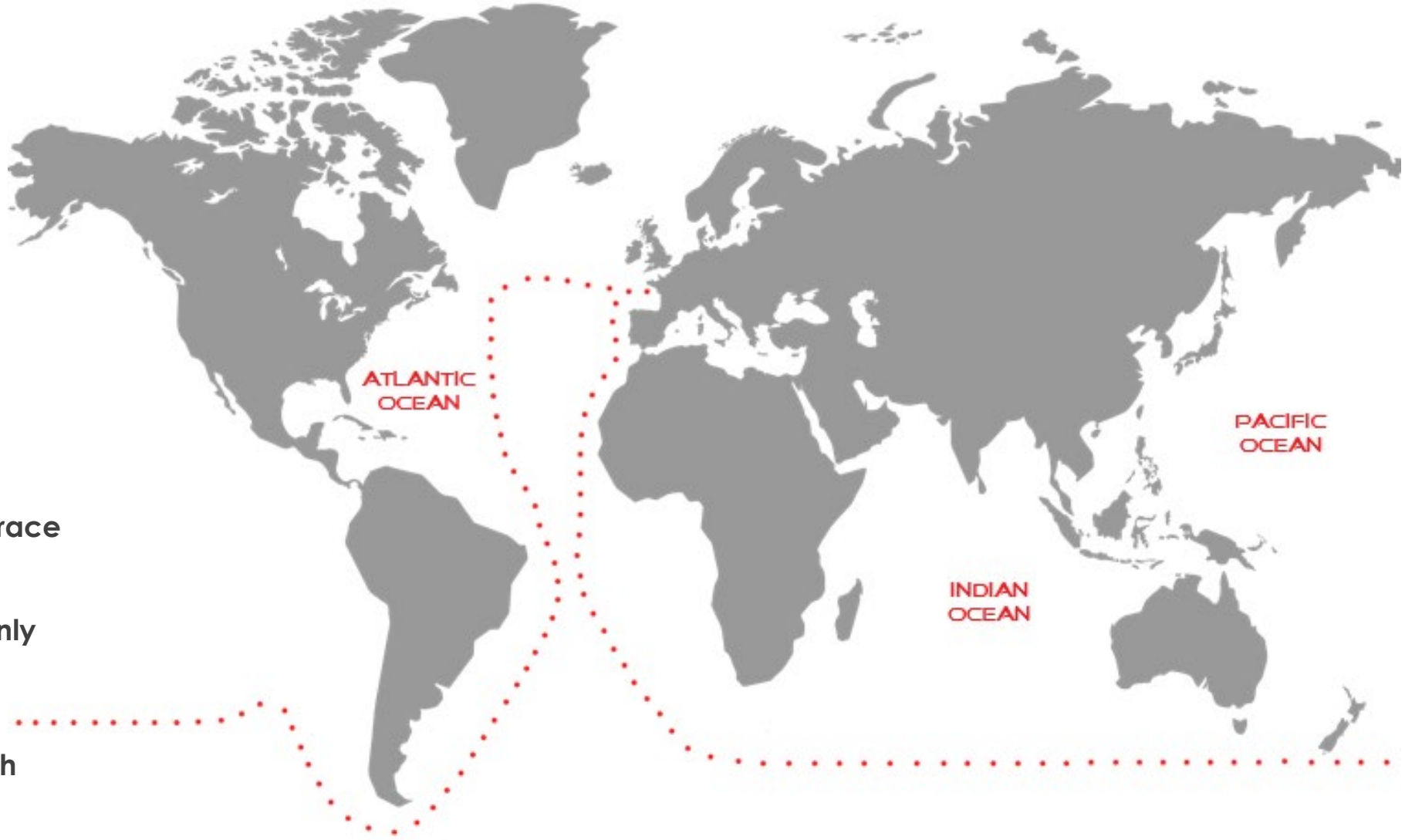
Vendée Globe 2024

Ocean Racing and Ocean Data Collection

THE VENDÉE GLOBE

OLIVER HEER OCEAN RACING

vendéeglobe
Les Sables d'Olonne



- 44,000 km solo, non-stop, unassisted, round-the-world race
- Since the first race in 1989, only 114 people have finished
- Only 50% of competitors finish

MY JOURNEY

OLIVER HEER OCEAN RACING

A LONG WAY

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120,000+ Nautical Miles

12 Transatlantic

5 Equator

50+ Offshore Races

2 World Records

MANAGING THE BOAT

MANAGING YOURSELF

An Effort for Sustainability

OLIVER HEER OCEAN RACING

Climate Neutral Campaign

In partnership with **ClimatePartner** we deliver a climate neutral Vendee Globe campaign

Ocean Data

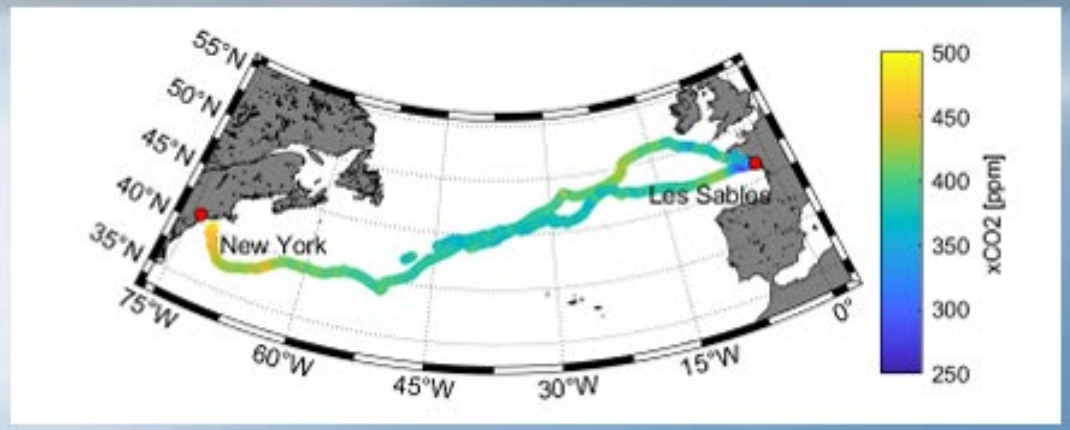
In collaboration with leading scientists, we collect data to further understand our climate

