Sustainable measuring strategies for the Ocean

Environmental monitoring using the OceanPack™

Robust, flexible, reliable and cost-efficient.

Designed for small vessels, pCO2 underway measurements

under extreme conditions

subCtech
Subsea Technologies

B.Sc. Saskia Heckmann
Chief Project Manager

Dipl.-Phys. Stefan Marx
Managing Director

Ships equipped during the last 4 years

Sustainable measuring strategies for the Ocean

Sailing Ships

Sailing systems

in cooperation

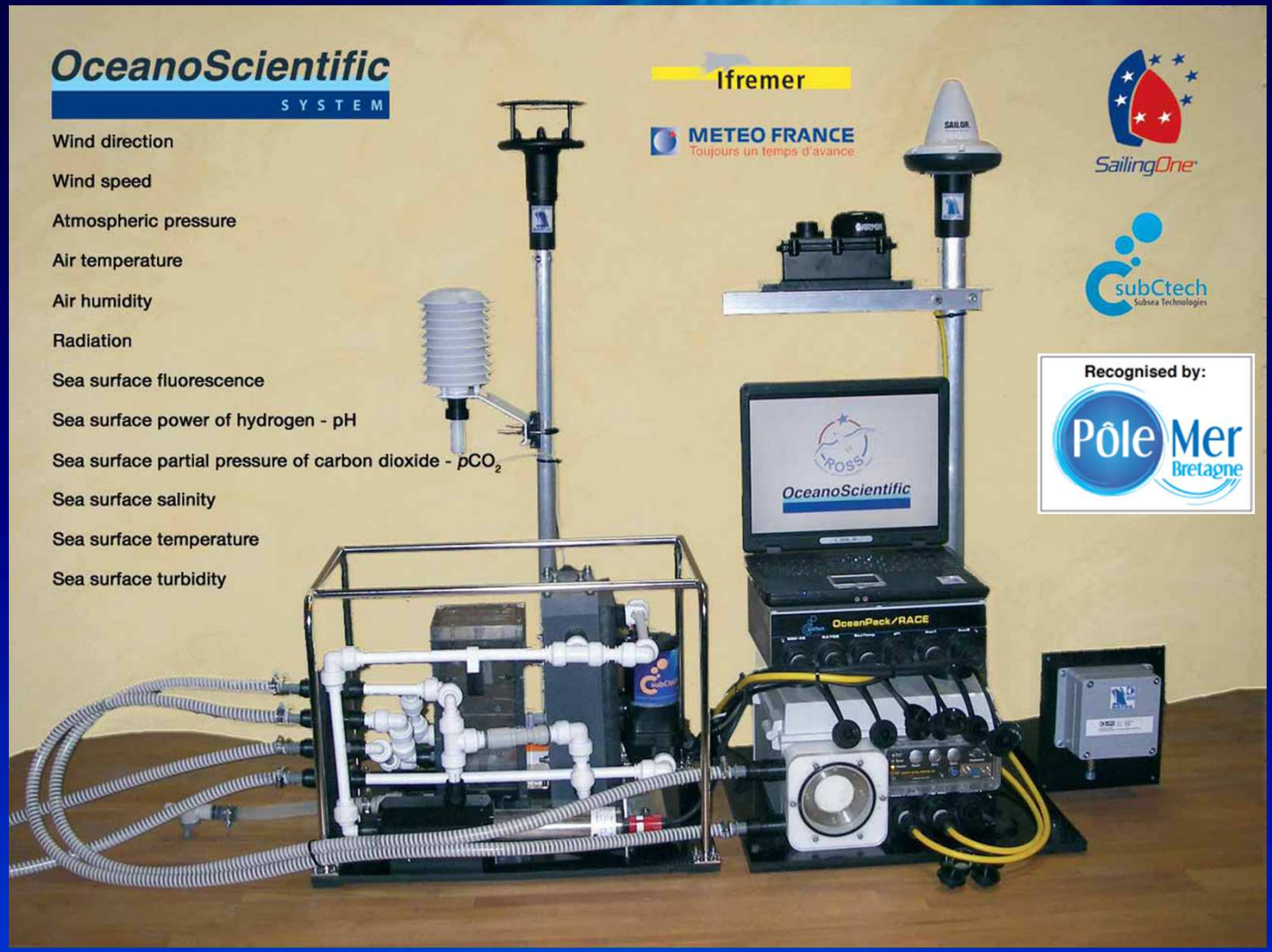
Recognised by: Pôle Mer Bretagne

SailingOne

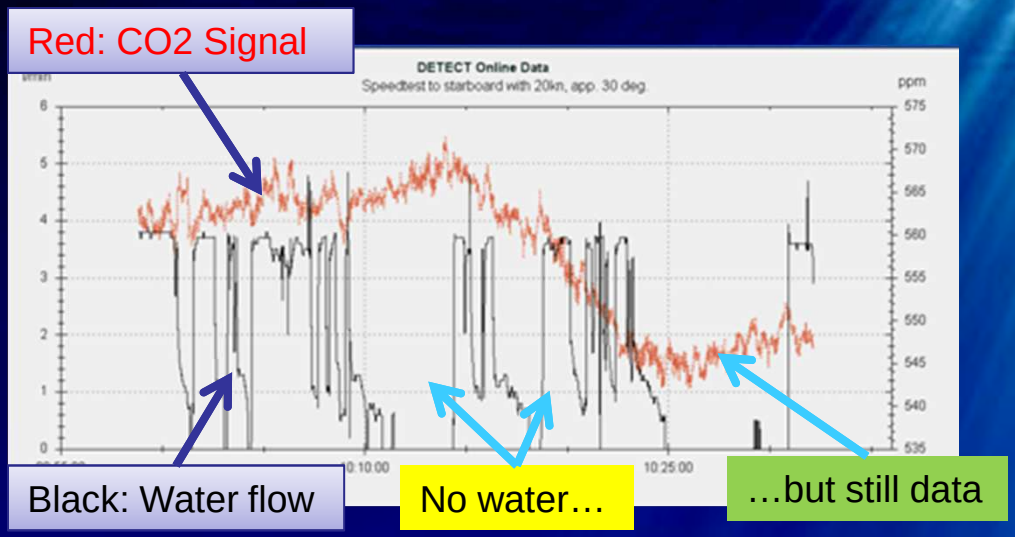
Pictures © by (top-down): SailingOne, Bark Europe, ALDEBARAN, SailingOne, Arved Fuchs

