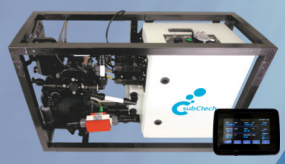
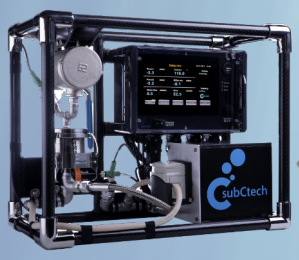
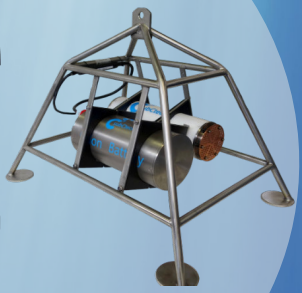
Ocean Monitoring

2021 2030 United Nations Decade of Ocean Science for Sustainable Development



Systems





Sensors / Analyzer

© AWI

©Boris Herrmann Racing

OceanPack™ & pCO_2 Analyzer

Modular, easy to use and reliable monitoring systems.
Water quality monitoring for: profiling, underway and mooring

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LI-COR inside

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subCtech Subsea Technologies

OceanPack™ Family

SubCtech presents a potent and cost efficient platform with its OceanPack™ measuring system. It consists of several high-end SubCtech products.

OceanPack™ RACK

Classical "FerryBox"-design, flexible, expandable

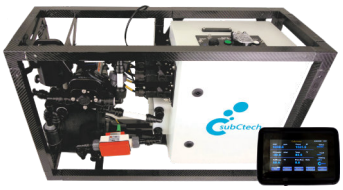
- Robust, versatile and standard 19" racks
- Water system fully removable for easy service
- CO2 tolerant debubbler mBubbler® for gas analysis
- Built in NetDI® data logger
- The data logger marks data automatically with quality flags
- Auto-zeroing calibration for high-accuracy long-time operations
- Easy integration of instrumentation through NetDI® data management system connected simultaneously by
- up to 30 serial interfaces
- Expandable through the optionally RS485 bus

OceanPack™ CUBE

Compact, versatile measurement system

- 19-inch rack format allows the mounting of 19-inch standard frames
- Touch Screen: the new 7" touch screen enables an intuitive control of the device
- own flight-case for fast and safe shipping
- Internal sea-water pump for below or above the waterline installation
- NetDI® data logger, robust Flat-Membrane-Equilibrator

OceanPack™ RACE



Highly mobile, extremely robust

- PCO2 carbon ocean-lab + optional Air- CO2
- 24V DC power supply, <30W operate, <14W standby
- 15 kg lightweight mechanical frame
- Up to 10 sensors/analyzer
- Sensors mostly calibration-free for approx. 1 year
- Integrated small debubbler mBubbler® for gas-tolerant de-airing
- Anti-Fouling design

Technology	OceanPack™ flow-through systems (also known as FerryBox or Underway System) with NetDI® for manifold measurement platforms: research vessels, ships of opportunity, platforms, racing yachts
Sensors	Nearly any oceanographic sensor can be integrated into OceanPack™ (e.g. pCO_2, SST, SSS, D.O., algae). In addition, external devices can be included: nutrient analyzers, water samplers, meteorological stations, GPS, Air-CO_2 analyzers - up to 30 sensors/analyzer
Calibration	All provided sensors are mostly calibration free for approx. 1 year. The SubCtech analyzers incorporates a fully automatic self-calibration (e.g. for achieving SOCAT conform quality data)
Storage	Self-recording on 32 GB SD cards, data download via USB
Pump	Self-priming low-power sea water pump, corrosion free
Debubbling	Integrated Debubbler mBubbler® unit for gas-tolerant de-airing, works up to ± 30° roll angel

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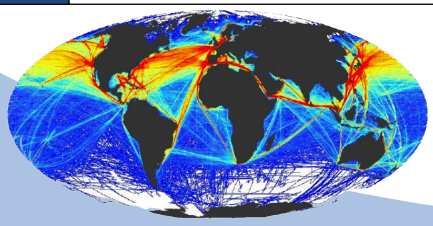

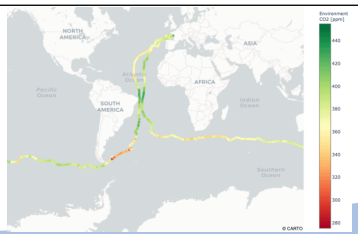

Sensors / Analyzer

Instruments for greenhouse gas measurements (CO_2 and or CH_4) in water and air

Ocean Xpert-Lab IR-CO_2

Mobile flow-through analyzer for precise pCO_2 measurements

- Premium optical NDIR LI-COR® analyzer Li-850x
- High precision
- Auto calibration, SOCAT-ready
- Simple Touch-screen operation via NetDI®
- Lowest maintenance
- Robust against sediments, fouling, shock & vibration
- Operates on small vessels or underway systems
- Optionally Top-Box contains GPS, AIR-CO_2 analyzer or meteo sensors