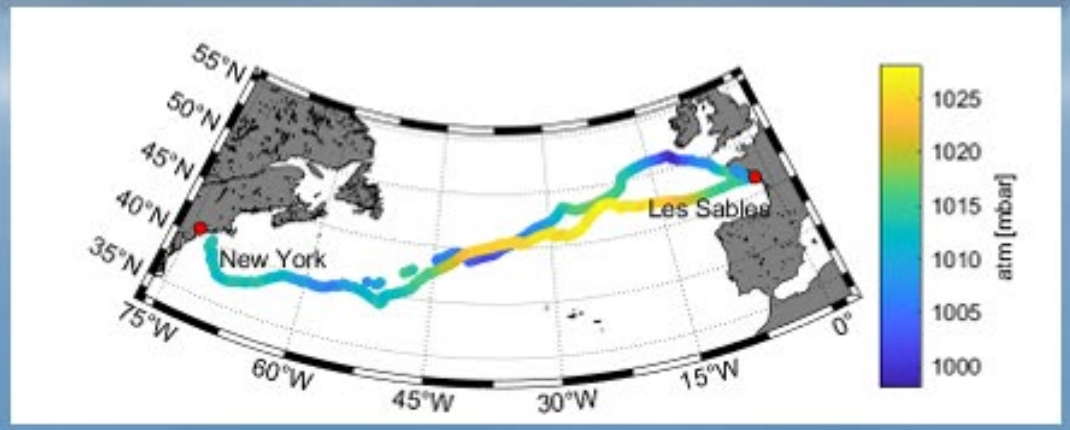
Sustainable Technologies

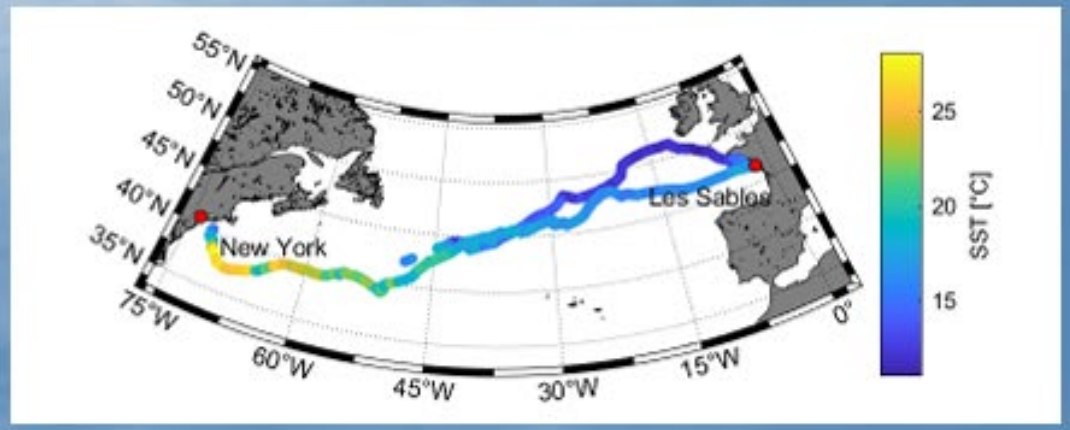
We leverage the boat as a “Floating R&D Lab” to promote sustainable technologies

A Small Price To Pay

Transatlantic Data Example







Facts

- About 700,000 measuring points during spring 2024
- Important contribution to the scientific community

Scientific parameters

- Physical oceanography: temperature, salinity
- Chemistry: pCO2
- Biology: Chl *a* fluorescence
- Meteorology: barometric pressure

Preliminary data. June 2024. S. Raimund , SRS Consulting, France.

Why We Must Act – NOW!

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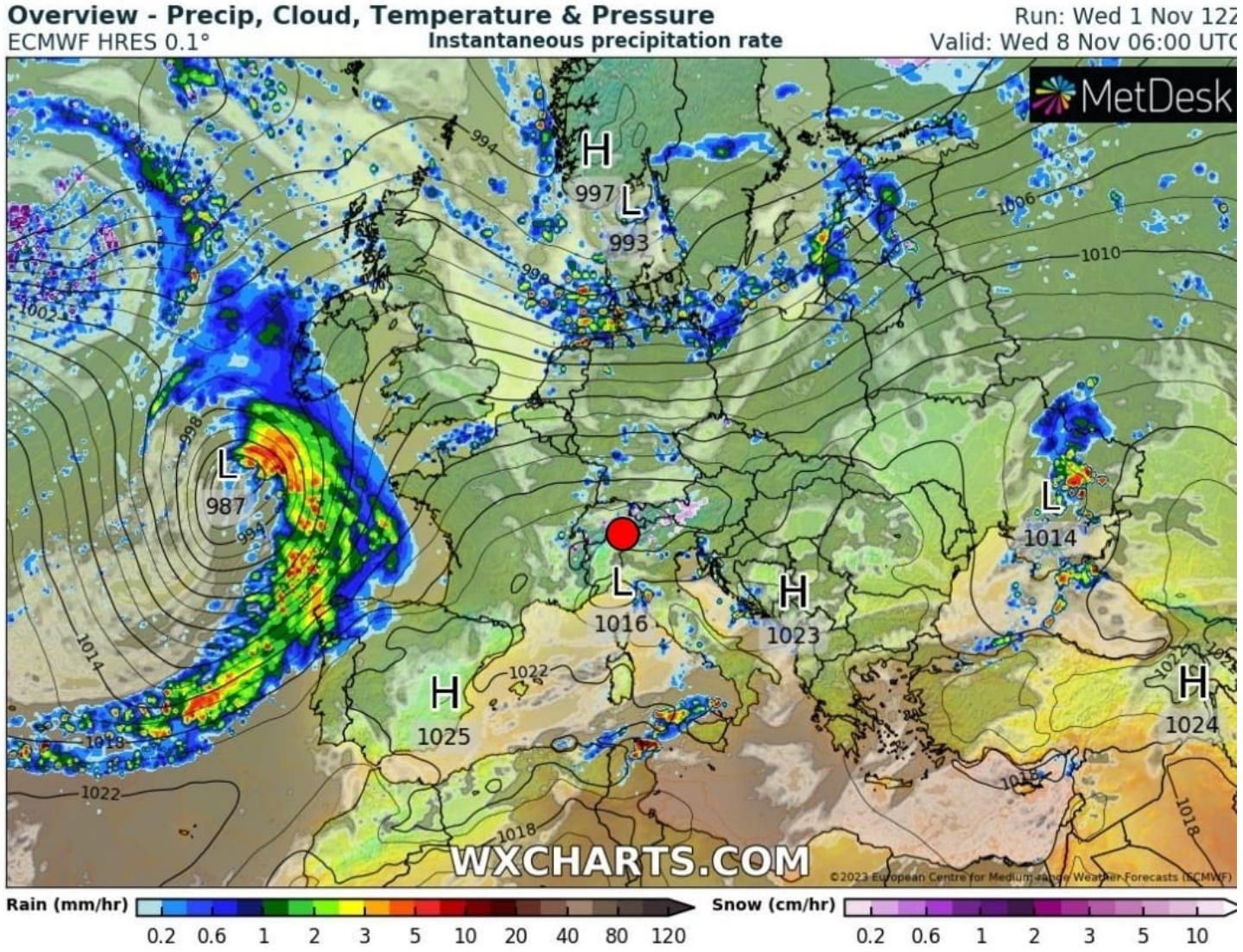