OceanoScientific® System:

First system 2010

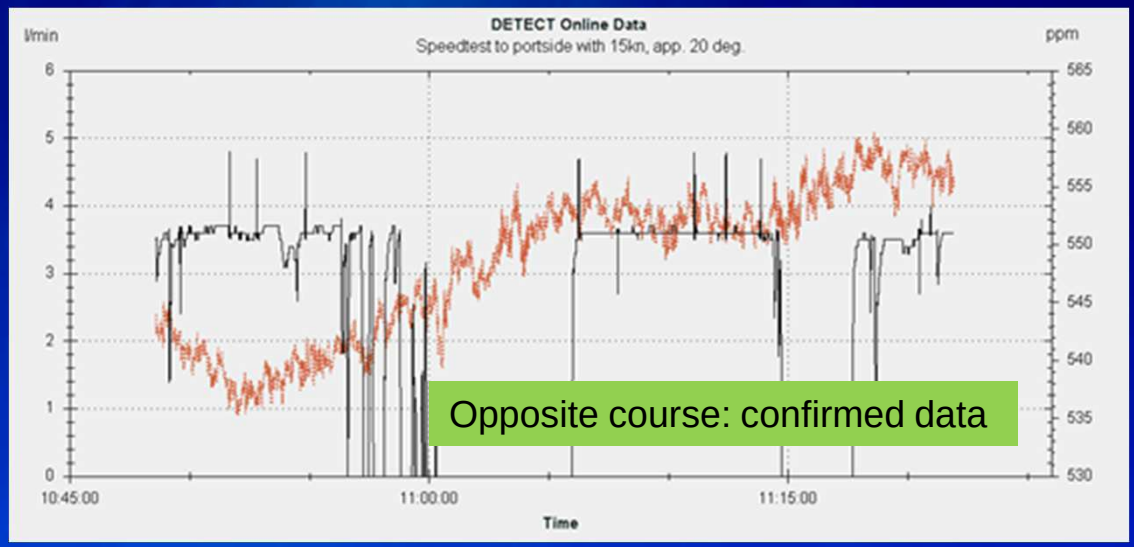


First tests in Brest



Verification at opposite course

Unprocessed raw data at 1 Hz



Worst-case „speed“ test

Photo SailingOne®

Video: www.youtube.com/watch?v=8CvUdUNcdsI&feature=related

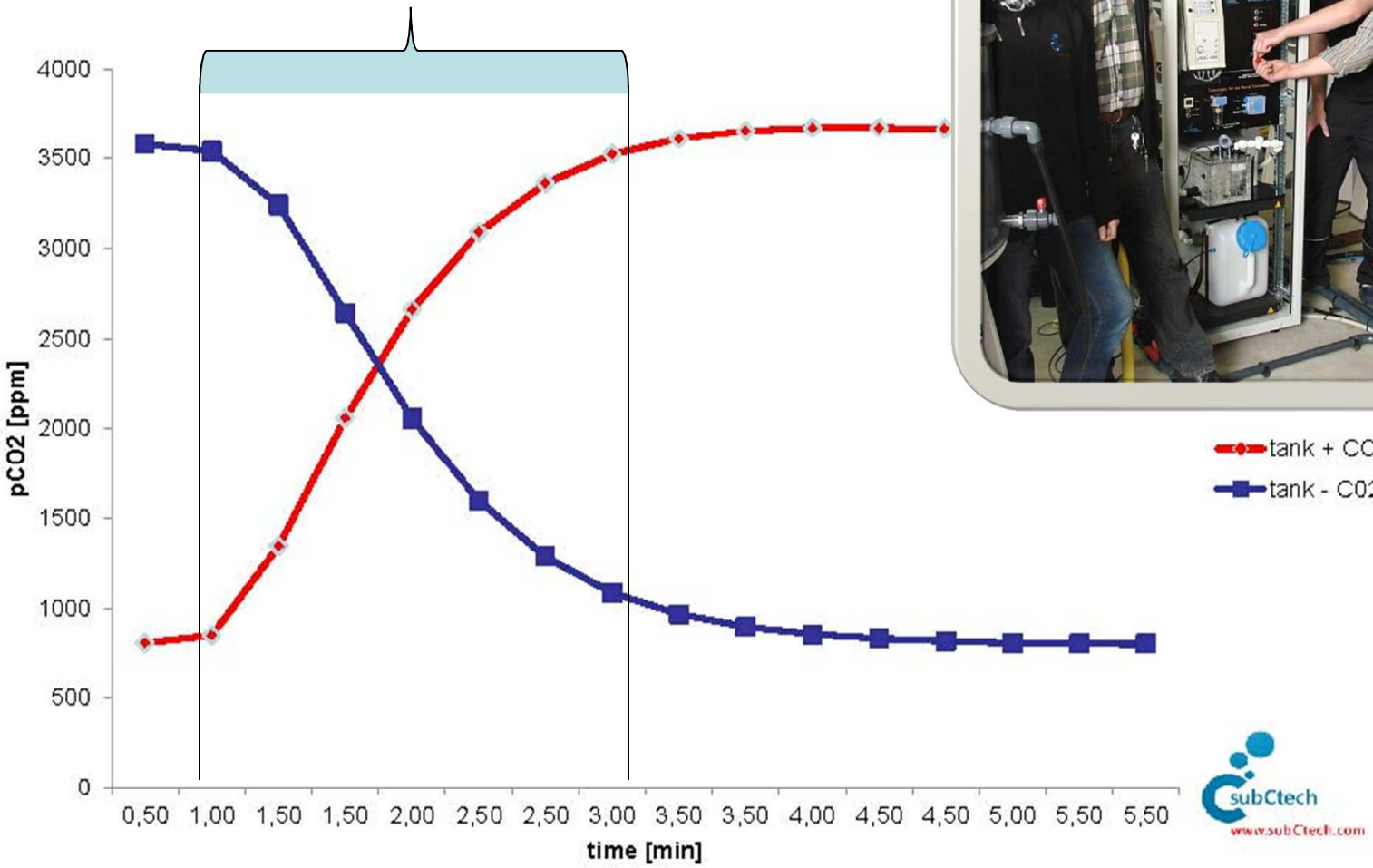
Gesellschaft für Marine Aquakultur Büsum

