# Verdien av tverrfaglig, langsiktig FoUI-samarbeid

INGER M. GRAVES
OCEAN AND COASTAL BUSINESS DEVELOPMENT LEADER, XYLEM ANALYTICS

## Xylem's Vision

We devote our technology, time and talent to advise the smarter use of water.

We look to a future where global water issues do not exist.

# This is Xylem

- A leading global water technology provider
- Nearly $4.5 billion in revenues
- Nearly 16,000 global employees
- Global footprint serving 150+ countries
- We devote our technology, time and talent to advance the smarter use of water
- We promote HSEQ for businesses operating in the ocean

# Våre varemerker

YSI
SonTek
HYPACK
TIDELAND
AANDERAA
sensus
mjk
WTW
visenti
O·I·Analytical
Global Water
ROYCE TECHNOLOGIES
Bellingham + Stanley
-ebro-
SI Analytics
WEDECO
Smith-Blair
essence OF LIFE
AC FIRE PUMP
godwin
rule
GOULDS WATER TECHNOLOGY
FLYGT
SANITAIRE
LEOPOLD
LOWARA
JABSCO
FLOJET
FLOWTRONEX
Standard Xchange
Bell & Gossett



AANDERAA a xylem brand

# Aanderaa

History

- Aanderaa Instruments started in 1966 by Ivar Aanderaa
- Located in Bergen, Norway
- Manufacturing, R&D, Sales, Marketing, Administration and Customer Care located here
- Worldwide offices
- Several sister companies around the world
- 88 employees

# Current Meter Evolution: Reliability & Data Quality

1966

**RCM4/5**
**Mechanical**
CTD
Data on Tape

1987

**RCM7/8**
**Mechanical**
CTD
Data on DSU

1994

**DCM12**
**Acoustic**
Profiling 12 cells
Surface cell
CTD
Data on DSU

1996

**RCM9**
**Acoustic**
Single point
CTDTurb
1000 m
Data on DSU

2000

**RCM11/RCM9(II)**
**Acoustic**
Single point
CTDTurb$O_2$
6000 m
Data on DSU

2003

**RDCP 600**
**Acoustic**
Profiling 150 cells
Surface cell
Multiple columns
Windows CE
CTDTurb$O_2$Wave
Data on MMC card

2007

**SeaGuard RCM**
**Acoustic**
Single point
Z-pulse
Windows CE
CTDTurb$O_2$Wave
AiCap/String
Analog sensors
Data on SD card

2013

**RCM Blue**
**Acoustic**
Single point
Z-pulse
Bluetooth
Temp
Pressure/depth
Self recording sensor

2014

**SeaGuardII DCP**
**Acoustic**
Profiling 150 cells
Surface cell
Multiple columns
Narrow/Broad-band
CTDTurb$O_2$Wave
AiCap/String
Analog/Serial sensors
Data on SD card
Spread/Burst
35 deg tilt comp
Long autonomy

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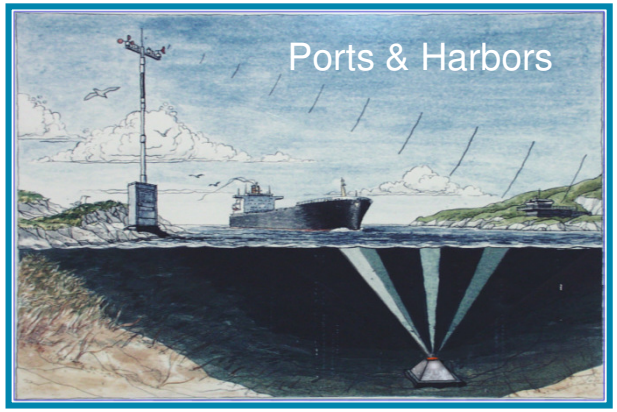