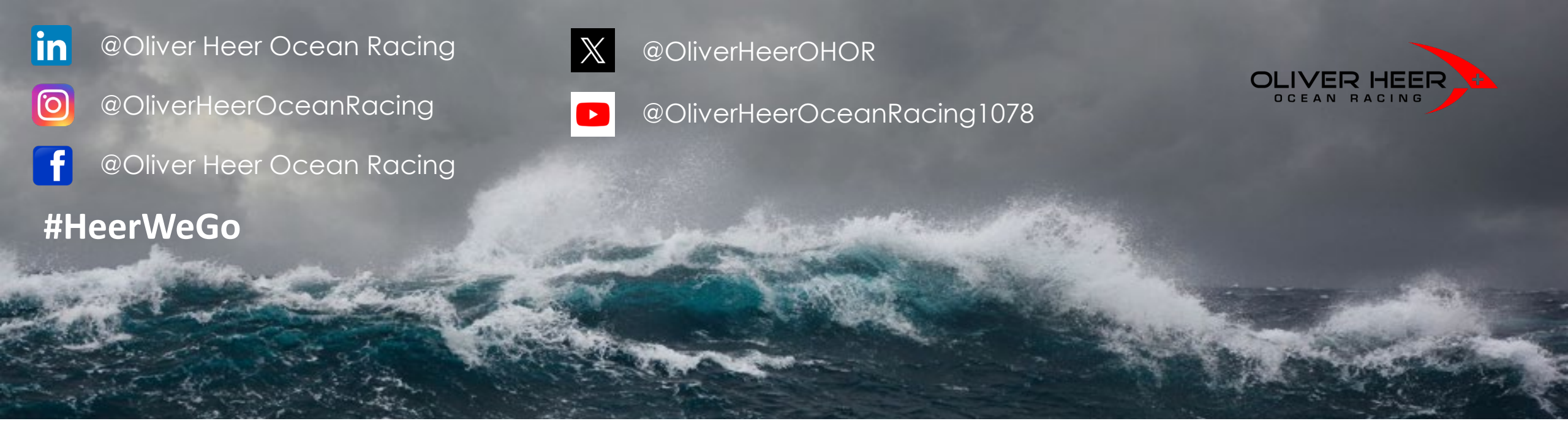

PORTIER-YACHTS

Burgerstein Vitamine

HÉRENS QUALITY ASSET MANAGEMENT

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Extreme Sailing and climate research on the Vendée Global race

Thomas Frölicher, Uni Bern
Nicolas Gruber, ETH Zürich
Samuel Jaccard, Uni Lausanne

SWISS POLAR INSTITUTE

ETH zürich u^b UNIVERSITÄT BERN Unil UNIL | Université de Lausanne

Rationale

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Equip Oliver Heer's IMOCA sailing yacht with sensors allowing for continuous, highly resolved measurements of temperature, salinity, chlorophyll and pCO_2 during both training and racing phases of the Vendée Globe

1. Constrain air-sea partitioning of CO_2, with a particular focus on the yet largely unexplored Southern Ocean

2. Unravel the mechanisms leading to marine extreme events and compound events, combining multiple stressors (T, pCO_2, chlorophyll)

3. Adding observations to public databases (SOCAT, WOA, etc), thereby strengthening the entire observing system, especially in the Southern Ocean

OceanPack™ RACE system (subCTech)

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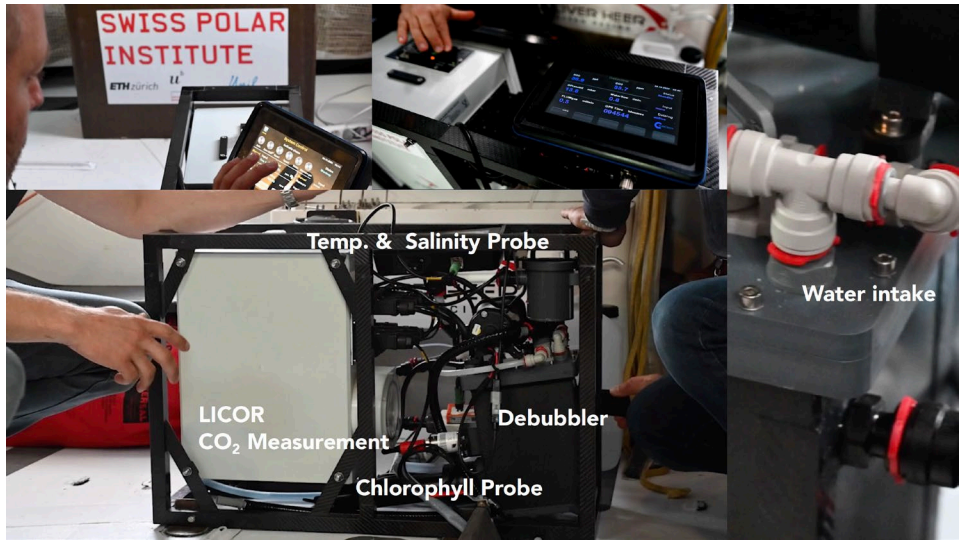

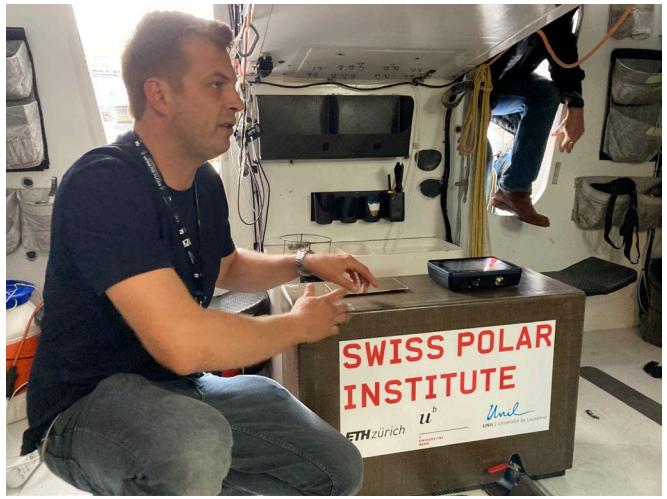

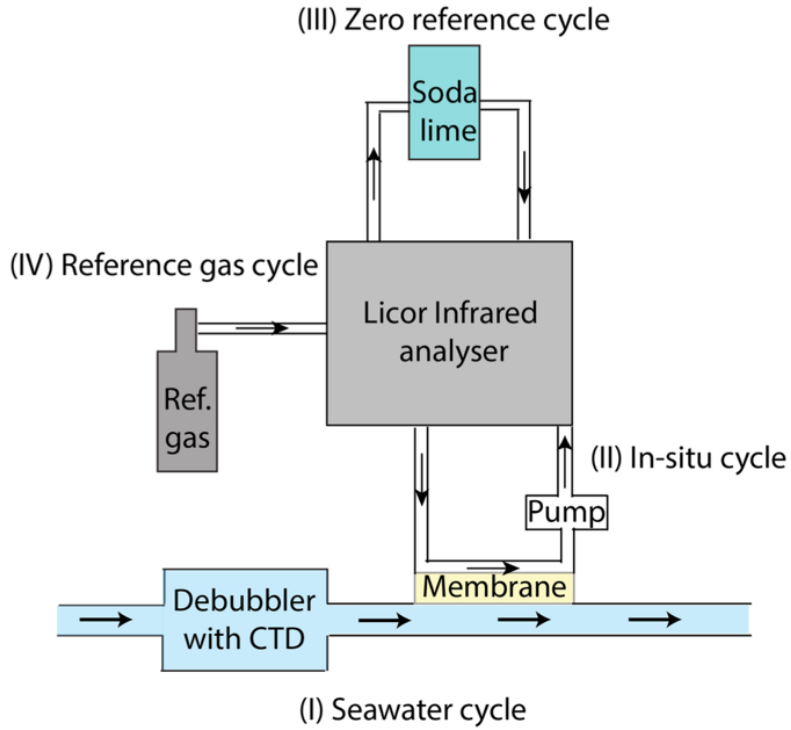

Landschützer et al. (Phil. Trans, 2023)

