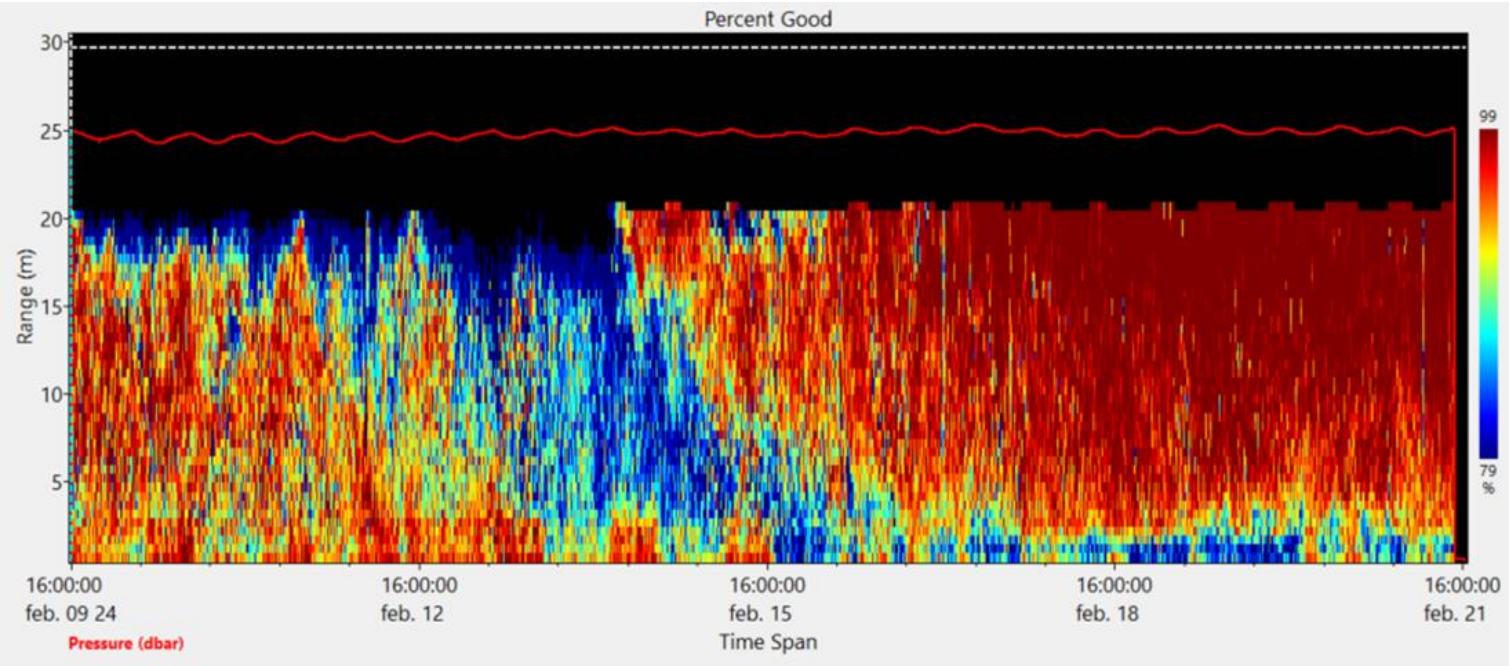
Quality control


Beam 1
100
80
60
40
20
Range (m)
62
26
dB
10:00:00
nov. 09 23
04:00:00
nov. 11
22:00:00
nov. 12
16:00:00
nov. 14
10:00:00
nov. 16
Pressure (dbar)
Time Span
Beam 1
100
80
60
40
20
Range (m)
57
33
dB
10:00:00
nov. 09 23
04:00:00
nov. 11
22:00:00
nov. 12
16:00:00
nov. 14
10:00:00
nov. 16
Pressure (dbar)
Time Span

Velocity

The velocity graph shows mostly south-flowing currents for the first few days (blue), and then a change in current direction to be mostly north-flowing currents (red).





Percent Good

"Percent good" is a metric for the percentage of pings for a given cell that were not masked by any of the filters. The percent good graph shows mostly high percent good, meaning most of the pings for the given cells returned quality data. However, during the period where the currents changed direction, the percent good readings were lower.

Q&A