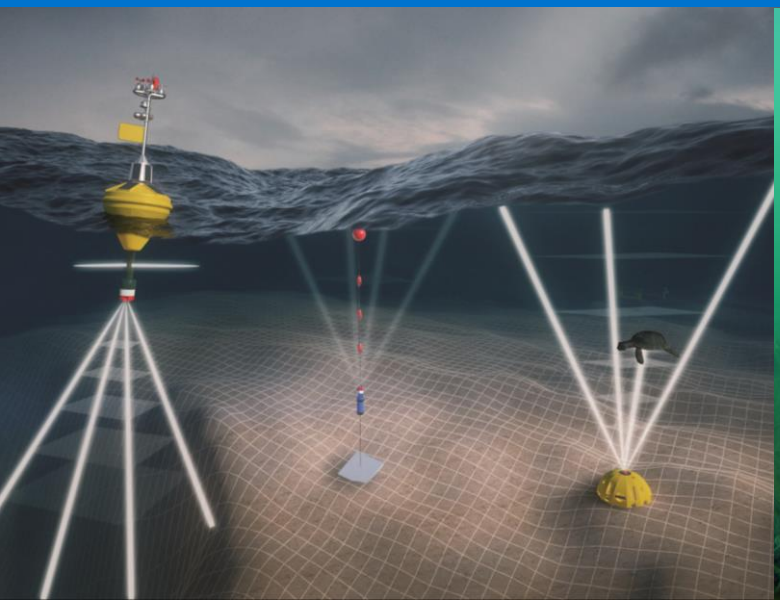
AANDERAA
a xylem brand

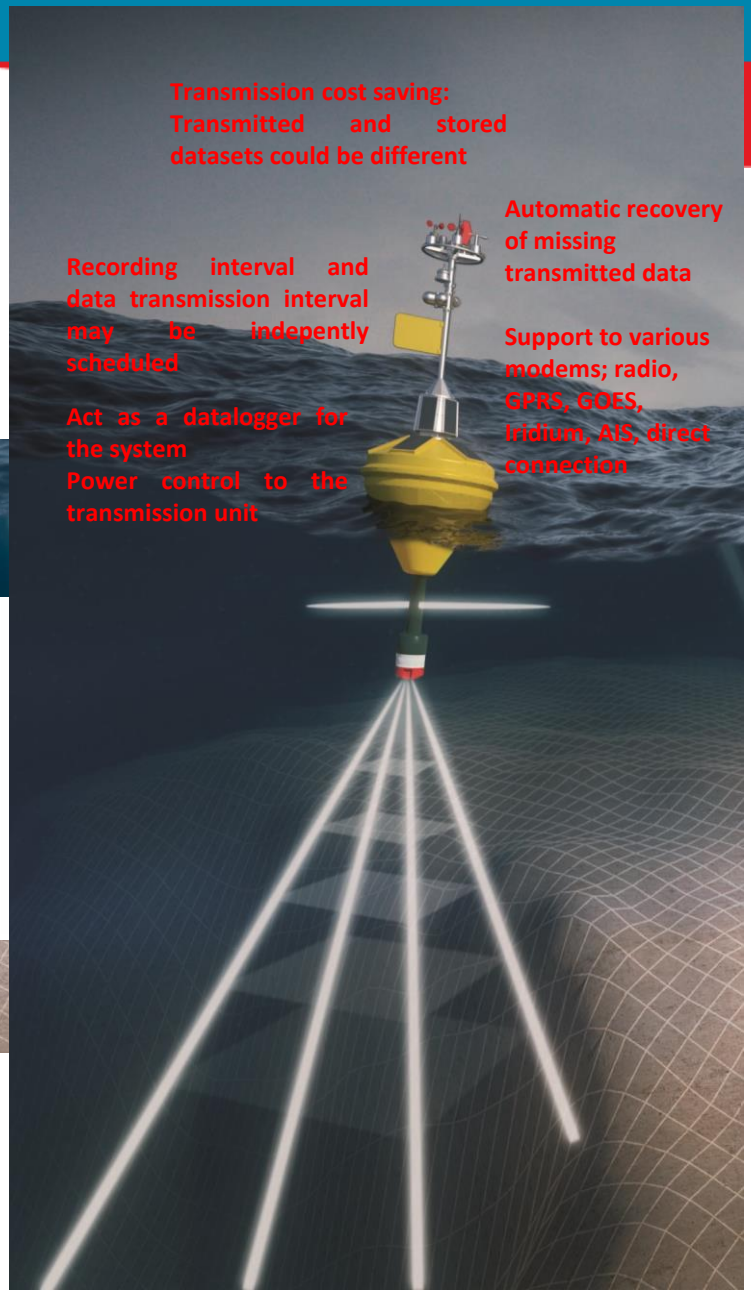
# SeaGuardII DCP: innovation in Doppler Current Profiling and Observatory Technology


**Emilie Dorgeville**, Jarle Heltne, Harald Tholo, Anders Tengberg




# SeaGuardII DCP – 600 kHz current profiler
# Configuration flexibility

- Current profiles up to 40m – 100m range
- Cell size selectable: 0,5m – 5m
- Up to 10Hz ping rate
- Up to three profiles : address different applications scenarios simultaneously
- Surface or instrument referred
- Burst / spread mode with same low power consumption
- Narrowband / Broadband
- Enhanced real time capability



# SeaGuardII DCP – 600 kHz current profiler
# Multiparameter platform – observatory

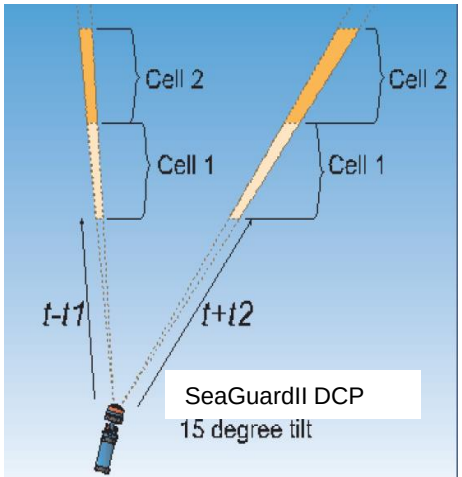
- Measurements of a wide range of additional parameters; cond, temp, wave, tide, pressure, oxygen, turbidity, pH, pCO2
- 6 sensors on the instrument top-end plate, Up to 20 AiCaP plug-and-play sensors
- 4 analog sensors for integration of third party sensors like ORP, chlorophyll, etc
- RS232/RS422 with full resolution and power control
- Multi sensors groups with individual recording
- Double the measuring range using 2 DCPS connected to the same instrument
- Long term deployment: Ex: 24 months with 30 minutes sampling (2m cell size, 20 cells, 40 pings)