Preliminary data (1): Route du Rhum, November 2022

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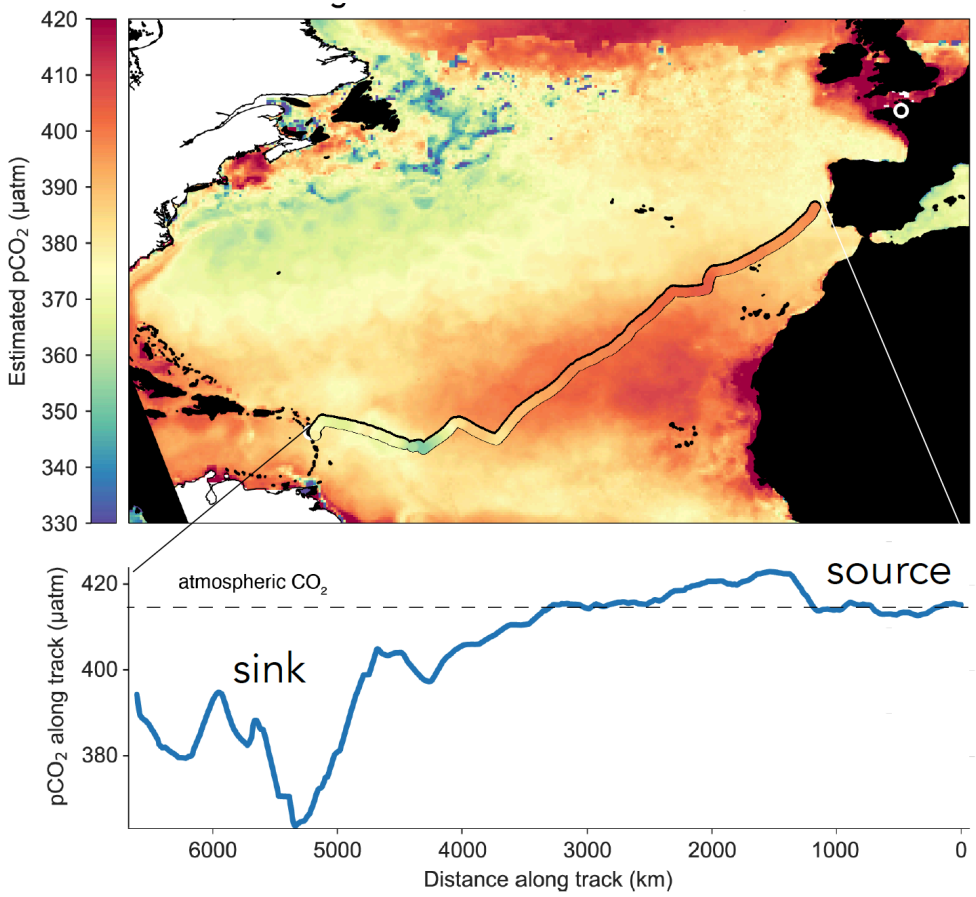
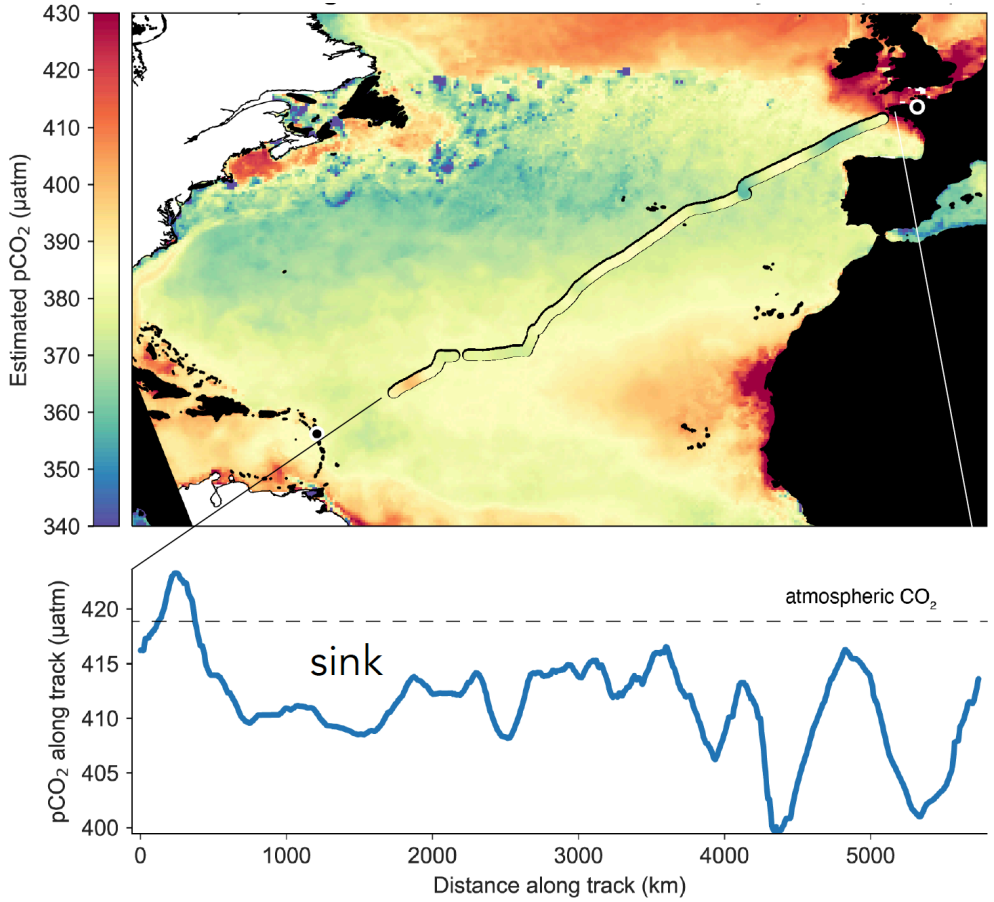
November 2022



December 2022



- Over the course of the two crossings (within one month), the air-sea CO_2 partitioning in the North Atlantic has varied quite strongly

Courtesy Luke Gregor (ETHZ)

