Robust technology for autonomous measurements of climate data and microplastics *for all types of ships*

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SubCtech GmbH

**11th FerryBox Workshop, 28-29 Sep. 2022, HZ Hereon Geesthacht**

Zukunft Meer
sea our future

2021
2030 United Nations Decade of Ocean Science for Sustainable Development

clean seas
turn the tide on plastic

- We need data to understand ocean and climate processes, but...
  ocean data coverage is not homogeneous, large gaps exist
  Source: Boris Kelly-Gerreyn; NOC, EuroGOOS FerryBox Meeting, Goteborg 16-17 March 2010
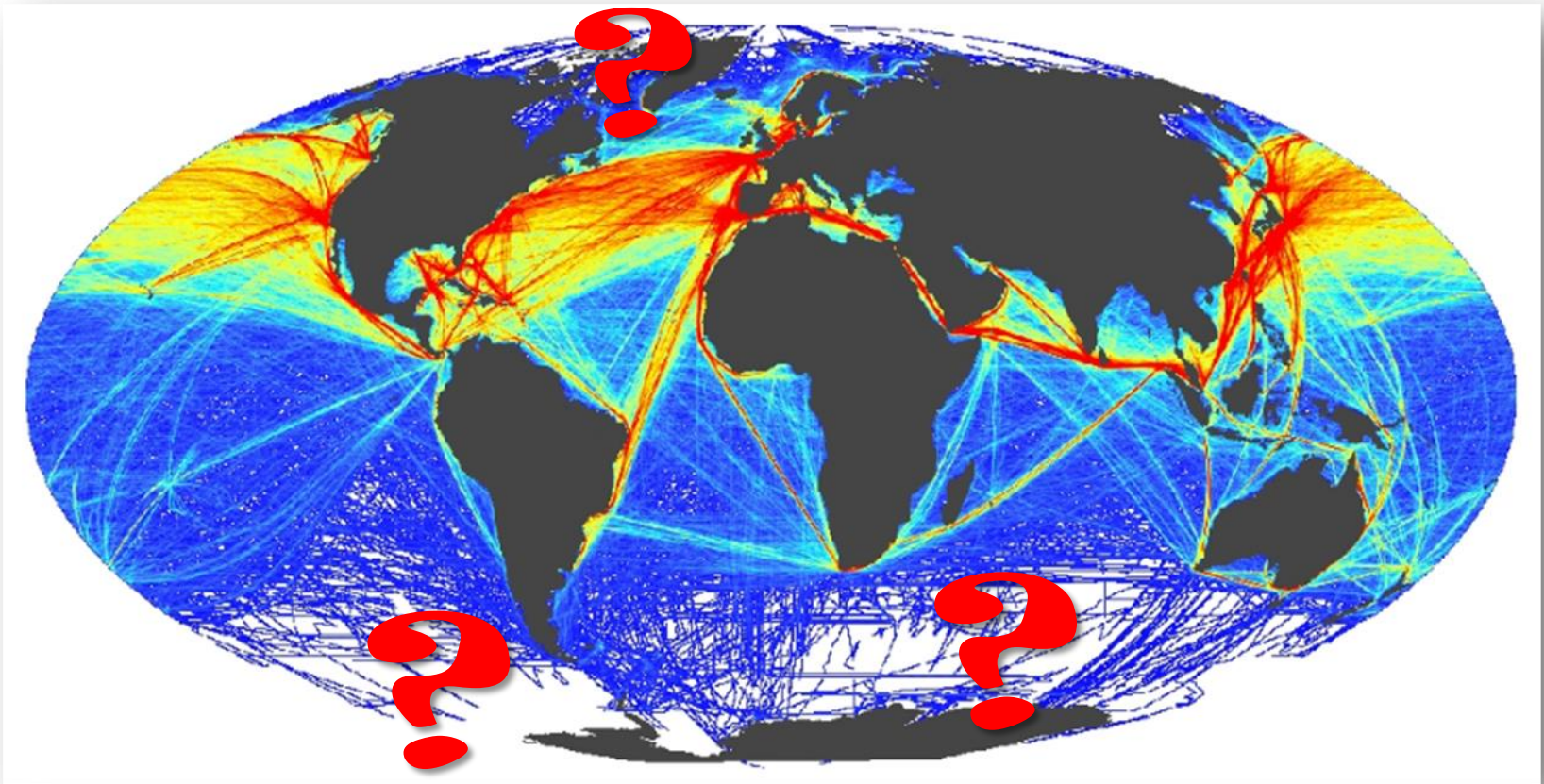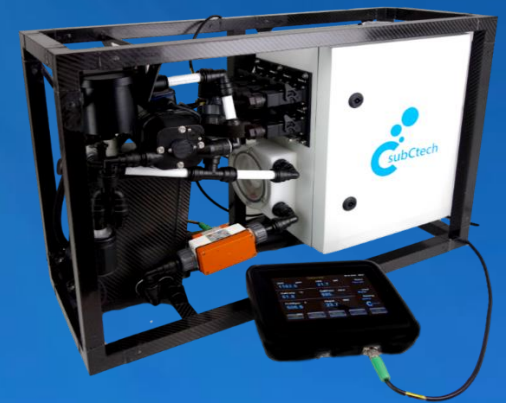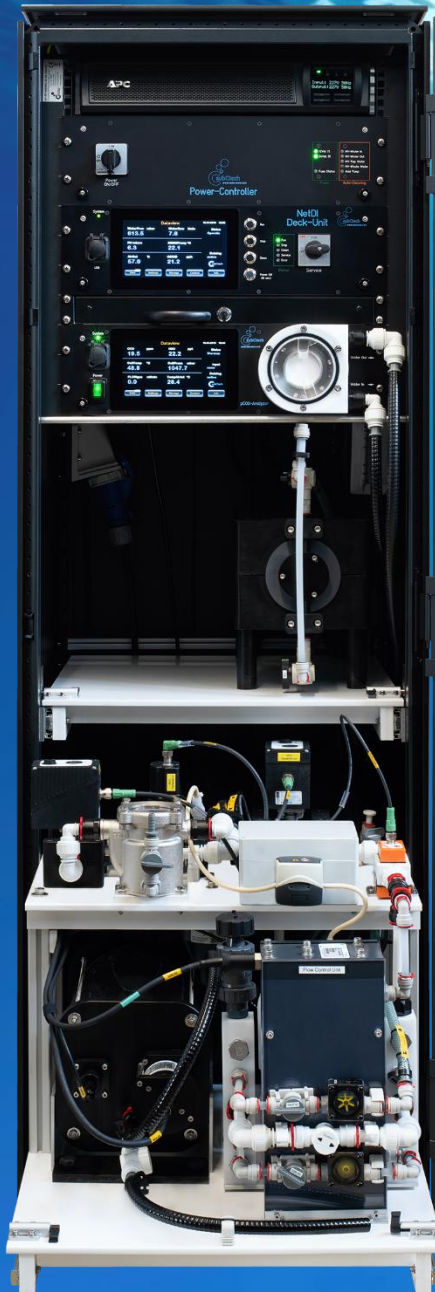