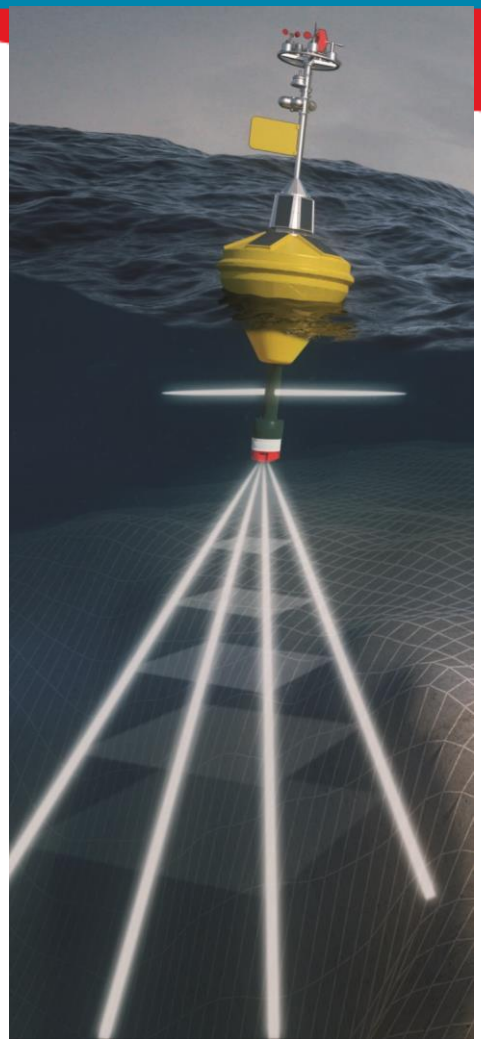
# SeaGuardII DCP in dynamic waters

Compensation for movement

- Tilt measured for each ping
- Advanced algorithm taking into account the tilt measurement and calculating the correct horizontal distance to a specific cell for each beam

Real time compensation for speed of sound changes; by measuring salinity / temperature / pressure



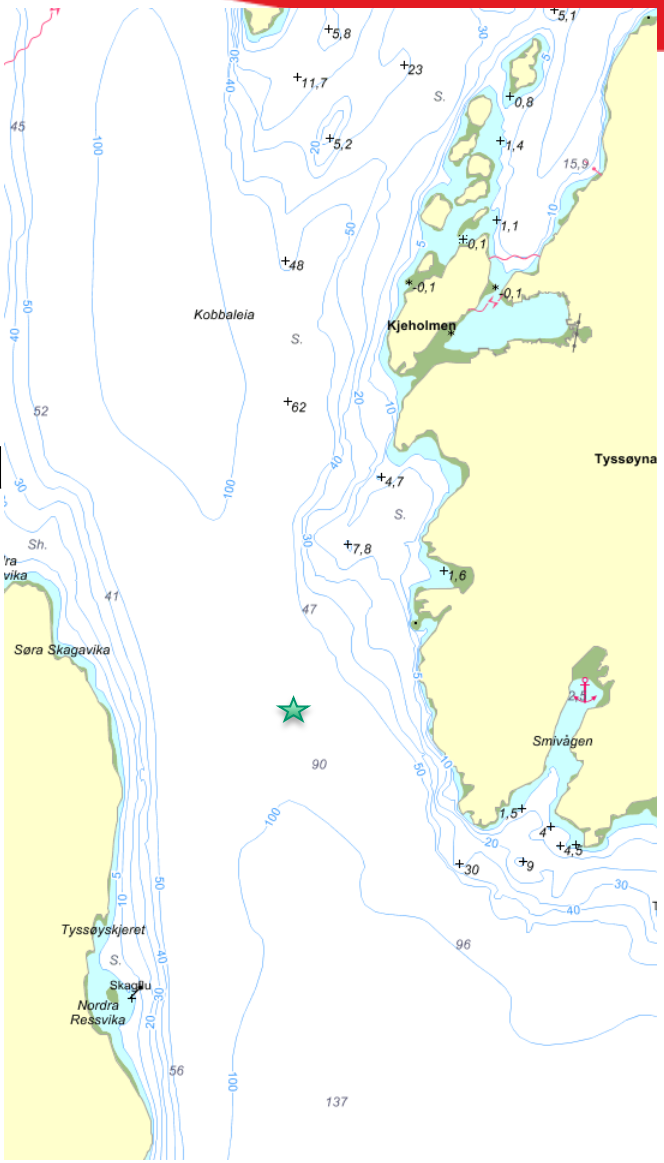





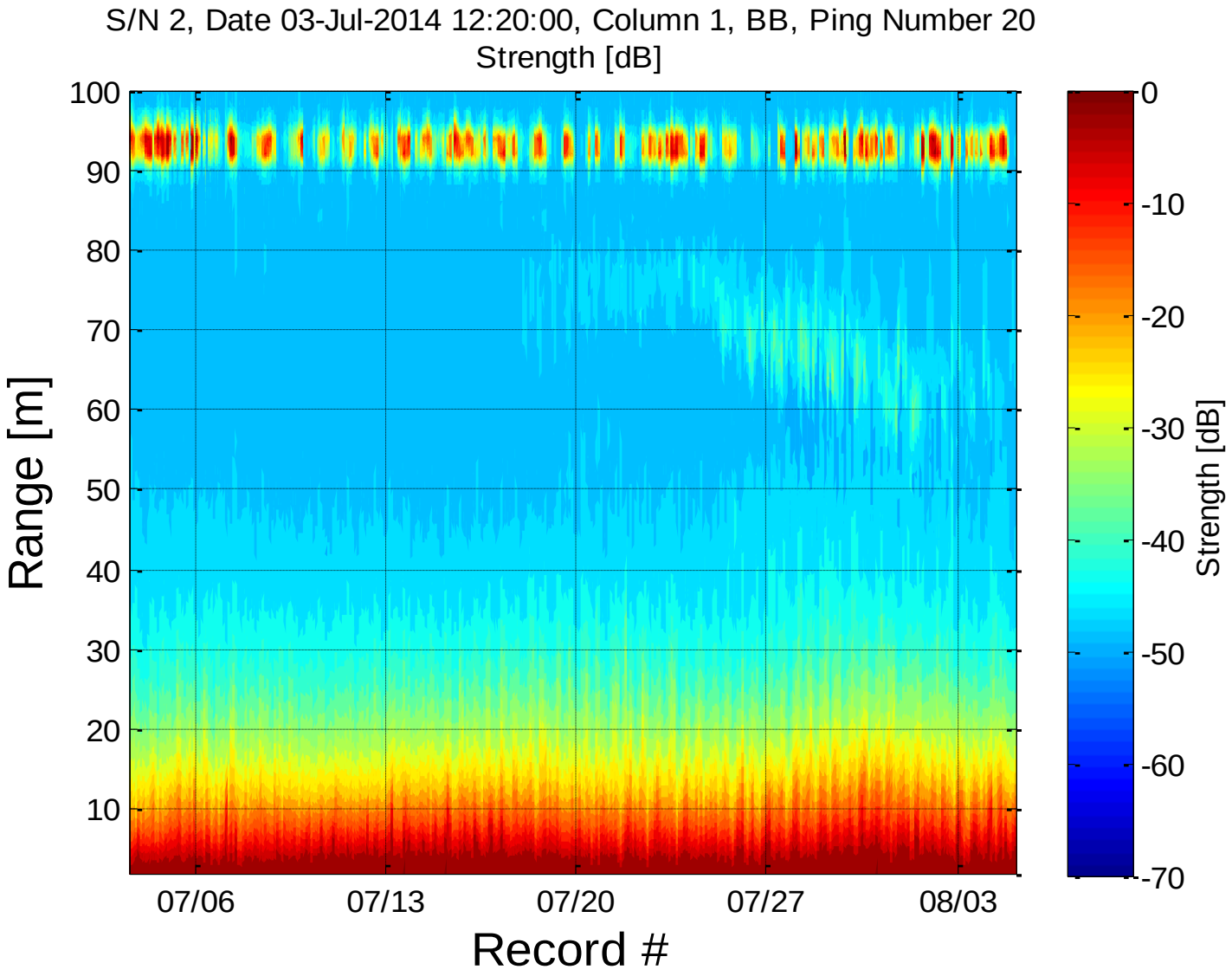
AANDERAA
a xylem brand

# Data Quality Control – Raunefjorden deployment

- July 2014, Raunefjorden, Southwest Bergen, Norway
- 10 minutes interval, 20 pings broadband
- 2m cell size, 93m depth, bottom mounted
- Tide related currents;
  - North / North west for incoming tide
  - South / South East for outgoing tide
  - Peak current at 60 cm/s