C | A | U Christian Albrechts Universität zu Kiel

First results:

New fast CO2 analyzing method realized

3 Minutes T90 for 3000 ppm

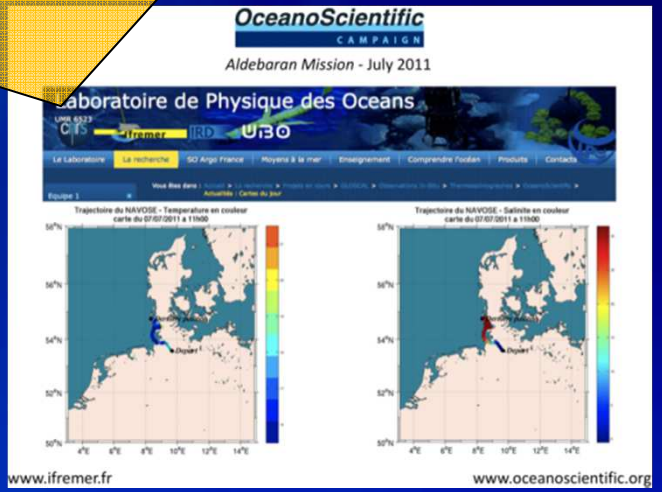


ALDEBARAN (Germany)
Meereswettbewerb 2011, 2012

Team of young scientist

Meteorology

www.meereswettbewerb.de
www.aldebaran.org



And in the evening input to the weather forecast

Press 2010: www.aldebaran.org/html/pressemitteilungen/2010/pm20100822.html

Recognised by:

Pôle Mer Bretagne

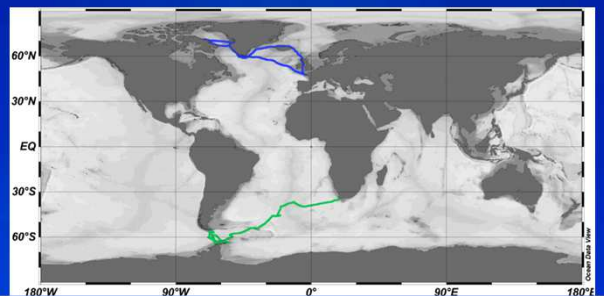
www.oceanoscientific.org

LA LOUISE (France)

5 Months Arctic (2012)
International presented

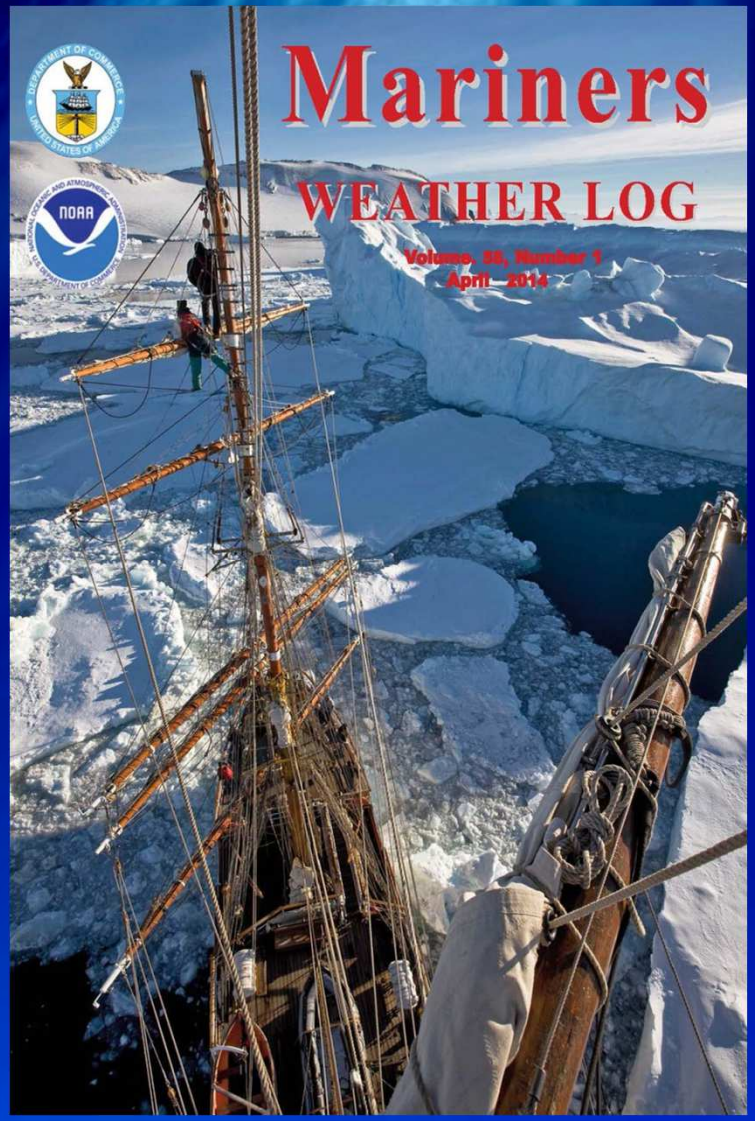
BARK EUROPA (Netherlands)