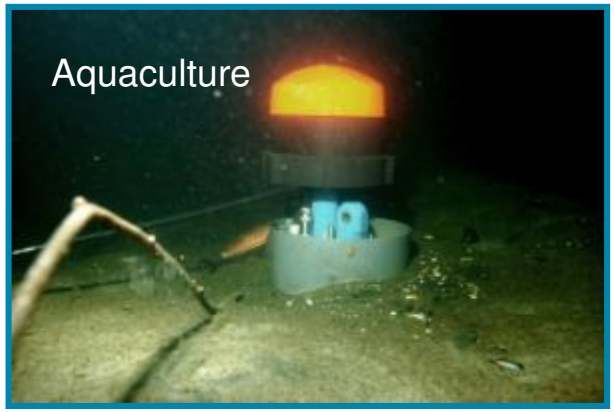




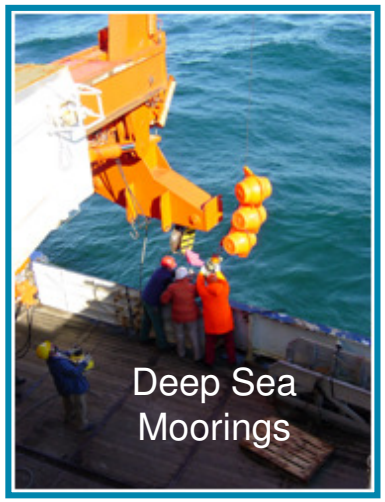




Accurate, Reliable & Low Energy

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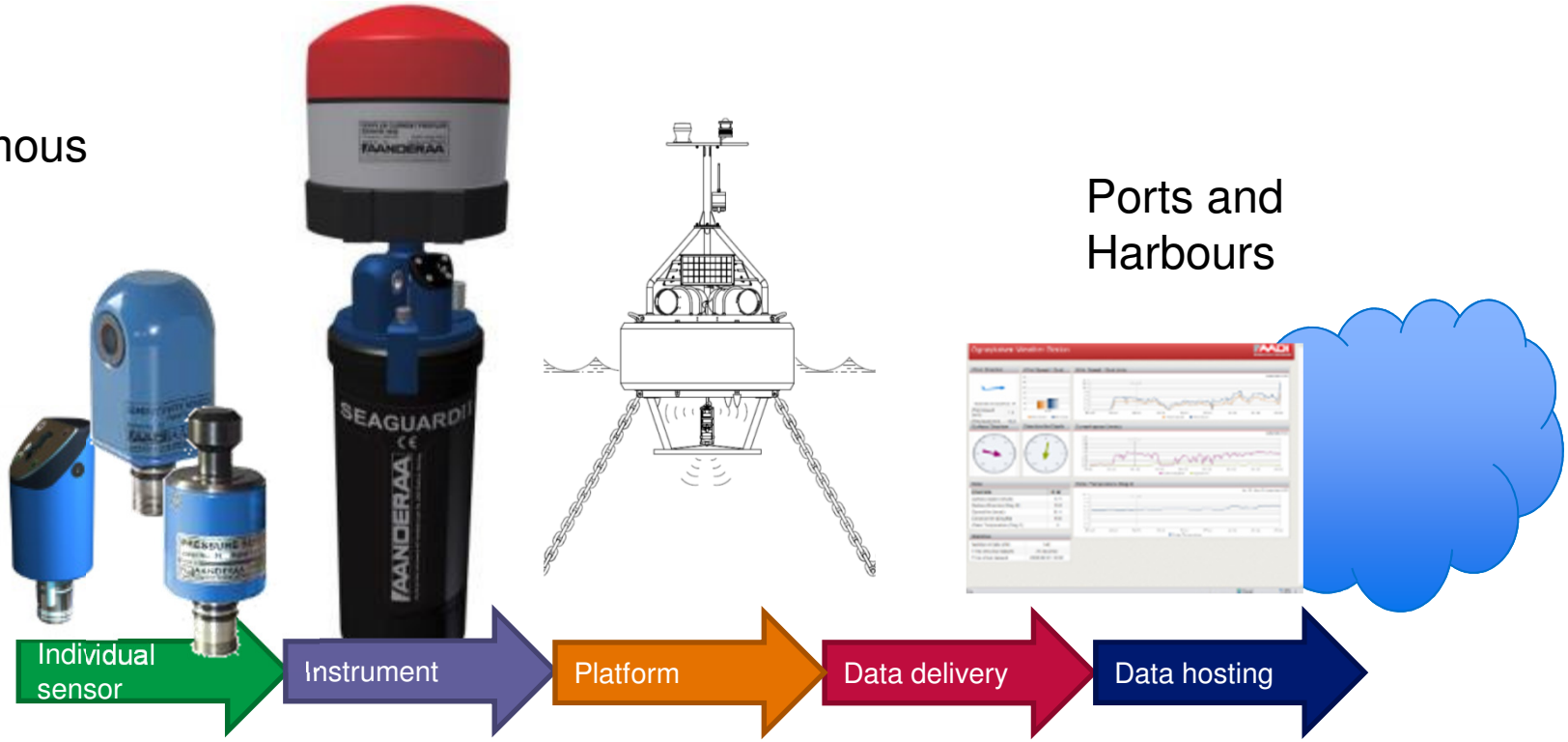
# Different customers – different needs