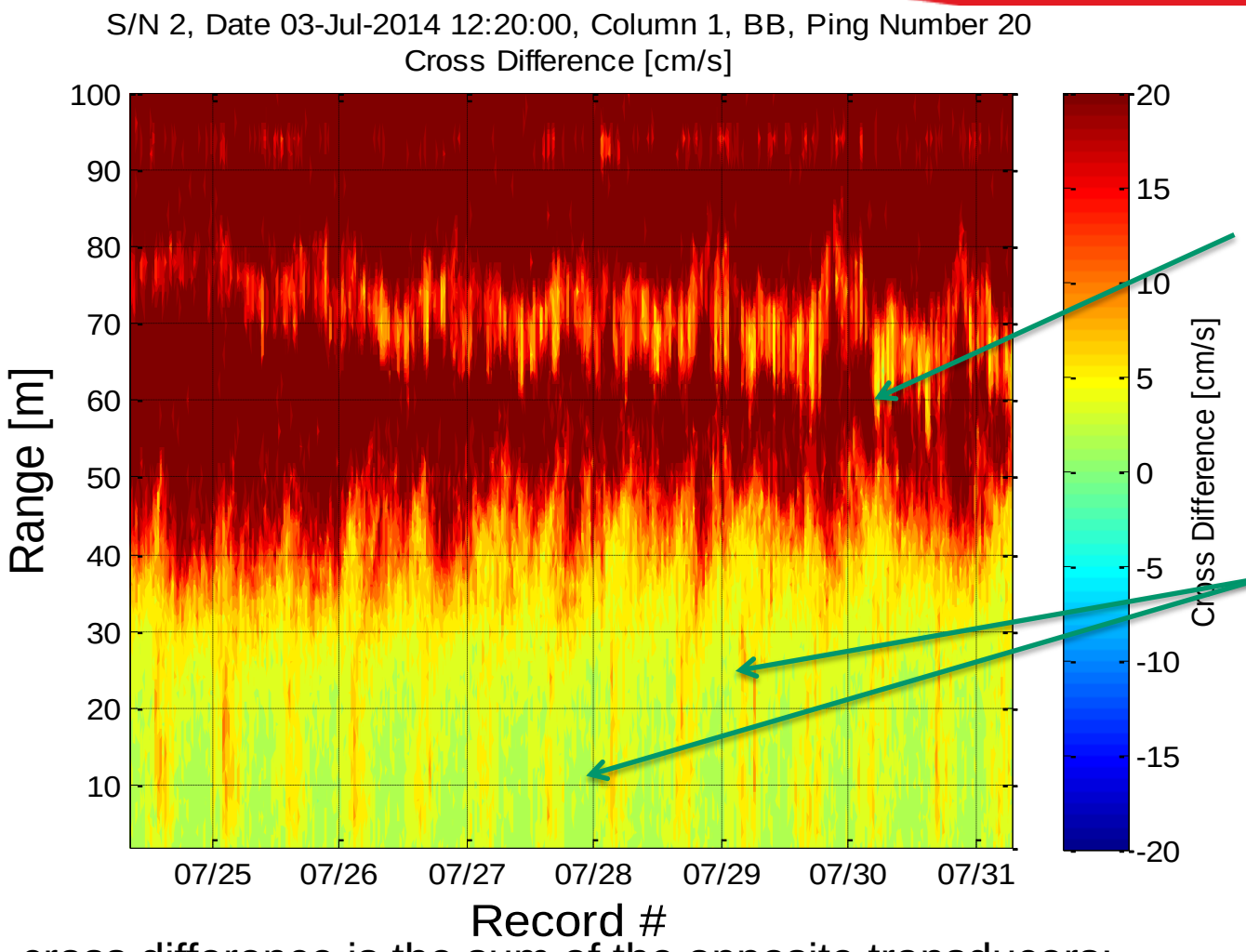


# Data Quality Control – Raunefjorden deployment
# Signal strength




Signal strength indicates tide related scattering conditions.

# Data Quality Control – Raunefjorden deployment Cross difference




High cross difference; noise in the data

Non homogeneous currents with tide current flowing North

cross difference is the sum of the opposite transducers;
(Beam 1 +Beam 3) - (Beam 2 +Beam 4)