12 Months Antarctic (2012-2013)
12 Months Antarctic (2014-2015)



BARK EUROPA (Netherlands)

International recognized,
paper by NOAA



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DAGMAR AAEN (Germany)

3 Months Arctic (2014)
3 Years Antarctic (2015-2017)

Expedition PITTARIK Grönland 2014
www.arved-fuchs.de

Sustainable measuring strategies for the Ocean

Research Vessels

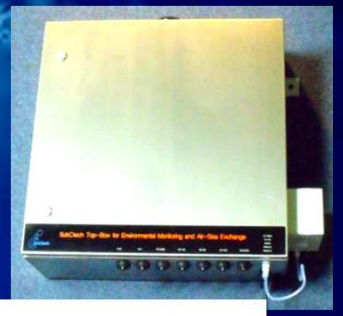
Sustainable measuring strategies for the Ocean

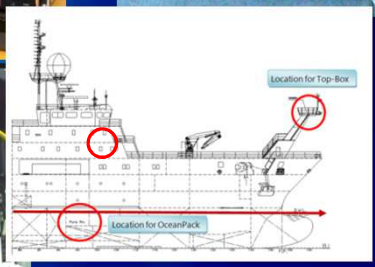
RV XE-XUE

since February 2012

China Sea

Data: Chinese Research Center





RV Belgica

since 2011

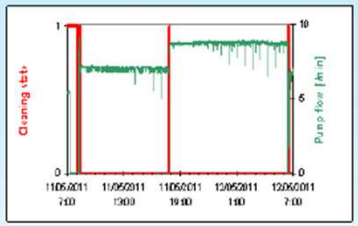
North Sea

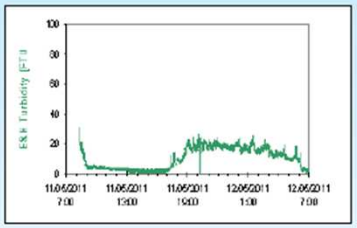
Data: MUMM

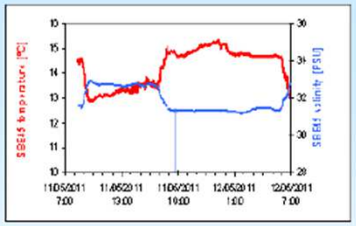
Pictures © by (top-down left): SubCtech, Belgium MUMM; (right): SubCtech

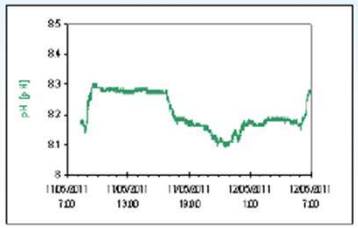
P dqdjhp hqw#X qlw#ri#wkh#Q ruwk#Vhd#P dwkhp dwlfdo#P rghov
P X P P #i#E P P #i#X J P P