- Data coverage is good in some regions, but large areas are still unknown.
  ⇨ effects on energy transport/climate models & predictions, etc.

OceanPack™

Ocean Monitoring Systems

Autonomous

Industrial

RSV Nuyina, © AAD/Flying Focus

Standardized

Simplified

Main Rack

- Power controller / UPS
- NetDI Deck Unit:

  controller, data logger and data interface
- pCO$_2$ Analyzer
  with auto-calibration
- Sensor integration:
  debubbler / bypass
- Automatic cleaning

Nutrients Rack

- RO water tank
- Systea Nutrient Analyzer
- Cool storage for reagents
- Automatic cleaning
- Water supply and data:
  integrated with main rack or stand-alone

Parameter & Sensors

- Water CO_2
- Air CO_2
- TSG (SSS, SST)
- Optode (DO)
- SeaFET (pH)
- LISST 200x (particles)
- Fluorometer (div)
- PhytoFlash
- Water sampler
- Automatic cleaning
- Automatic calibration

DAMEN

EMS

Australian Government
Department of the Environment and Energy
Australian Antarctic Division
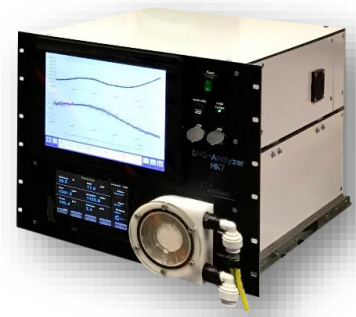
© CGTN

Parameter & Sensors

- Water CO_2 (CRDS)
- TSG (SSS, SST)
- Optode (DO)
- SeaFET (pH)
- LISST 200x (particles)
- Fluorometer (div)
- Nutrient analyzer
- Automatic cleaning
- Automatic calibration