Preliminary data (1): Route du Rhum, November 2022

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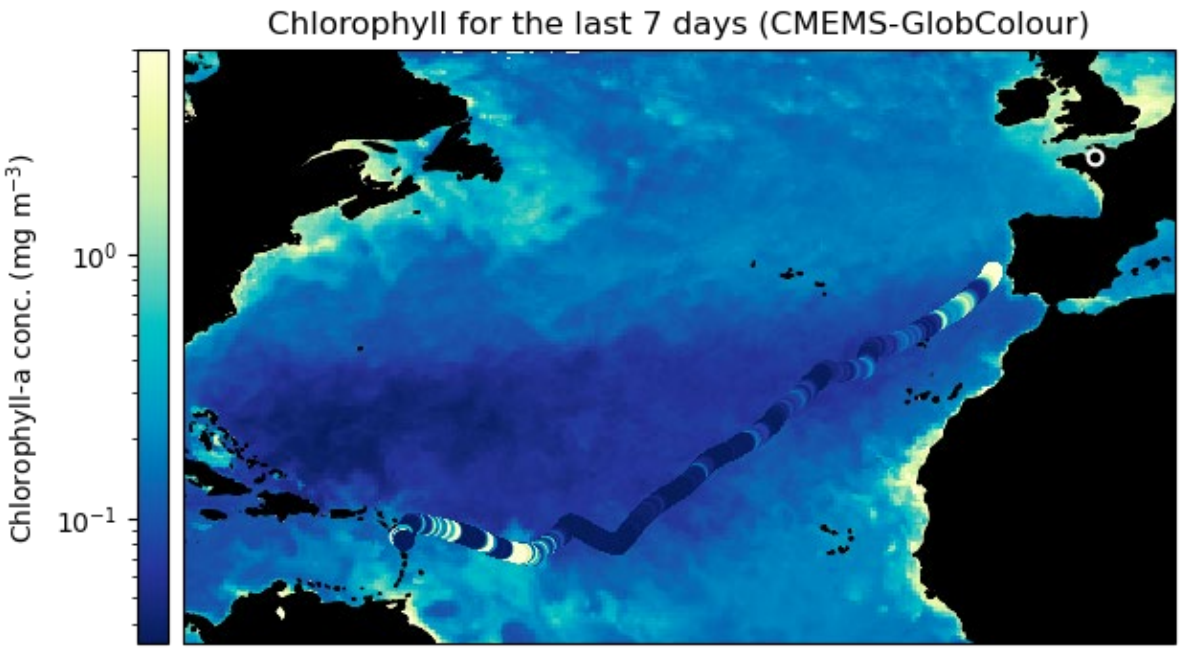

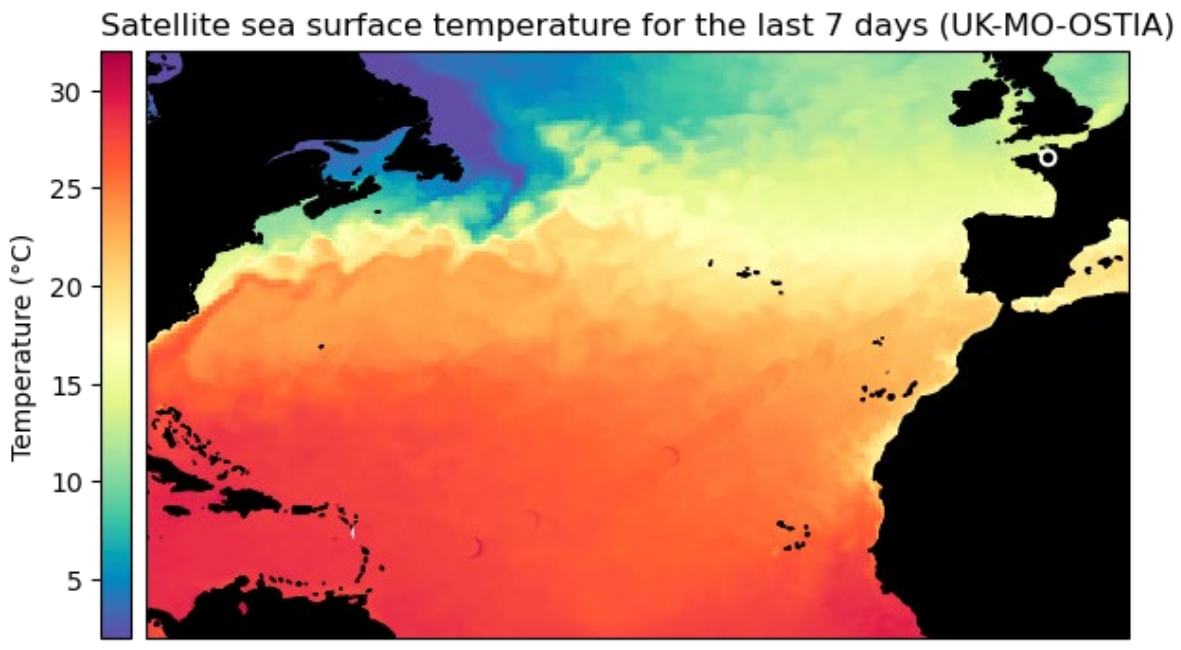

Courtesy Luke Gregor (ETHZ)

Preliminary data (2): Transatlantic Race, May 2024

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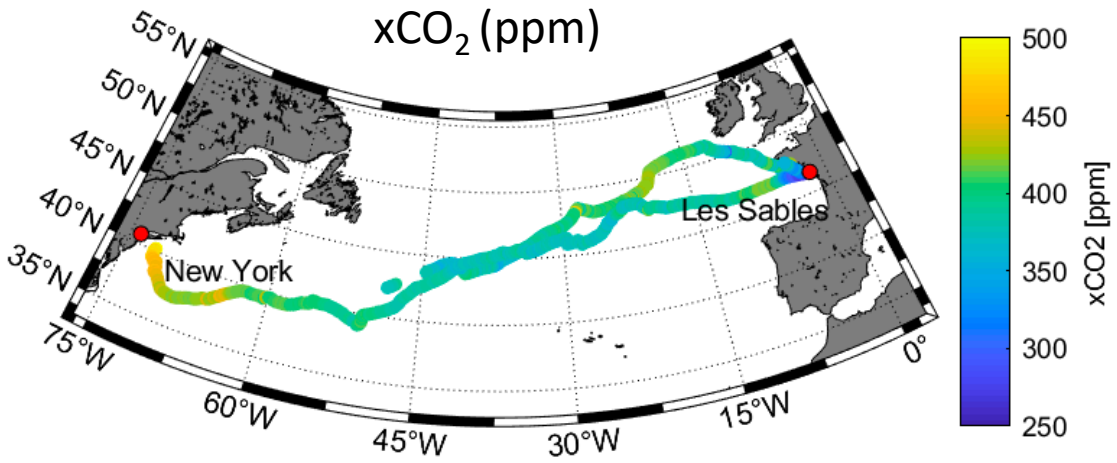