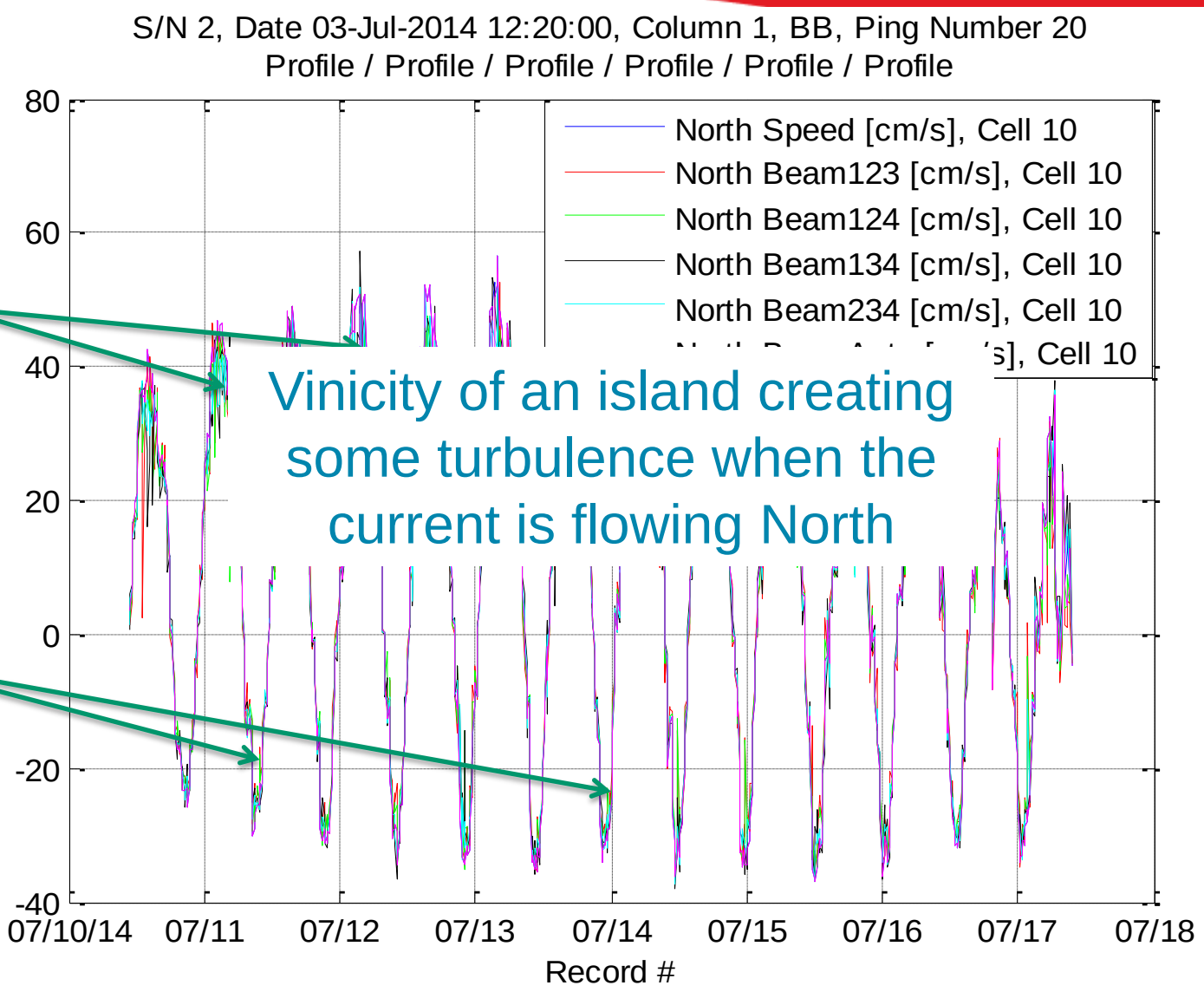


AANDERAA a xylem brand

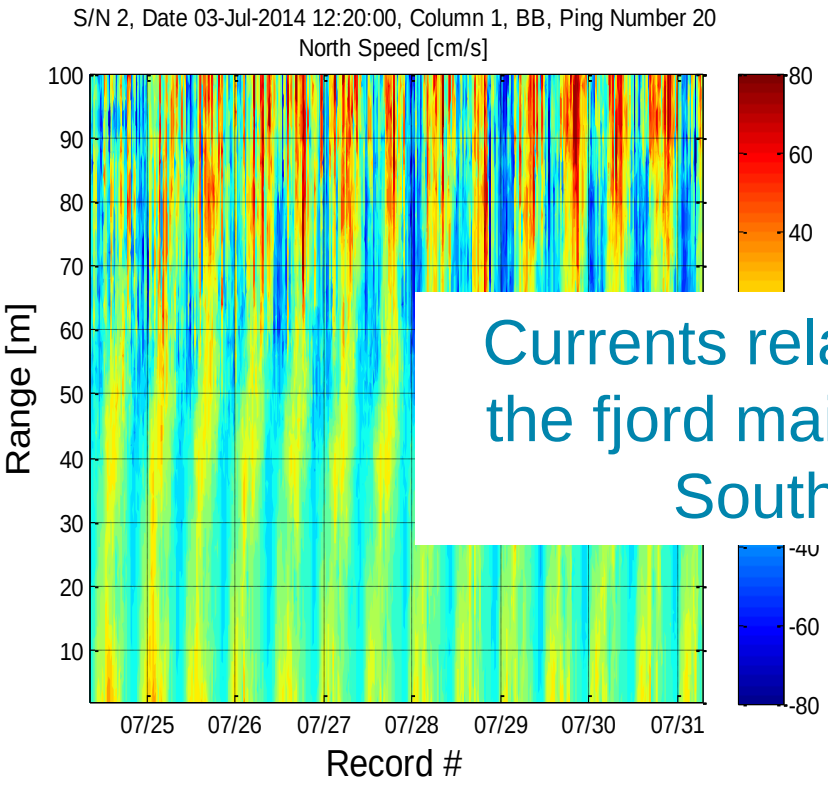
# Data from the cell 10, located 20m under the surface

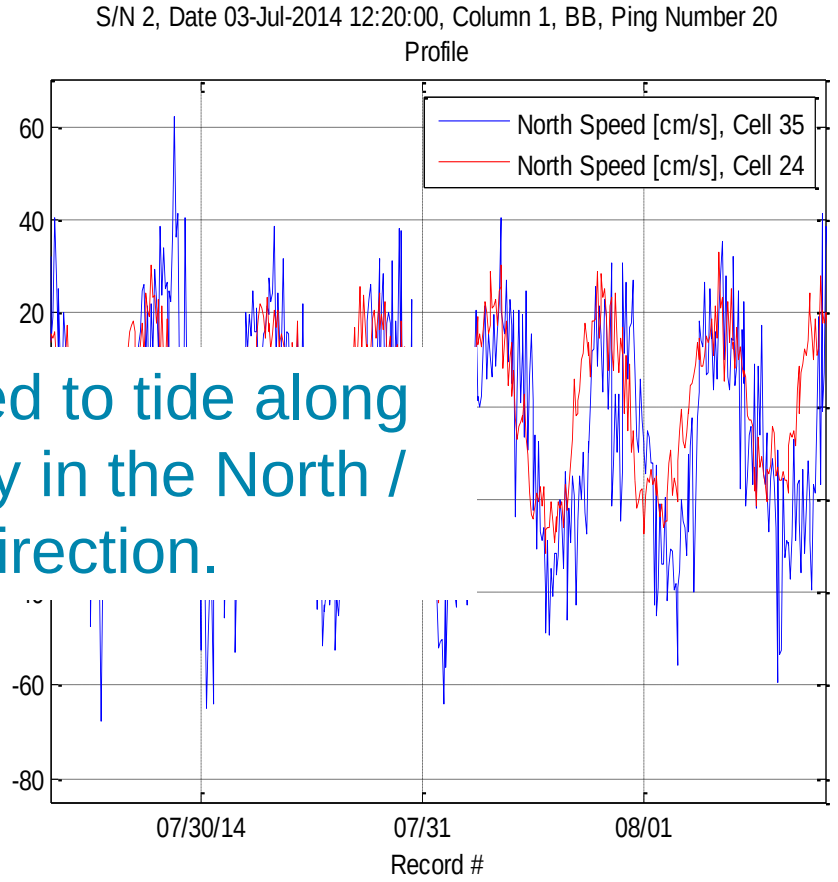
Turbulence effect; non-homogeneous currents when flowing North