Aquaculture consultants

Autonomous vehicles

Ports and Harbours




WHOI

AWI

Helsingborg Harbour

WSA

UIB



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We extend our monitoring solutions ensuring that you measure **what** you need, **where** you need it.

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# Aanderaa samarbeid med FOU (utdrag)

pCO2 sensor
Acoustic material for current meters

pH sensor
NANO2021

MOTUS wave buoy
MAROFF

Sailbuoy Ice Edge
Sailbuoy Ocean Currents

AUV DCPS
DEMO2000

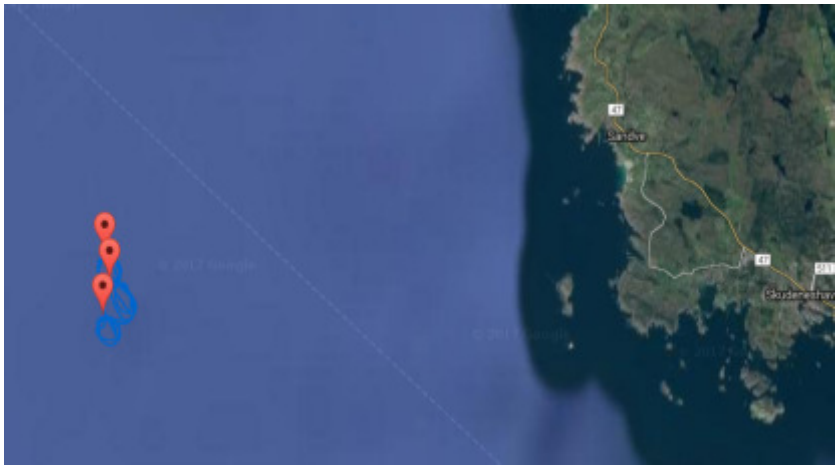
# Example: MAROFF project

Collaboration with:

- Christian Michelsen Research (CMR); Validation of technology through simulation and downscaled tank tests. Uncertainty analysis.
- Norwegian Meteorological Institute (MET): Data Validation, comparison towards SWAN modelling.
- Uni Research Polytec: Data validation and field testing.