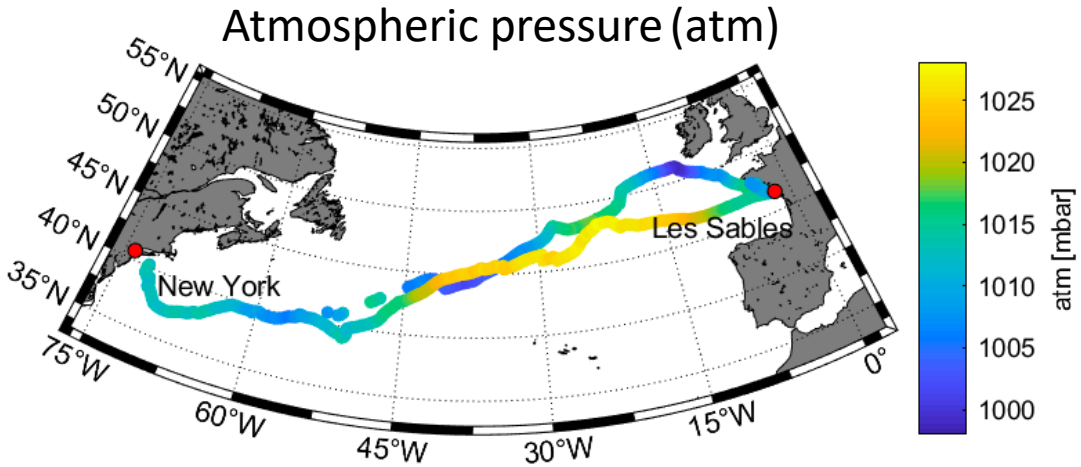

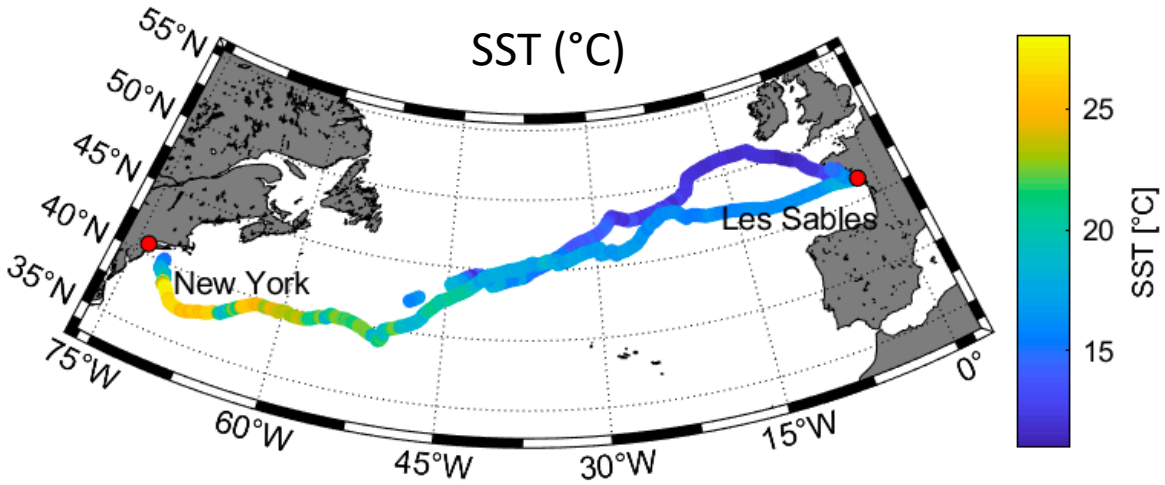

About 700’000 measuring points

Courtesy S. Raimund, SRS Consulting, France

Data limitation in Southern Ocean makes the estimation of ocean carbon sink uncertain - Sailboat racing events as an opportunity to close gap