Agreement when current flowing South



# Data contour plot – cells comparison at 50m (cell 24) and 72m (cell 35)



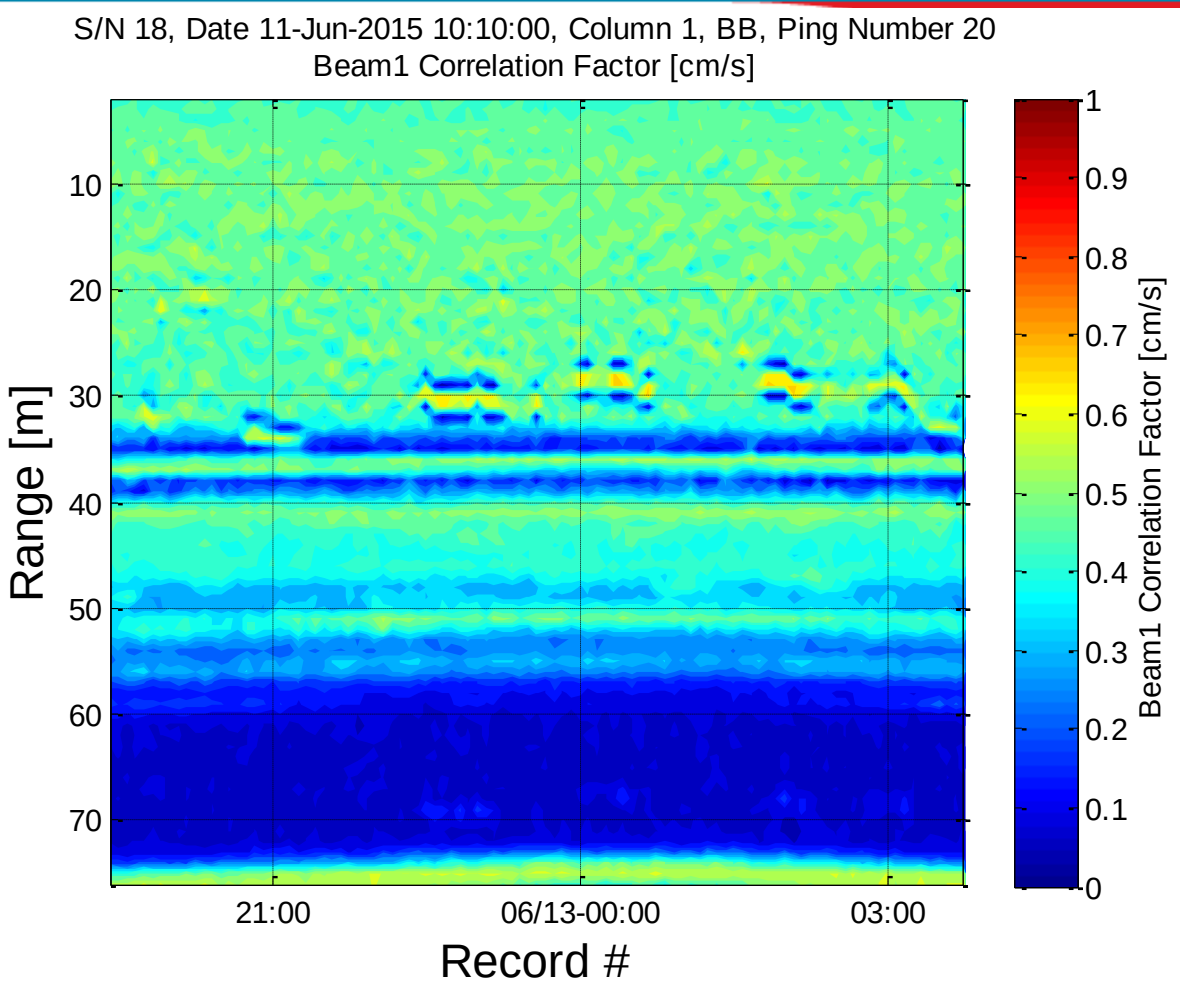




Currents related to tide along the fjord mainly in the North / South direction.



AANDERAA a xylem brand

# Detection of an object in the water column



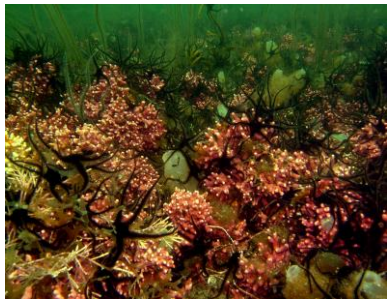

Correlation factor indicates mooring line passing in front of beam 1 at around 30m. The cell will be contaminated, and a three beam solution omitting this beam should be selected.



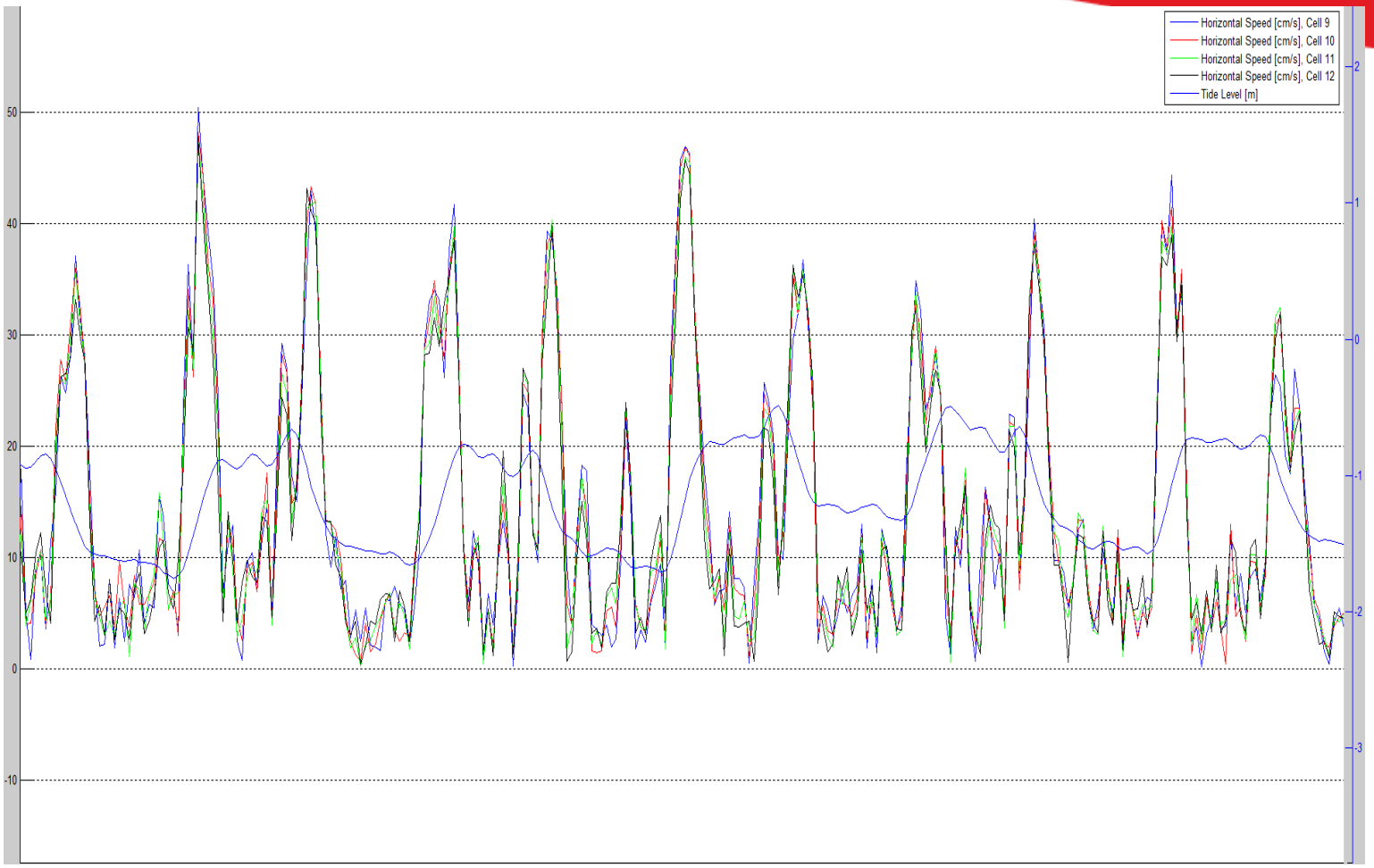
AANDERAA
a xylem brand

# Example of use – the blue carbon project

- Blue carbon project = storage of atmospheric CO2 by marine ecosystems, Coastal benthic habitats are extremely productive and assimilate a lot of carbon
- Investigation the carbon storage capacity of coralline algal beds (lock up CO2 by organisms associated with the algae)
- Promising carbon stores in coastal regions
- Collect high resolution in-situ multiparameter data (pH, pCO2, oxygen, temperature, salinity, water level, waves and current profiles) from above a coralline algal bed
- Interaction between the seabed and the overlying water column and the subsequent effects on carbon sequestration
- Refine the understanding of blue carbon storage by red coralline algae