OceanPack Rack

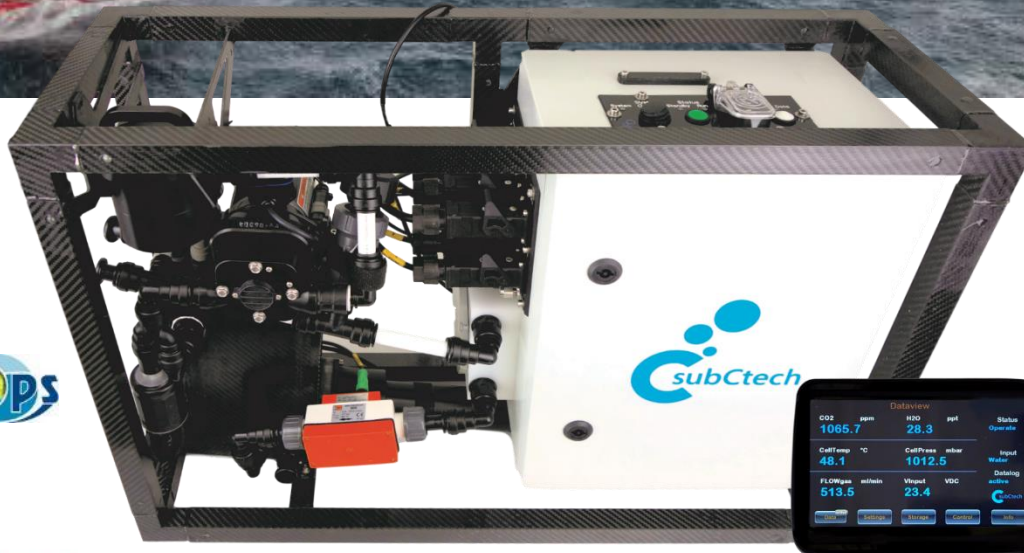Ship Water Sampler

Laser Spectrometer

Display

Polar Research Institute of China · 1989 ·

江南造船（集团）有限责任公司
Jiangnan Shipyard(Group) Co.,Ltd

Volvo Ocean Race 2017-18

© Photo Volvo Ocean Race

Dataview

CO2 ppm	H2O ppt	Status
1065.7	28.3	Operate
CellTemp °C	CellPress mbar	Input
48.1	1012.5	Water
		Datalog
FLOWgas ml/min	Vinput VDC	active
513.5	23.4	

Ocean Summit
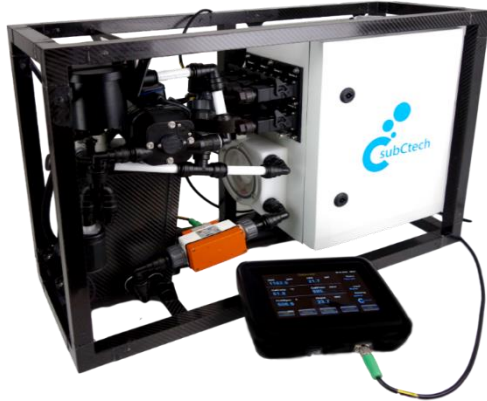
OceanPack™ RACE® 6th generation
autonomous monitoring system for greenhouse gases (CO_2), temperature, salinity, algae etc.

© BorisHerrmannRacing, Photo Jean-Marie Liot/Malizia 2020

© Fabrice Amédéo, Kapitän der Newrest - Art & Fenêtres, Photo Pierre Bouras #VG2020