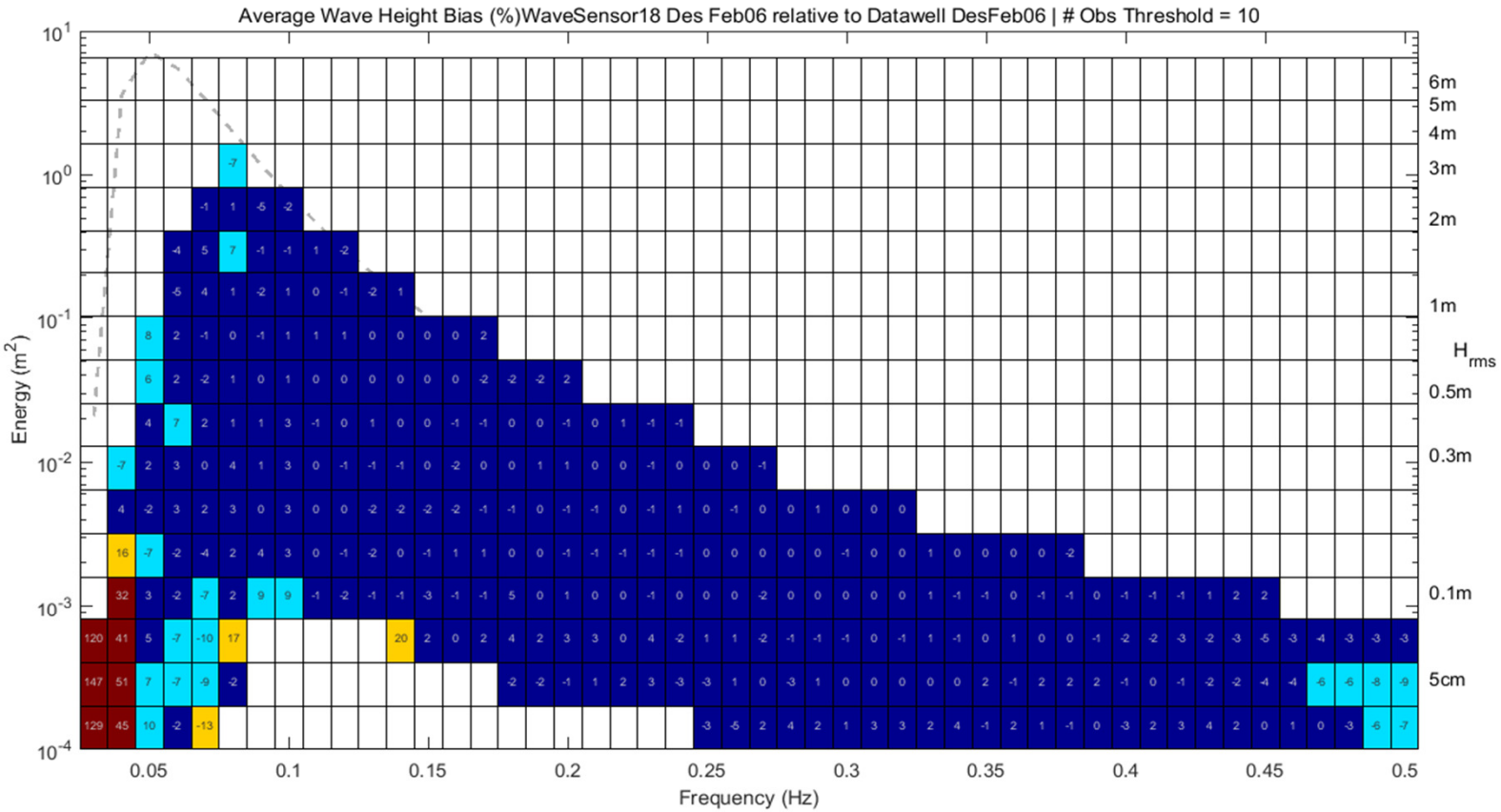
CMR - Tank test facility used for IMU – wave processing validation and downscaled buoy modelling (Proteus)