Ocean Xpert-Sea IR-CO_2

Precise optical Subsea pCO_2 analyzer

- Premium optical NDIR LI-COR® analyzer Li-850x
- Robust, versatile and compact submergible housing for buoy and subsea applications (e.g. monitoring Offshore Oil&Gas or CCS)
- ROV or AUV integration
- optional external Li-Ion PowerPack™

Ocean Xpert-Lab Laser-CO_2/CH_4

Underway analyzer for precise pCO_2 , H_2O and pCH_4 measurements

- Los Gatos greenhouse gas analyzer
- High precision
- Simple Touch-screen operation to control the NetDI® controller and datalogger
- Second display to show Los Gatos analyzer interface
- 5 USB-ports

Specification - LI-COR® sensor

Sensor Technology	High-performance LI-COR® LI-850x or LI-7200 ● exclusively produced by LI-COR® Biosciences for SubCtech ● Dual-wavelength NDIR detector for CO_2 and H_2O or CH_4
Equilibrator	Silicone flat membrane equilibrator ● Lifetime >10 years ● Fast response time ● No sedimentation or fouling ● Fast exchange with membrane cassettes ● Patent pending
Range	Standard 0 ppm ...3000 ppm CO_2 ● 0 ppt...80 ppt H_2O ● up to 10% CO_2 ● Selectable units
Resolution	0.01 ppm CO_2 ● 0.001 ppt H_2O
Accuracy	Overall accuracy < 1% ● Compensation for water vapor, pressure and temperature effects With auto-calibration < 1ppm ready for SOCAT database
Sample Rate	Configurable, typ. 1 Hz self-recording and real-time output ● Configurable data format
Calibration	Factory calibration with 15 traceable gases to WMO standards for CO_2 ● NIST traceable LI-610 portable dew point generator for H_2O ● User correction supported
Auto Calibration	Auto zeroing at programmed intervals ● Zeroing reference included for >1 year operation time Manual span and optional full auto-span gas calibration, up to 3 gas inputs
Data Interface	RS-232 or RS-485 ● Simple standardized ASCII NMEA-0183 data protocol ● Easy integration with existing systems ● Optional usage of radio links, Ethernet,WLAN etc.
Analogue Output	0 V...2.5/5 V or 4 mA...20 mA ● Range can be configured

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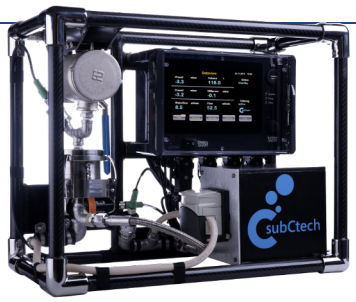
Solutions

Modular and flexible monitoring solutions for the marine environment

- Complete systems
- Lowest maintenance
- Robustness for harsh environments
- Long-term deployments
- Autonomous operation
- Fully integrated gas analyzer
- Automatic calibration and referencing
- Small and lightweight design
- Open design for a multitude of sensors
- OceanView™ Windows® software

Microplastic Sampler

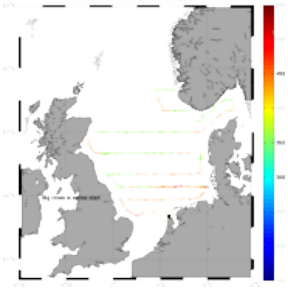


Sailing meets Science™ - microplastic automatic sampler

- Robust, versatile and compact water proof design
- Highest efficiency sampling, even for high speed boats with 30kn
- On board sampler: smallest size, low weight and low power (size like a shoebox)

Volvo Ocean Race: round the world 2018-19
© Volvo Ocean Race. Data source: Dr-Ing. Sören Gutekunst and Dr Toste Tanhua, GEOMAR Helmholtz Centre for Ocean Research Kiel

Racing Yacht "Malizia"
©Boris Herrmann Racing



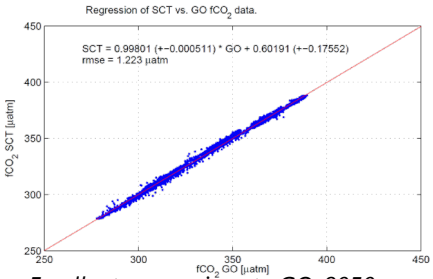
North Sea data: 1.5 Mio. Datasets by NIOZ

Ocean Xpert-Air IR-CO_2

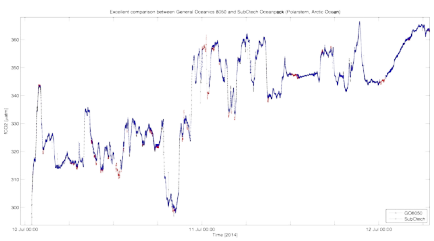
OceanPack™ System addition to measure Air-CO_2

- The LI-COR® pCO_2 analyzer is already included and fully configured
- Complete, flexible and easy to maintain
- Handy design: small size and low weight, can be operated on small vessels
- No or little post-processing necessary
- Best accuracy and long-time stability
- Can be operated unattended

Polarstern Data



Excellent comparison to GO-8050: data by NIOZ and AWI



AWI RV Polarstern 2013-2019+ comparing GO-8050 to OceanPack™

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