"An unprecedented circumnavigation of high quality CO_2 data in 80 days. I think this has never been done before. That is a great testimony to the instrument that it survived a very bumpy ride!"
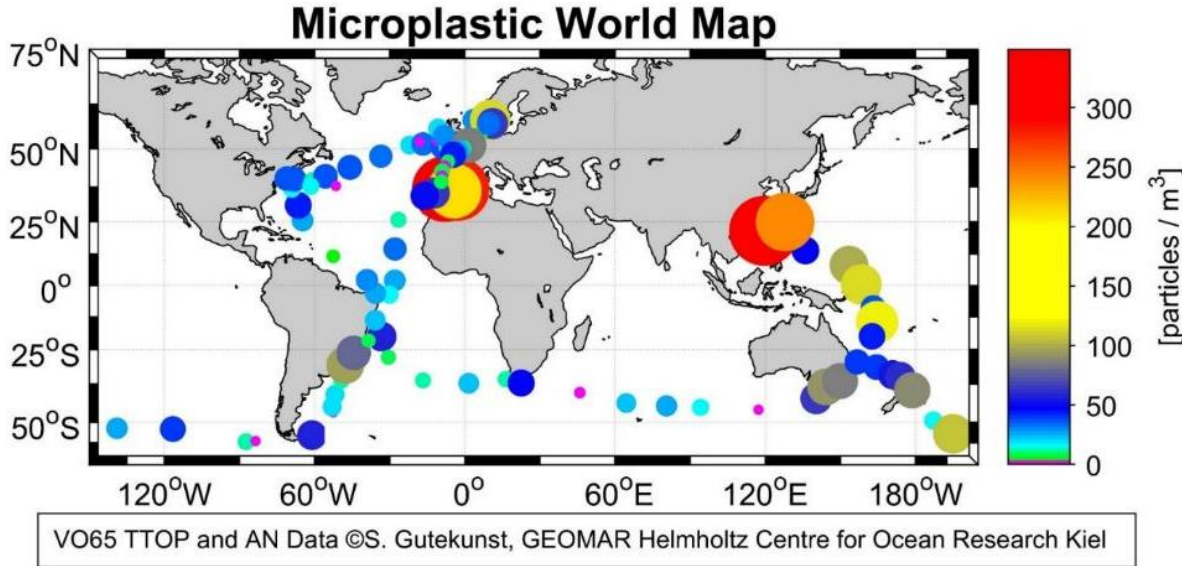Toste Tanhua, GEOMAR
Feb. 2021
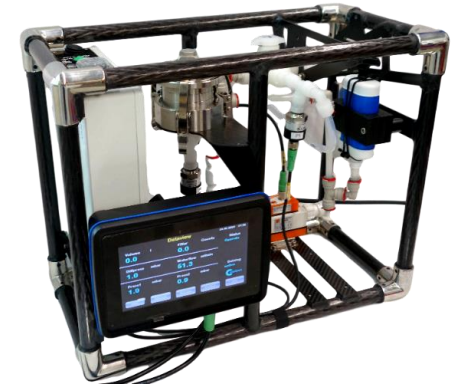
RACE® Microplastics Sampler
flow-through

RACE® Microplastics Sampler
for autonomous operation

Microplastic World Map

VO65 TTOP and AN Data ©S. Gutekunst, GEOMAR Helmholtz Centre for Ocean Research Kiel

Microplastics data by GEOMAR (Toste Tanhua, Sören Gutekunst),
© Image Volvo Ocean Race, 2017/18.

- Two sailboats: TTOP, AN
- Subsurface sampling (0.5-1.5m depth)
- 30, 100 and 500 µm
- 96 locations sampled, µ-plastics in 93 locations

### Along-track CO2 during Vendée Globe 2020/21

- ➢ **80 days 24/7, round the world**
- ➢ **not a single record is missing**
- ➢ **no instrument errors**

(Toste Tanhua, GEOMAR; Peter Landschützer, MPIM; Team Malizia)
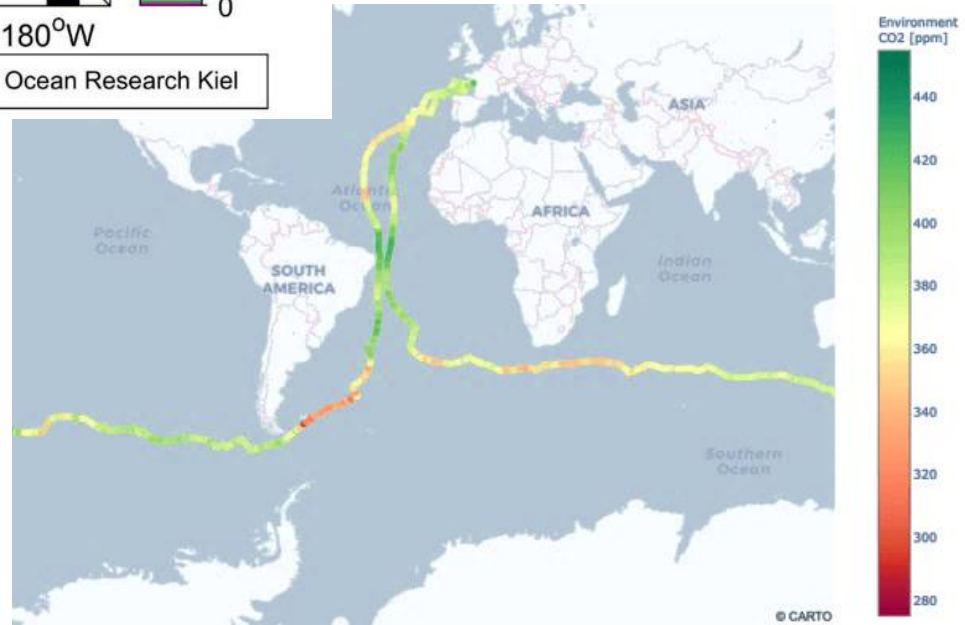
"A new era of sailing for science is beginning, with support for vital ocean observations from the high-profile round-the-world Vendée Globe yacht race."