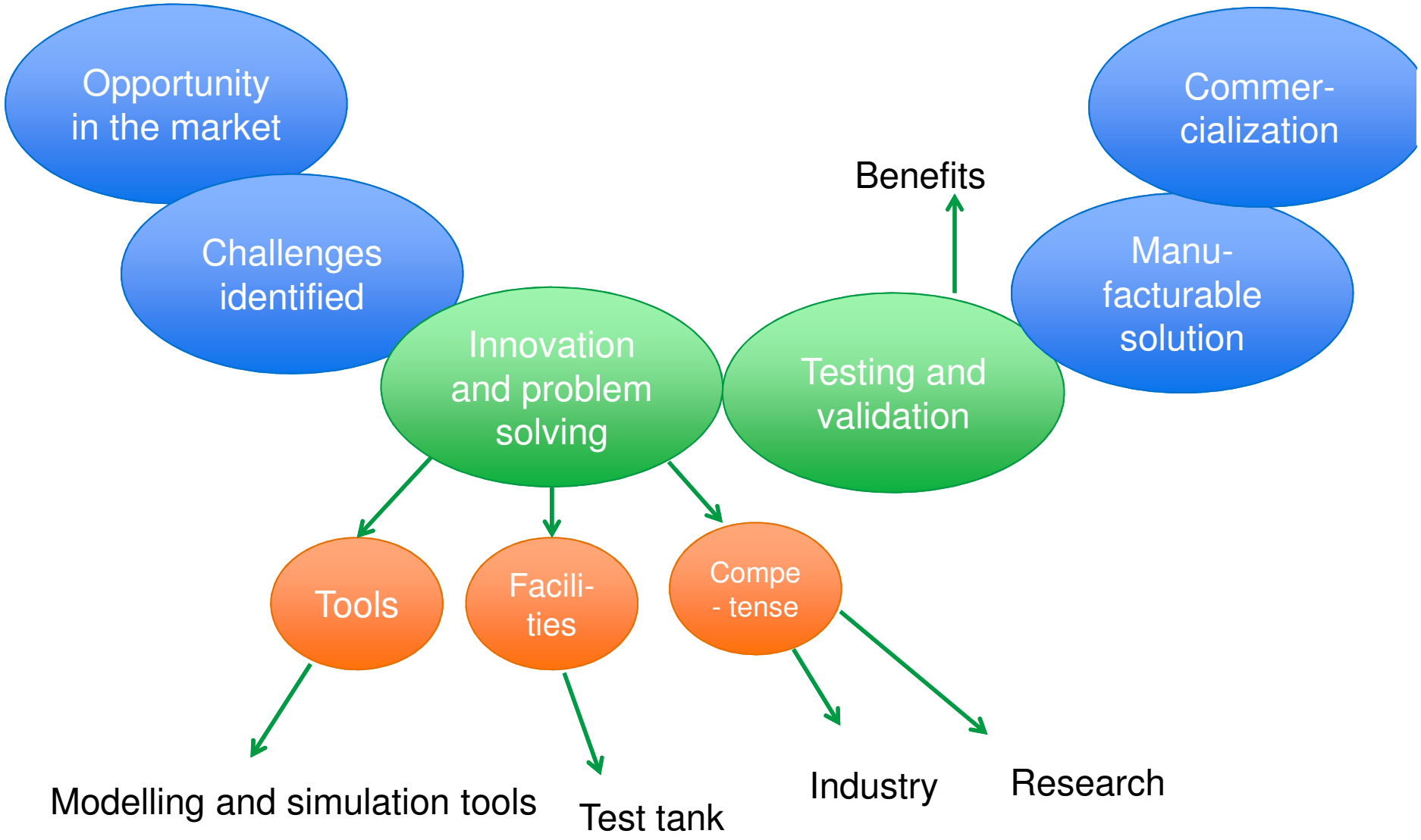
# Field Validation



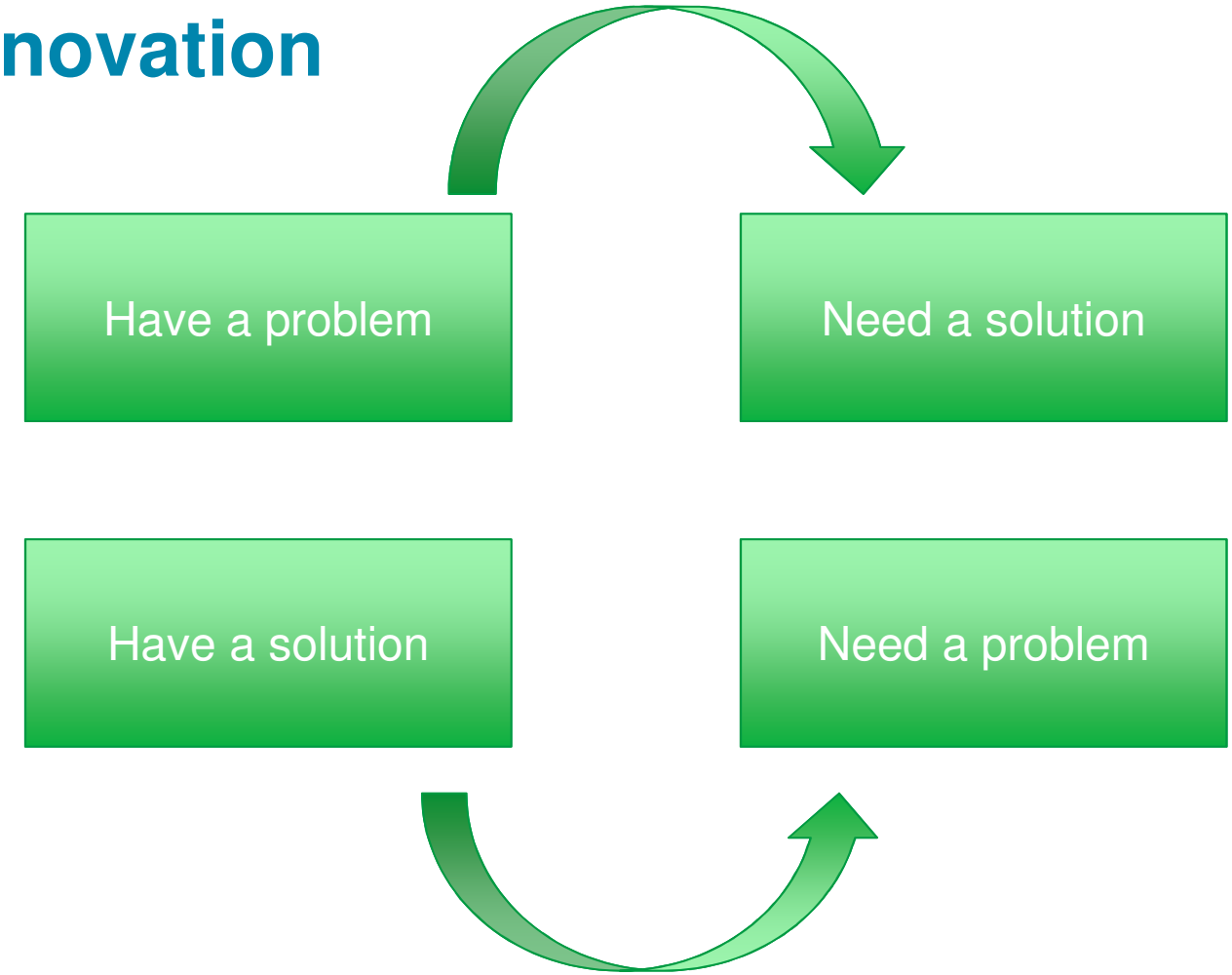
- Two buoys and one Datawell Waverider were deployed in the North sea approximately 4 nm off the coast of Karmøy.
- One **Tideland SB138P**, buoy was fitted with Motus wave sensor #4, Buoy orientation sensor, In line DCS single point current sensor, Gill wind sensor and GPS.
- One **EMM2.0** buoy was fitted with two Motus wave sensors, Buoy orientation sensor, In line DCS single point current sensor, DCPS Current profiler, Gill wind sensor and GPS.
- One of the EMM 2.0 wave sensors (#2) were located close to the buoy COG, and the other wave sensor were located close to the outer top edge of the floating cylinder in order to evaluate the effect of the installation position and the build in offset compensation algorithm.

# Comparison with CDIP Wave Evaluation Tool




Opportunity in the market
Challenges identified
Innovation and problem solving
Testing and validation
Benefits
Commer-cialization
Manu-facturable solution
Tools
Facili-ties
Compe - tense
Modelling and simulation tools