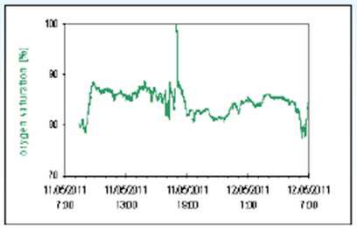
museum

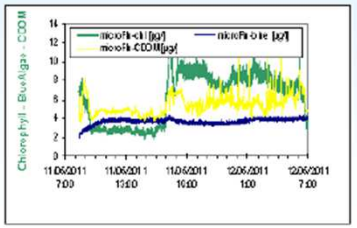


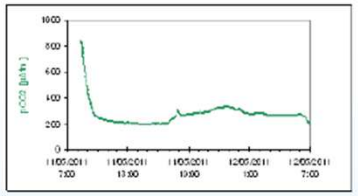


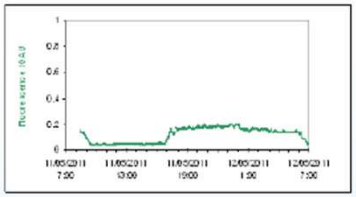


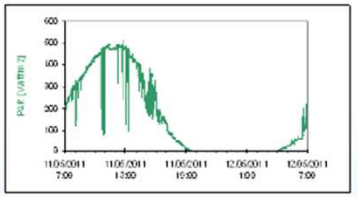


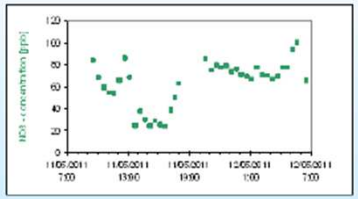


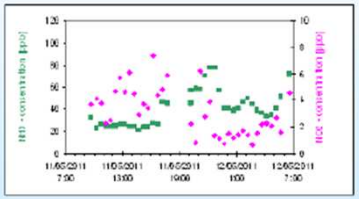


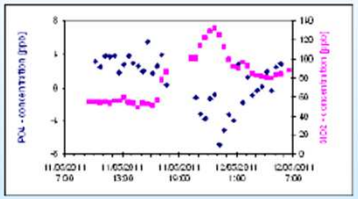












AUMS data

from 11 May 2011 07h00
till 12 May 07h00.

Sustainable measuring strategies for the Ocean

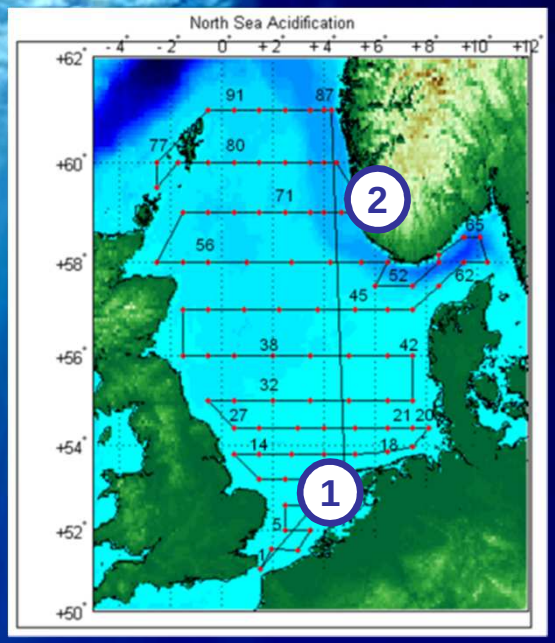
Photo NIOZ

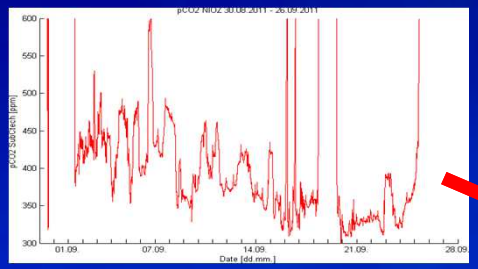
RV Pelagia

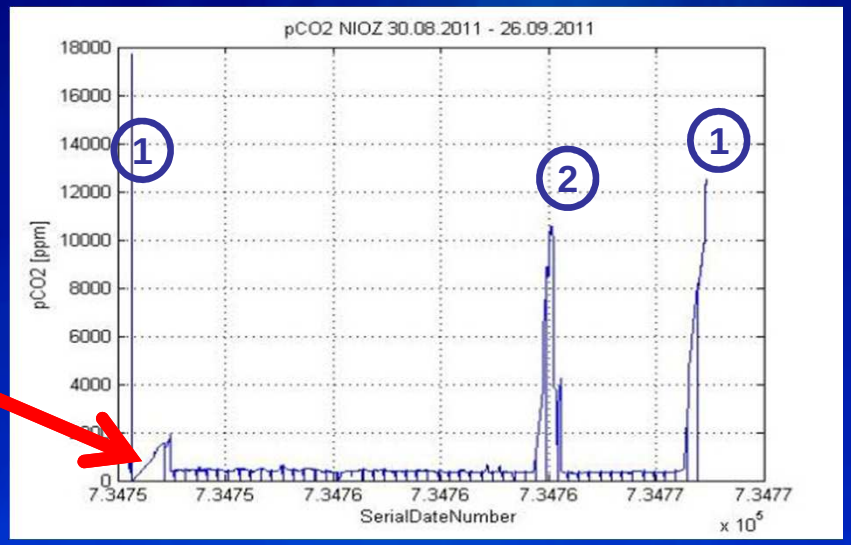
30.08.2011-26.08.2011

North Sea

Data: NIOZ







First result: 4 weeks continuously data – 1.5 Mio. Datasets

Notes:

(1) Start and return to NIOZ

(2) Touch & Go Norway

Sustainable measuring strategies for the Ocean

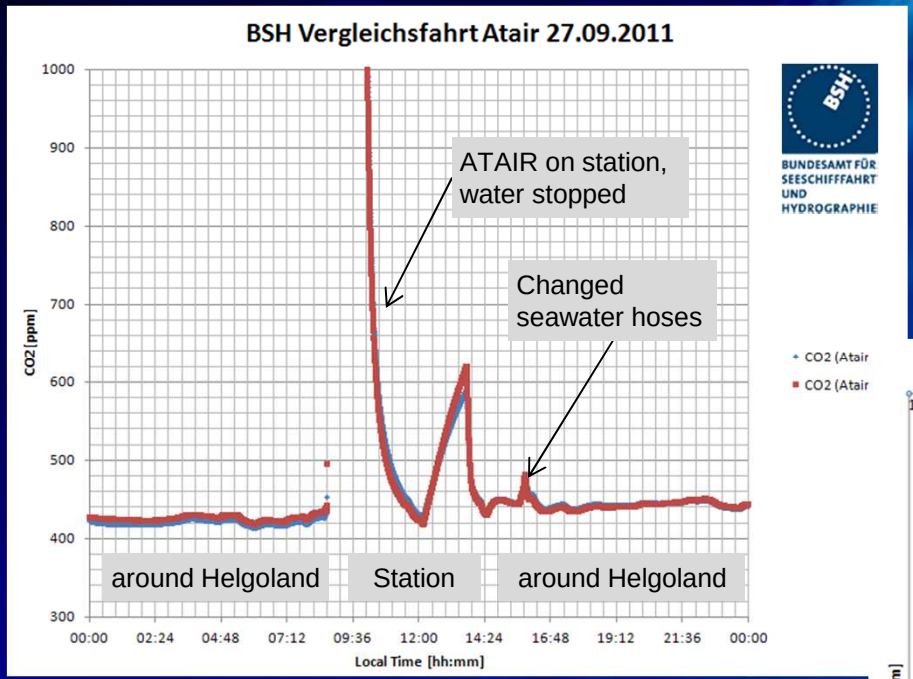
RV ATAIR

September 2011

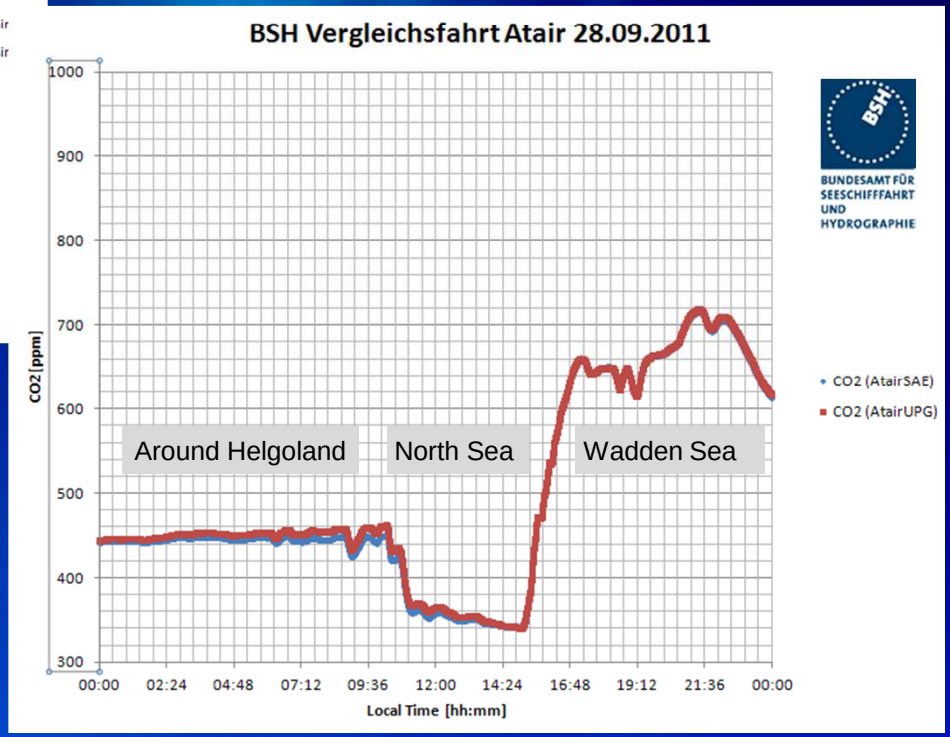
North Sea/Helgoland

Data: BSH

Photo BSH



Trip around Helgoland



Helgoland to Weser estuary

Sustainable measuring strategies for the Ocean

FS POLARSTERN

15 Months Antarctic (2012-2013)
12 Months Antarctic (2014-2015)

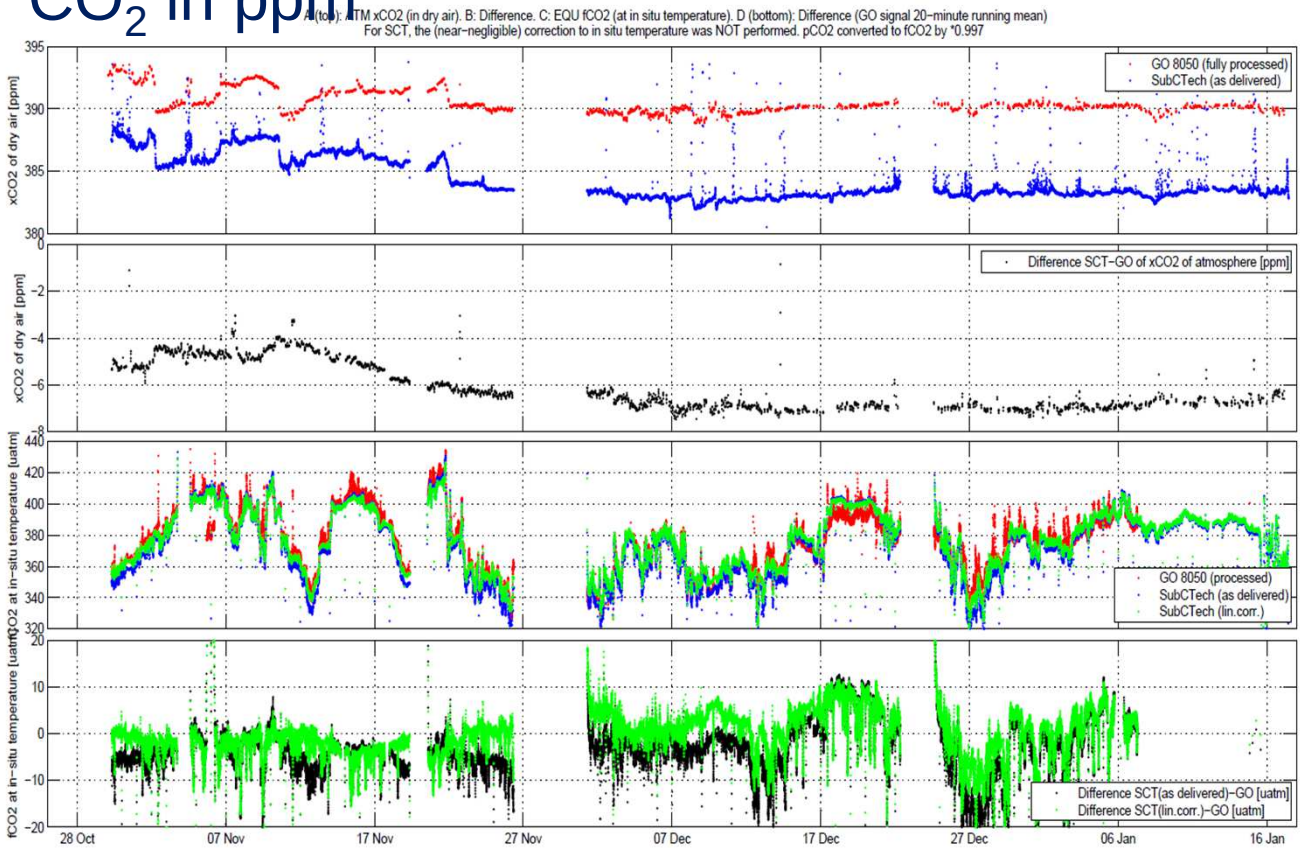
Air-Intake
- Air-CO_2
- Arctic Version
- Protection against 30s of flooding