News from **WMO -** Sailing for Science | World Meteorological Organization (wmo.int)

© Photo Volvo Ocean Race
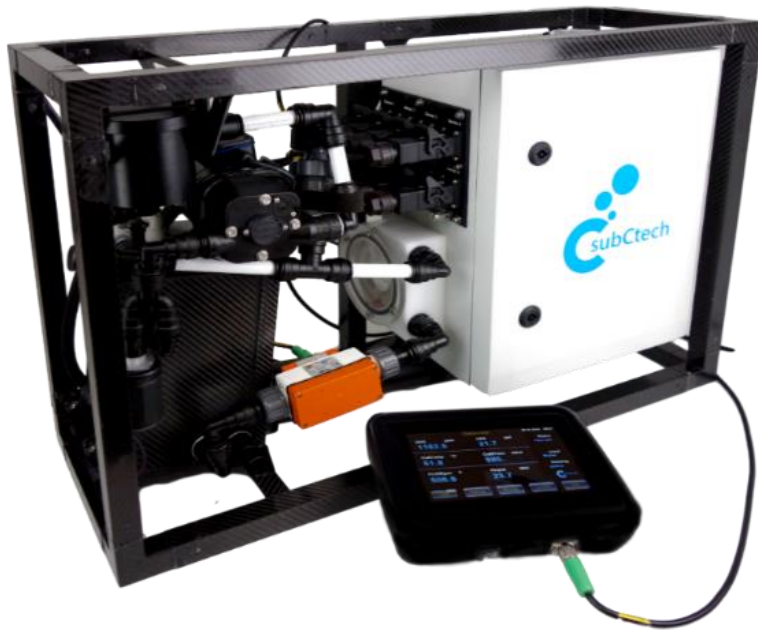
OceanPack™ RACE® 6th generation

- Maintenance free and simple to use
- NMEA-0183 data recording
- State-of-the-art LI-COR® gas analyser
- Automatic calibration
- Proven track record since 2009

- Operating at ±30° roll, high speed
- Low-power 25W to 75W
- Compact and lightweight
- Modular and expandable
- Real-time telemetry

- Mobile OceanPack™ solution
  → for smaller / charter vessels
- Ruggedised; robust flight case
- Simple installation: Plug & Play

- *p*CO2 Analyzer with auto-calibration
- Sensor integration: debubbler or bypass
- External sensors: benchtop, meteo, etc.
- Automatic cleaning

RACK

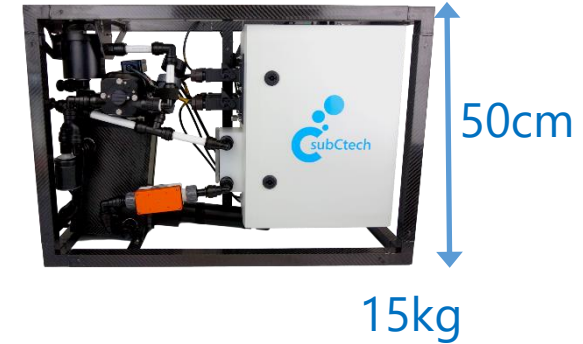# CUBE

RACE

2m

1m

50cm

15kg

~50kg

RSV Nuyina, © AAD/Flying Focus

UCadiz © Uni Cadiz

© BorisHerrmannRacing

A RACE WE MUST WIN
CLIMATE ACTION NOW!

- **A**utonomous **U**nderway **M**easurement **S**ystems (autonomy for several months)
- Measuring of all typical parameters of the ocean surface and meteorology
- Latest sensors: highest precision and accuracy
- Automatic: water supply, calibration, cleaning, diagnosis, processing, recording, transmission

OceanPack™

subCtech

Thank you!