Test tank
Industry
Research

# Innovation


Have a problem
Need a solution
Have a solution
Need a problem


Post-it
Notes
3M

# Erfaringer fra FOU samarbeid

## Hvorfor samarbeid FOU og industri


- Selskaper blir samtenkte, “nye øyne” på definerte problemstillinger skaper bedre løsninger
- FOU miljø har verdifulle kontakter og nettverk som kan sette bedrifter i forbindelse med viktige bidragsytere
- FOU miljø har oversikt over fagfelt og publikasjoner

# Erfaringer fra FOU samarbeid

## Hvordan samarbeide


- Markedsdrevne behov fra industrien kan lede til gode produkter med en riktige løsningen
- Potensiell teknologi identifisert av FOU miljø kan lede til innovasjon i uventede sammenhenger
- Strukturerte prosjekter med gode planer leder til best resultat

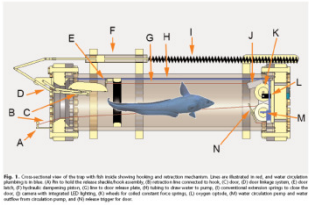
# Suksessfaktorer

- Selvdrevne deltakere som har evne til å tenke utenfor “boksen”
- Variert bakgrunn i gruppen, løsningen kommer kanskje fra uventet hold
- Innovasjonserfaring i teamet eller som tilgjengelig ressurs
- Gode prosjektplaner og oppfølging
- Lav overhead på det administrative