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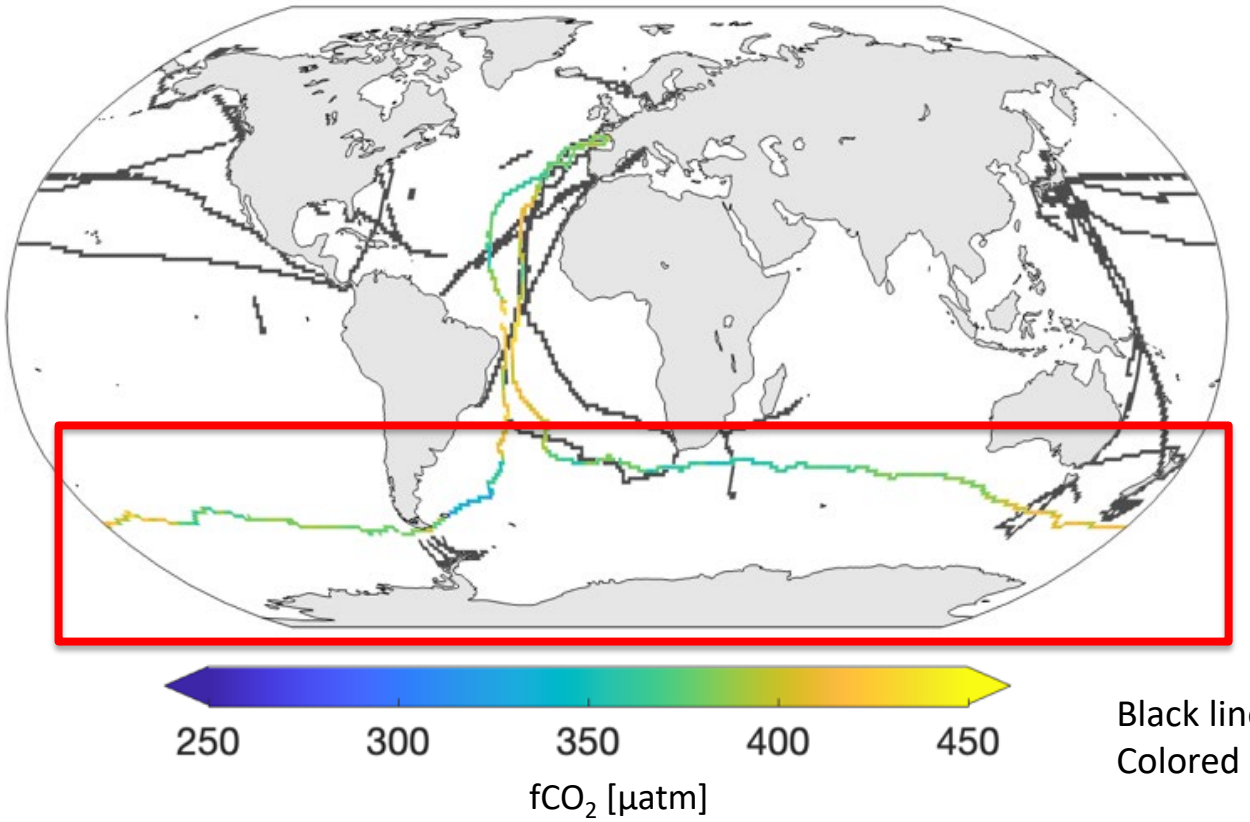
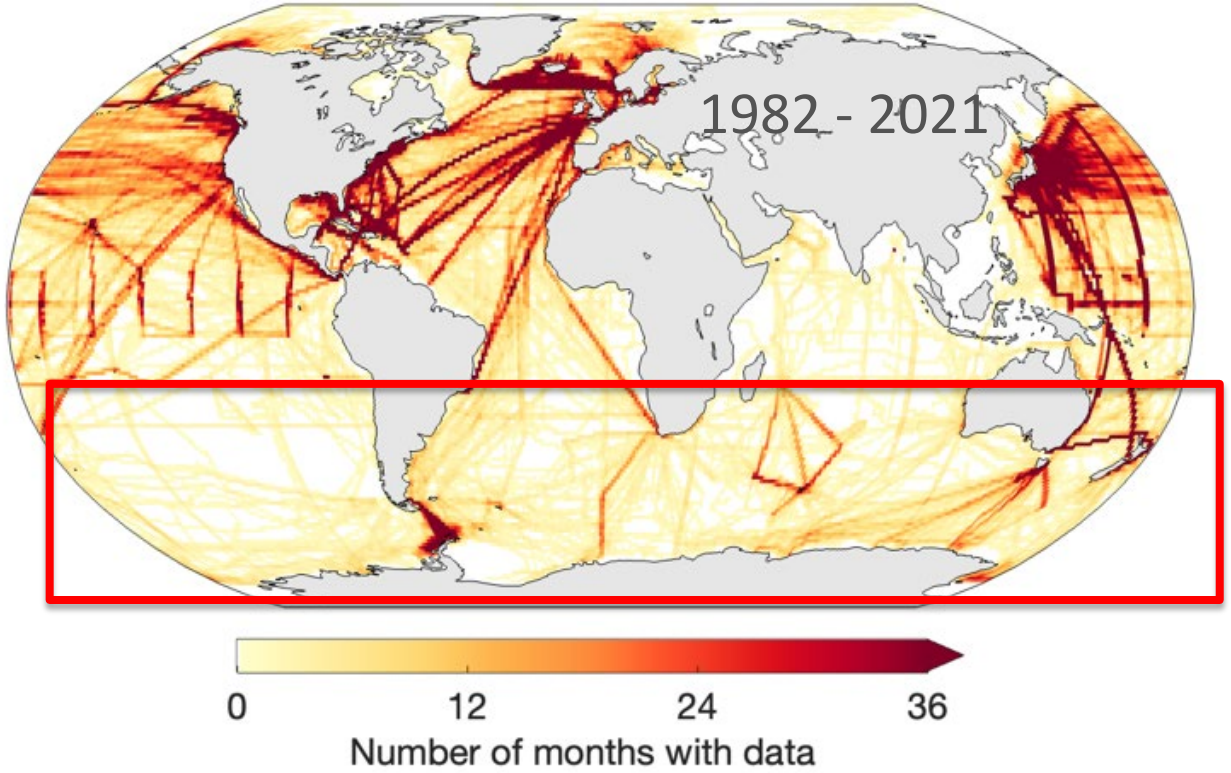
SOCATv2022 (Nov 2020 – Jan 2021)





Black lines = SOCAT data
Colored line = *Seaexplorer* data

Behncke et al. (Scientific Reports, 2024)

The importance of the Southern Ocean for carbon and climate

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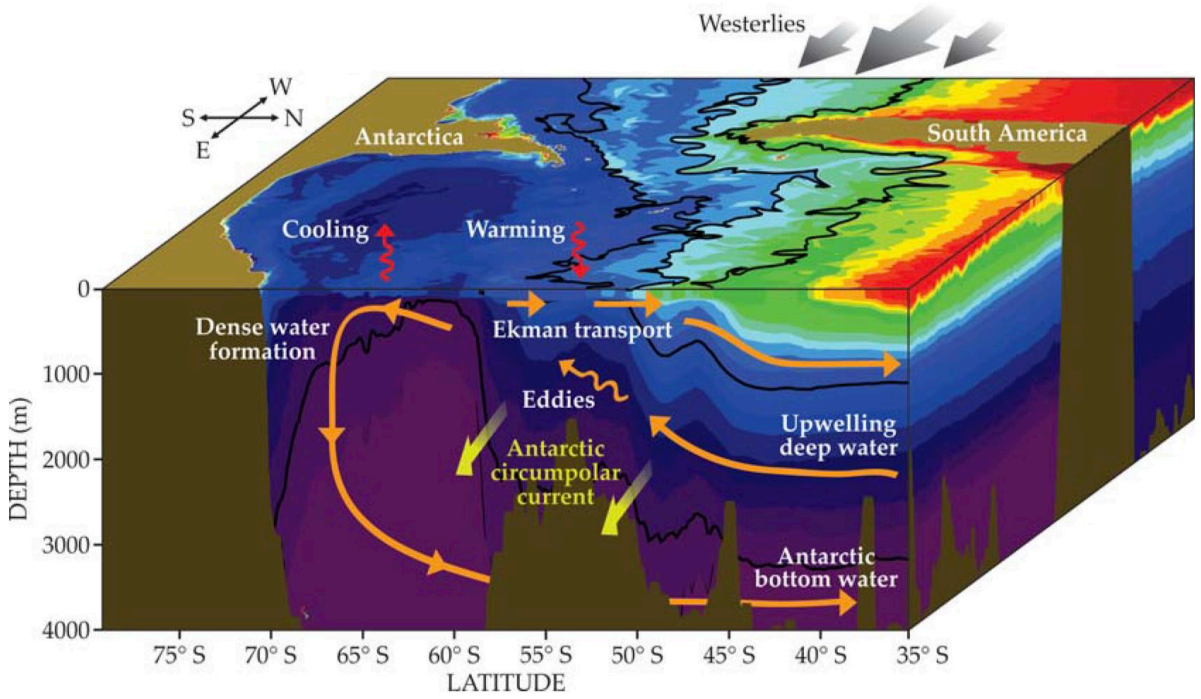

Morrison, Frölicher, Sarmiento (Physics Today, 2015)

The ocean south of 30°S accounts for

- about half of the current anthropogenic CO_2 uptake by the ocean (Miklaloff-Fletcher et al. 2006)
- about 75% of excess heat uptake by the ocean (Frölicher et al. 2015)
- Nutrient supply supporting three-quarters of biological production north of 30°S (Sarmiento et al. 2004; though debated: see Rodgers et al. 2024)

→ Yet, the processes governing CO_2 uptake are poorly constrained as is their temporal evolution