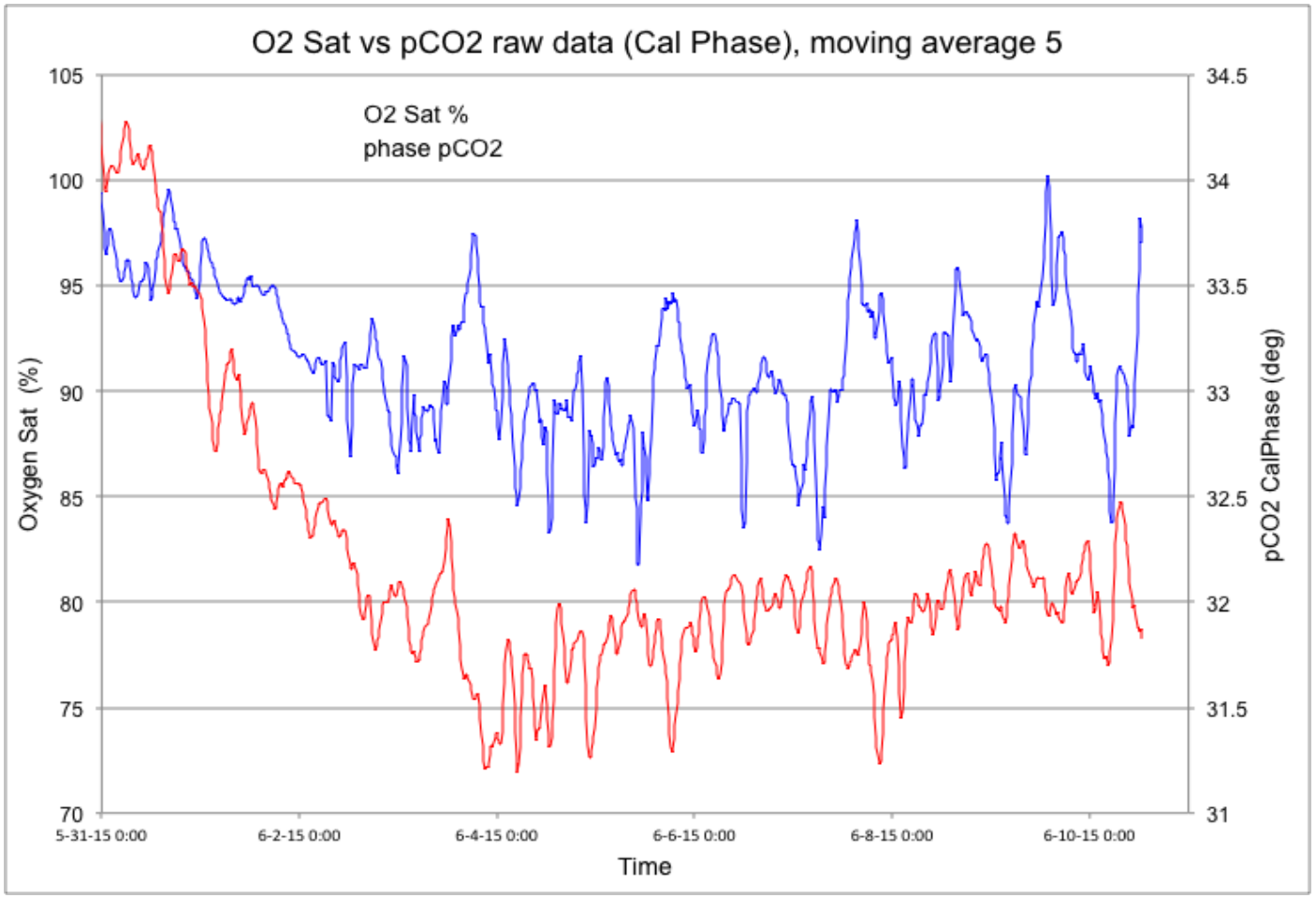


# Example of use – the blue carbon project



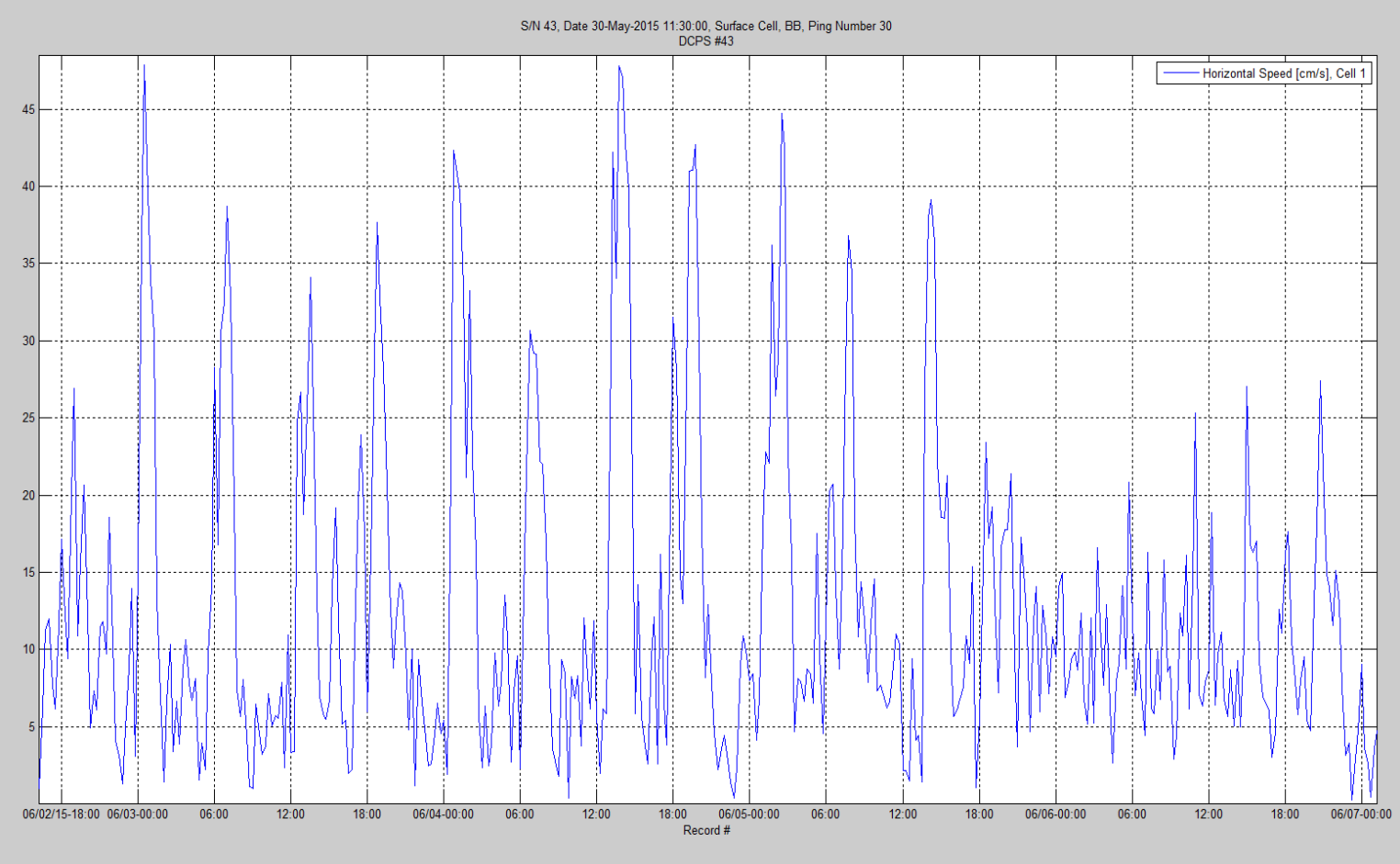

Tide data and horizontal current amplitude at about 2m depth from 4 different cells with 0,2m spacing