Top-Box
- Air-CO_2
- Meteorological Datalogger
- Arctic Version -40°C
- Fully Autonomous
- Low Maintenance
- Connected by Ethernet

Water Supply
- Constant Flow & Pressure
- Supply for analyzers
- Gas neutral, e.g. for CO_2
- Fully Autonomous
- Low Maintenance

OceanPack
- Water pCO_2 “Underway”
- Oceanographic Datalogger
- Multi-Sensor Support
- Fully Autonomous
- Low Maintenance

CO_2 in ppm



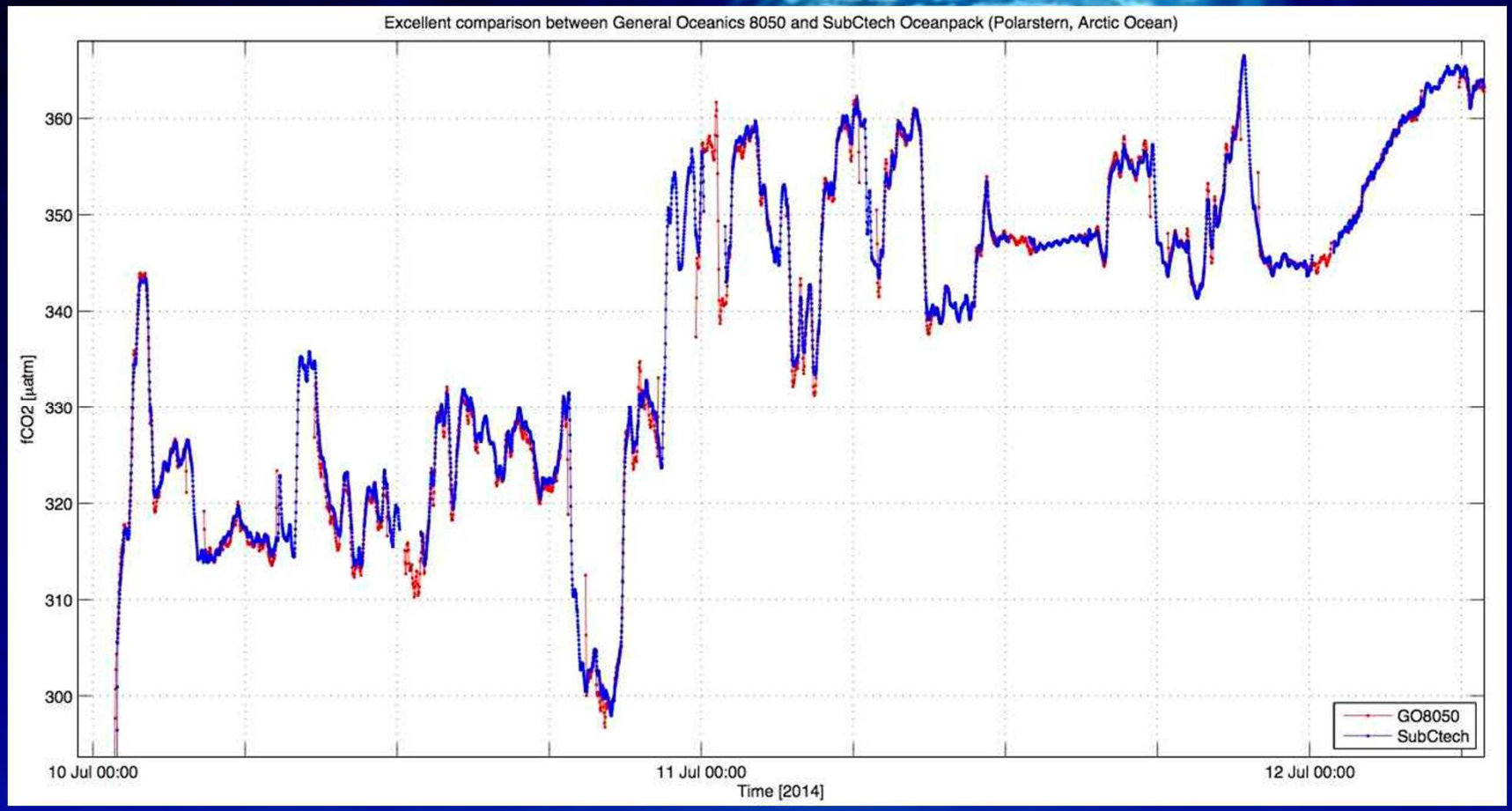
Differences in CO_2

Data NIOZ/Uni GroningenI

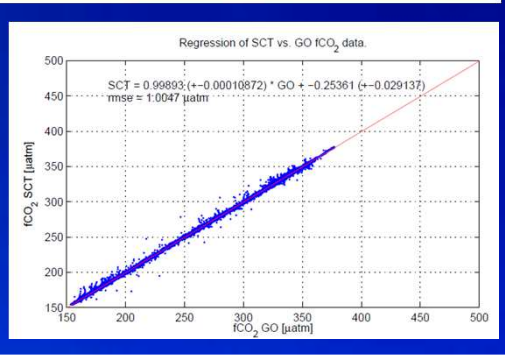
2012: First results - promising, but issues to fix.

Offset → additional fully automatic span gas calibration

Pressure dependencies → internal compensation, new processing



Data NIOZ/Uni Groningen/AWI



2014: New results– improved technology

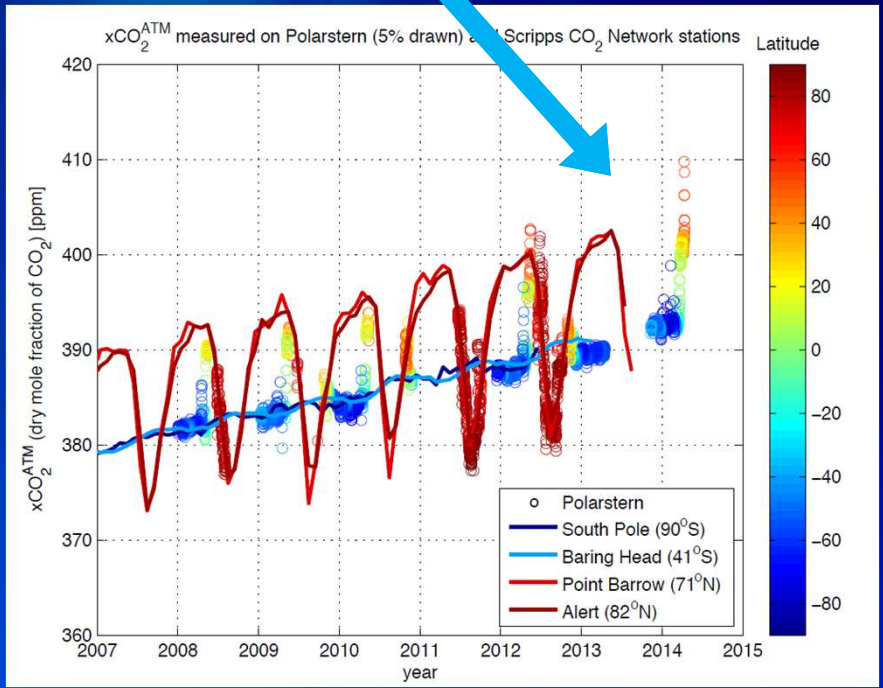
POLARSTERN

Works all the time.

„Thanks for those data! The latest comparison is excitingly good. … Thanks again and all the best,“
Steven van Heuven, NIOZ, 01.Aug.2014

„I took a very detailed look at the datastreams from the past three weeks. … I obtained an extremely good comparison between the GO and SCT systems…. I'll note that the very good fit between the two instruments is all the more remarkable in light of the highly spatially variable region that Polarstern is currently sailing in (which could create large errors if small differences in response time existed between the two instruments).“
Steven van Heuven, NIOZ, 02.Juy 2014