# Oxygen Optodes

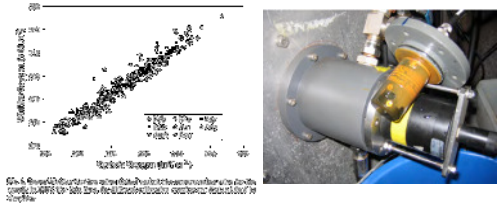
## Examples of Scientific Papers (+150 published)

Incubators



Drazen et al (2005), Almroth et al (2012), Wikner et al (2013)

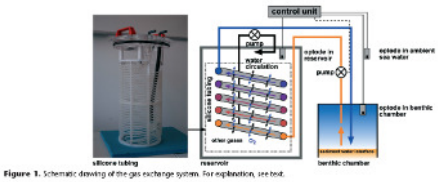
Ferry boxes



Hydes et al (2009)

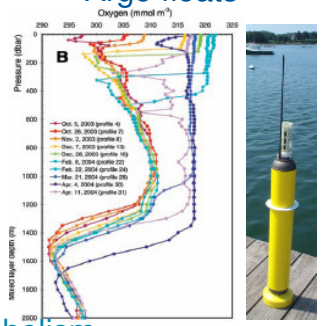
Tengberg et al (2006) technology description

Gas Exchange Chamber



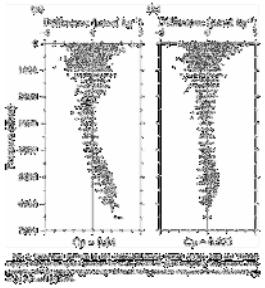
Sommer et al (2008)

Argo floats



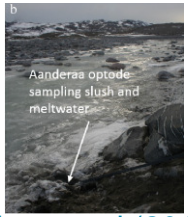
Körtzinger et al (2004, Nature) Johnson et al (2010, Nature) Fiedler et al (2013) Takeshita et al (2013)

Cabled CTD



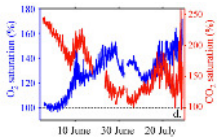
Uchida et al (2008)

Chryosphere



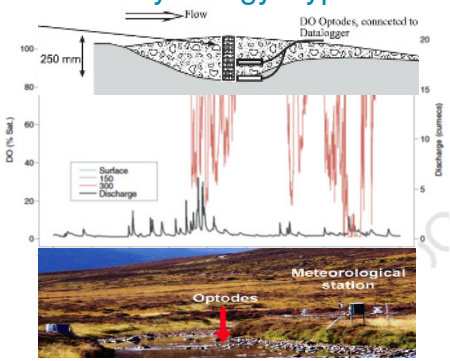

Bagshaw et al (2016)

Lake Metabolism



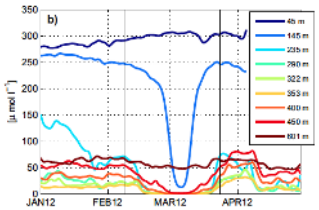
Peeters et al (2006)

Rivers/Hydrology/Hyporheic




Birkel et al (2013), Malcolm et al (2006, 2008, 2010), Soulsby et al (2008)

Morings

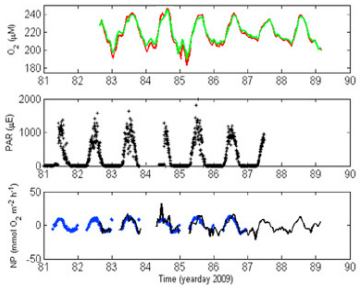


Stramma et al (2014), Viktorsson et al (2012)

Buoys

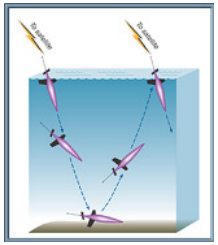
Jannash et al (2008), Bushinsky & Emerson (2013)

Gradients



McGillis et al (2011), Champenois and Borges (2012)

Gliders



Nicholson et al (2008, 2017)

# Laboratory Simulation and Measurement of Instrument Drift in Quartz-Resonant Pressure Gauges

Glenn S. Sasagawa and Mark A. Zumberge
University of California San Diego, Scripps Institution of Oceanography, La Jolla, California

*Poster presented at AGU meeting, San Francisco, December 2017*

## Results - Instrumental Drift Estimates From DWT and Zero Calibration Methods