# Example of use – the blue carbon project




Oxygen and pCO2 data from a 10 days deployment in June 2015

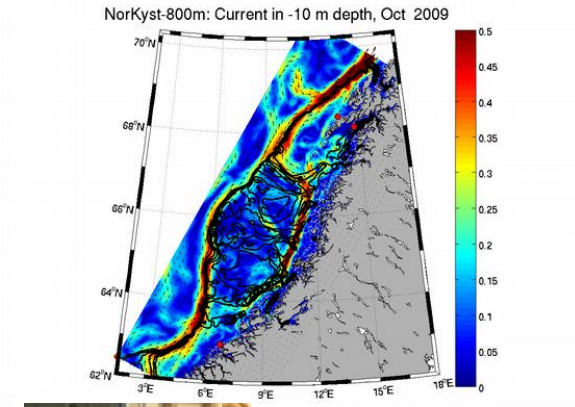
# Example of use – the blue carbon project




Current measured at the surface by using the surface cell functionality

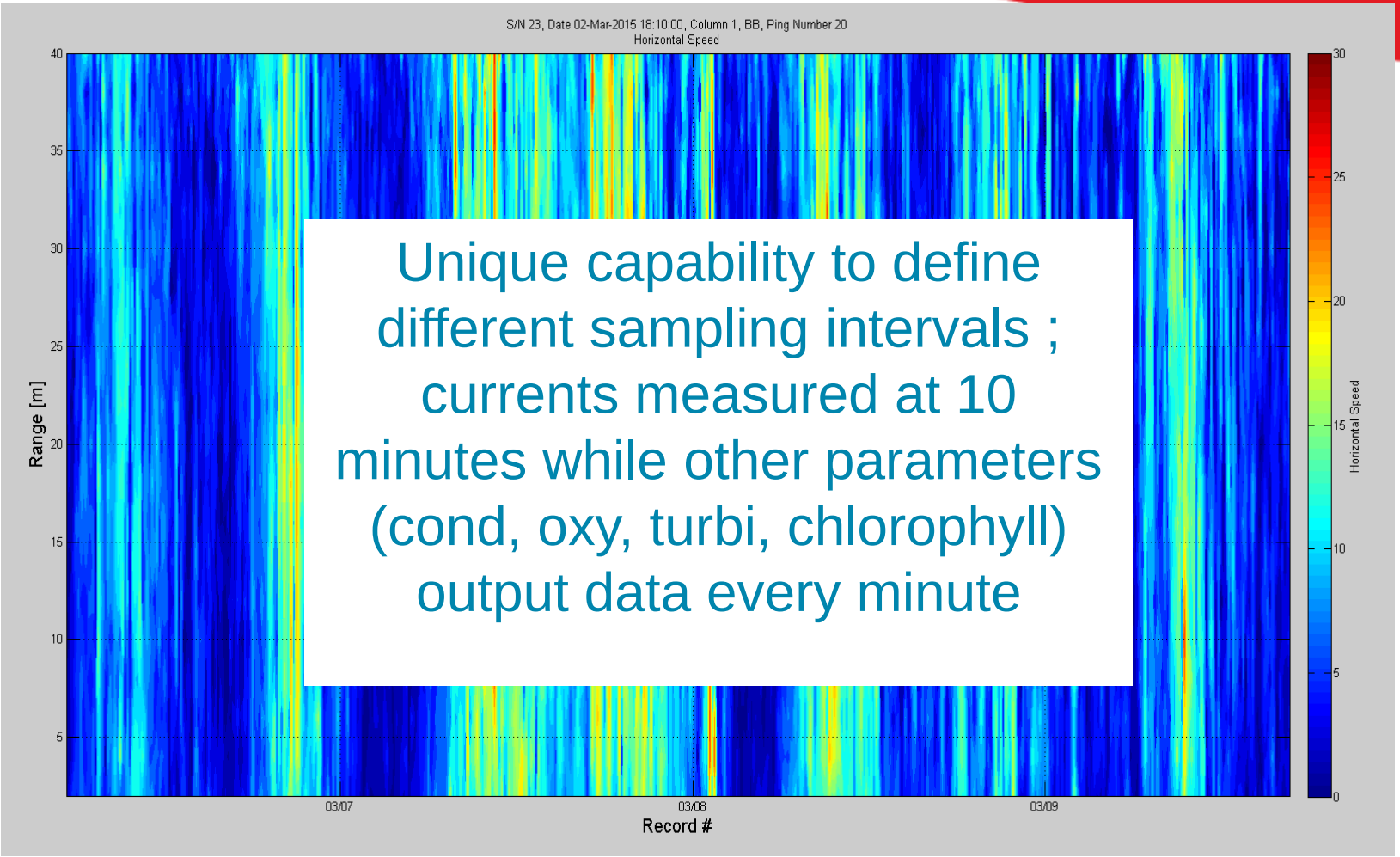
# IMR / Bergen; Aquaculture environment impact

- Norway = intensification of aquaculture production, increase the environmental impact including discharge of suspended solids, nutrients and organic enrichment of waters resulting in build-up of anoxic sediments and changes of the benthic communities
- Long term international project ERA; Ecosystem Responses to Aquaculture
- Developing new methodologies for monitoring hard and mixed bottom habitats; combining models with in situ data using the SeaGuardII DCP; current profiles, cond, tide, pressure, oxygen, turbidity and chlorophyll and benthic sampling
- Developing sustainability tools for optimal selection of new fish farming localities
- Risk assessment of Norwegian aquaculture




These above research topics are funded through a large research platform "ERA" funded through the Norwegian Research Council (Project # 228871/F40) focusing on the environmental responses of aquaculture
These research topics are also supported through both National (University of Bergen; NGU) and international collaborations (University of Melbourne, Australia; University of Southern Denmark; Department of Fisheries and Oceans, Canada; Centre National de la Recherche Scientifique, CNRS France; Fiskaaling - Aquaculture Research Station, Faroe Islands).