NEW data 2014 for pCO2 !!



Sustainable measuring strate

Our feedback.

2013 SubCtech and SailingOne receiving the French-German Prize of Economy award.

It is under the patronage of Dr. Philipp Rösler, Germany's Federal Minister of Economics & Technology and German Vice-Chancellor; and Pierre Moscovici, France's Federal Minister of Economics and Finances.

2013 SubCtech becomes an approved vendor for CAMERON and OneSubsea to supply products in the Offshore Oil+Gas market. Certifications for MIL, UL, IPC, ISO 9001

2012 Saskia Heckmann received the VDE award for outstanding academic achievements at SubCtech:

Improvement of the pCO2 equilibrator system.

2012 SubCtech becomes member of the France Excellence Cluster „*Pôle Mer Bretagne*" with the *OceanoScientific® Systeme* together with IFREMER and Meteo-France.

2010 Nathalie Kosciusko-Morizet, French Minister of Ecology, Sustainable Development, Transport and Housing, signs the official letter of patronage for the OceanoScientific® Programme and its recognition by the *"Le Club des Explorateurs du Grenelle de la Mer"*

Thank you for your attention

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Improvements with scientist for scientist

- Calibration unit with calibration and reference gases for the water measurement
- Including formulas for direct compensation of water temperature
- Including formulas for direct flux calculation
- Detailed testing of the Air CO_2 measurement