# Example of use – impact of aquaculture on the marine environment

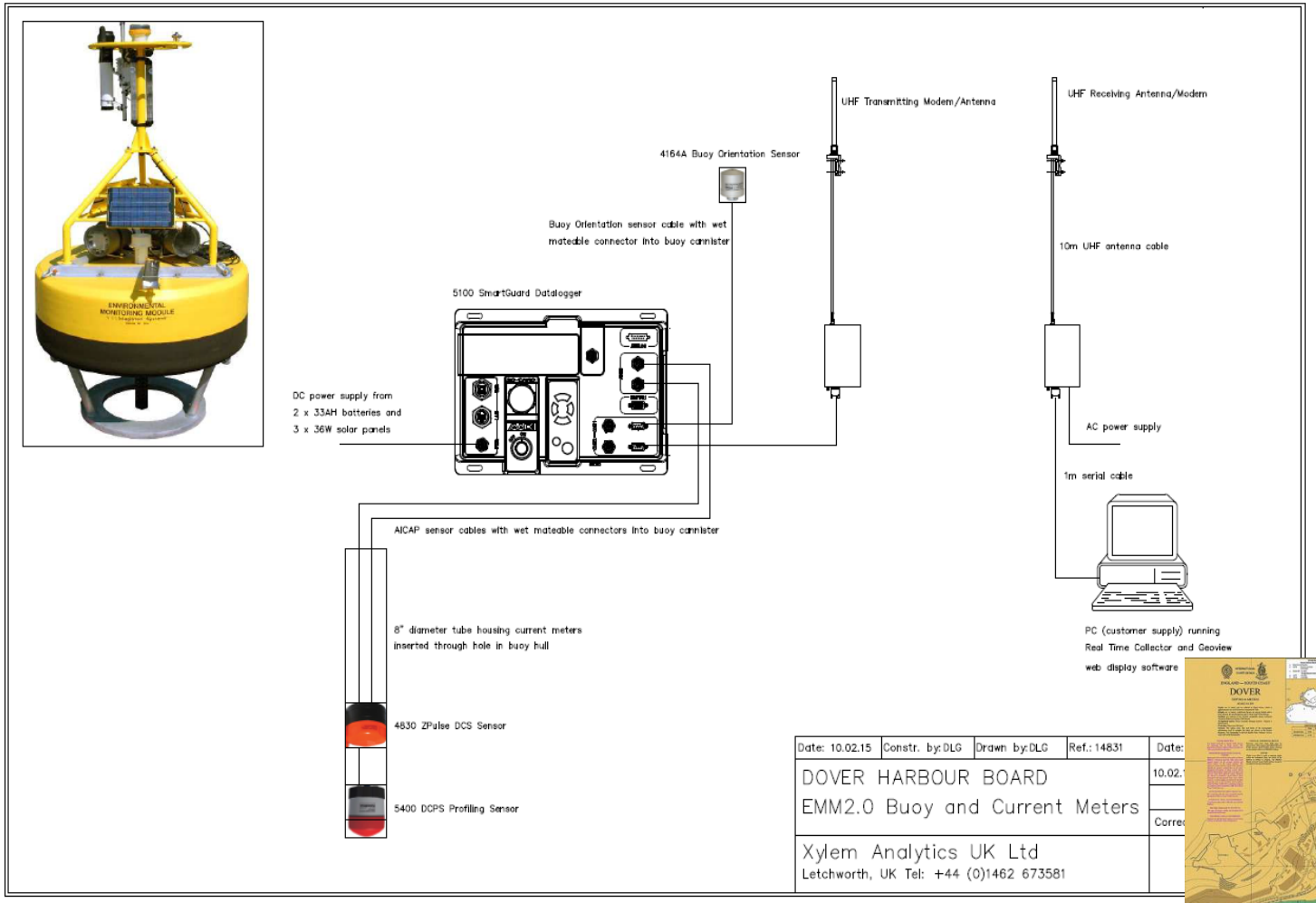



Current profile data using Broadband, 20 pings, cells with 2m spacing over a 4 days period (6th to 10th of March 2015)



AANDERAA a xylem brand

# Example of use – The port of Dover




Support vessel traffic navigation

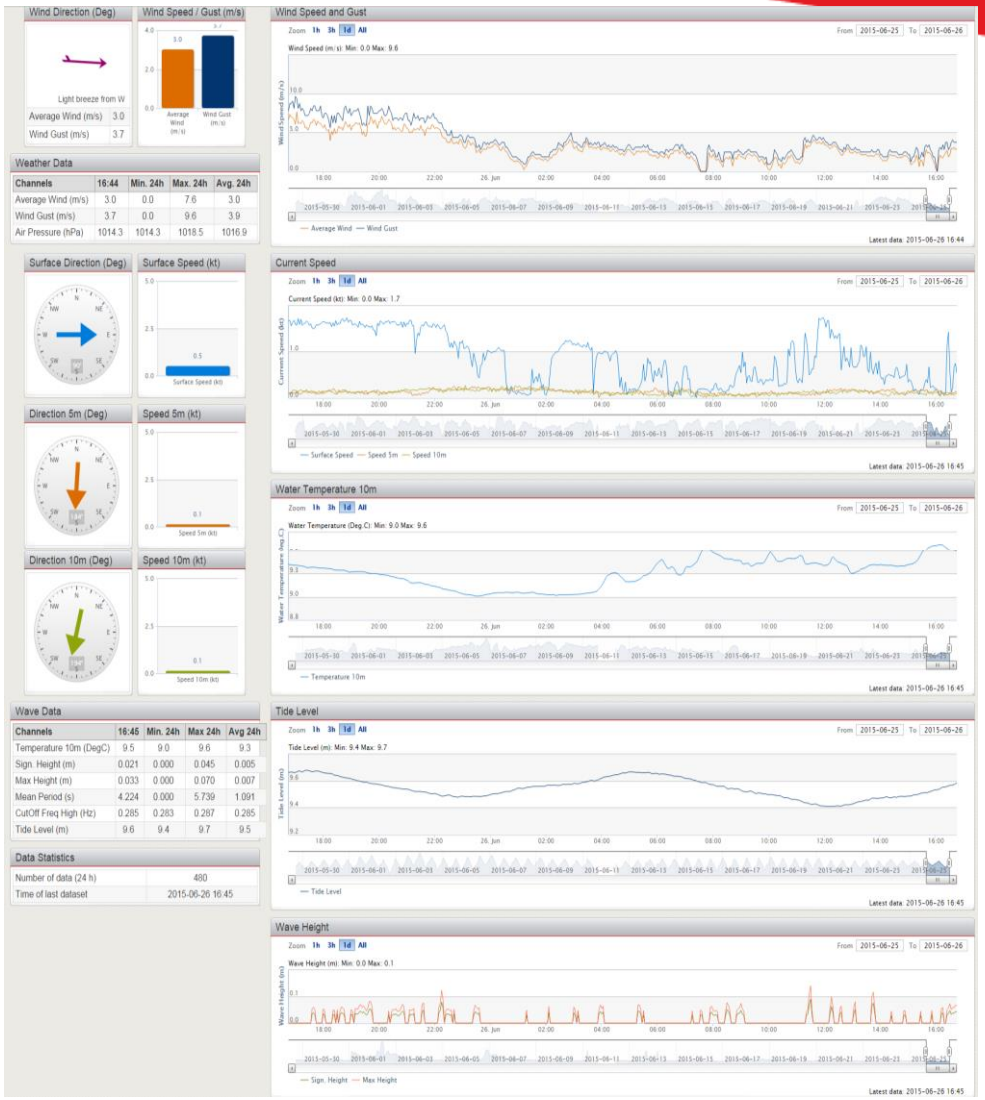

provide accurate current information to incoming and outgoing vessels as speed and direction of the flow immediately outside the harbour wall

# Example of use – The port of Dover



AANDERAA
a xylem brand

# Real time data to incoming and outgoing vessels






AANDERAA
a xylem brand

# Thanks for your attention! Muchas gracías

## Any questions?