How does sailboat data change the air-sea CO_2 flux estimate

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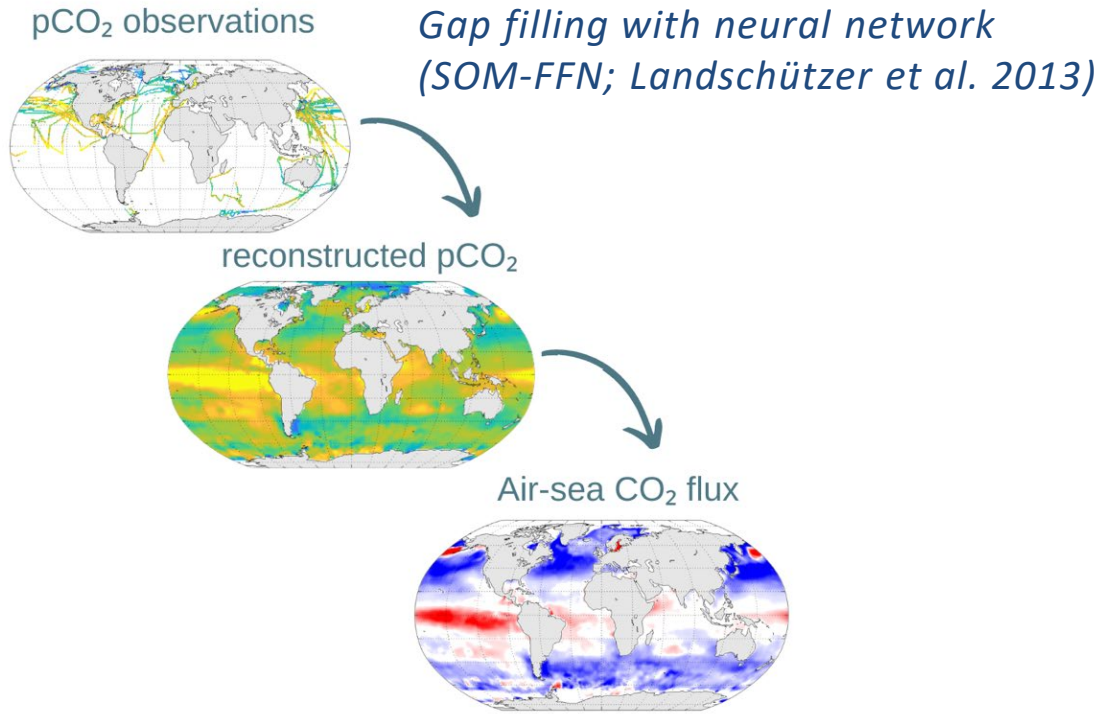

- 2018 – 2021 (129 days)
- more than 250’000 pCO_2 observations

Compare 2 flux estimates:

1. based on SOCAT incl. sailboat data
2. based on SOCAT excl. sailboat data

Behncke et al. (Scientific Reports, 2024)

Including sailboat measurements from 2018-2021 significantly alters regional air-sea CO_2 flux estimates

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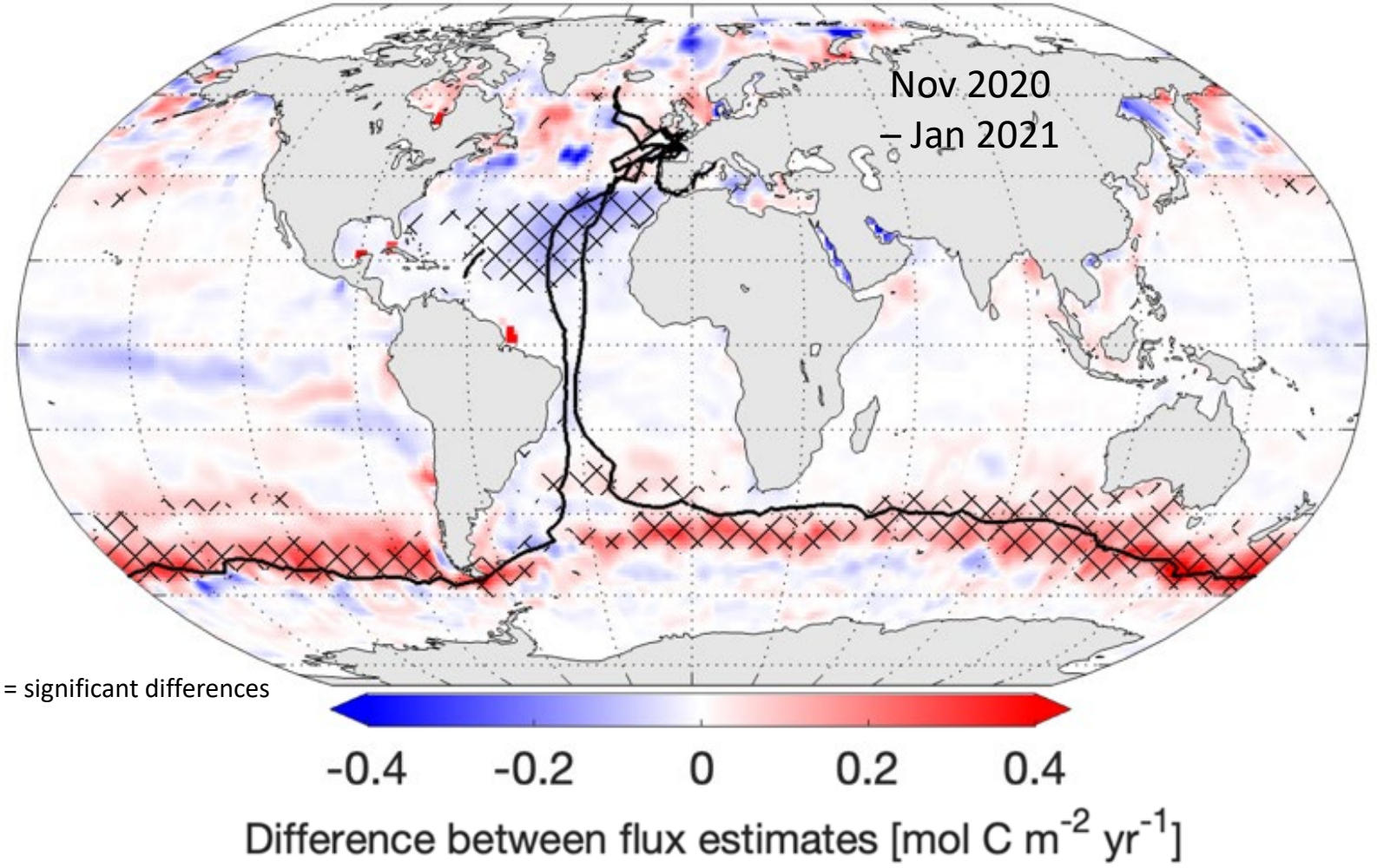
With – without sailboat measurements



Hatching = significant differences

- Lower impact in already well-observed North Atlantic
- Increased uptake in North Atlantic
- Reduced uptake in Southern Ocean (up to 20% of regional mean flux)
- Global difference of up to 0.04 PgC yr^{-1} (2021)

Behncke et al. (Scientific Reports, 2024)

Marine heatwaves are biological game changer

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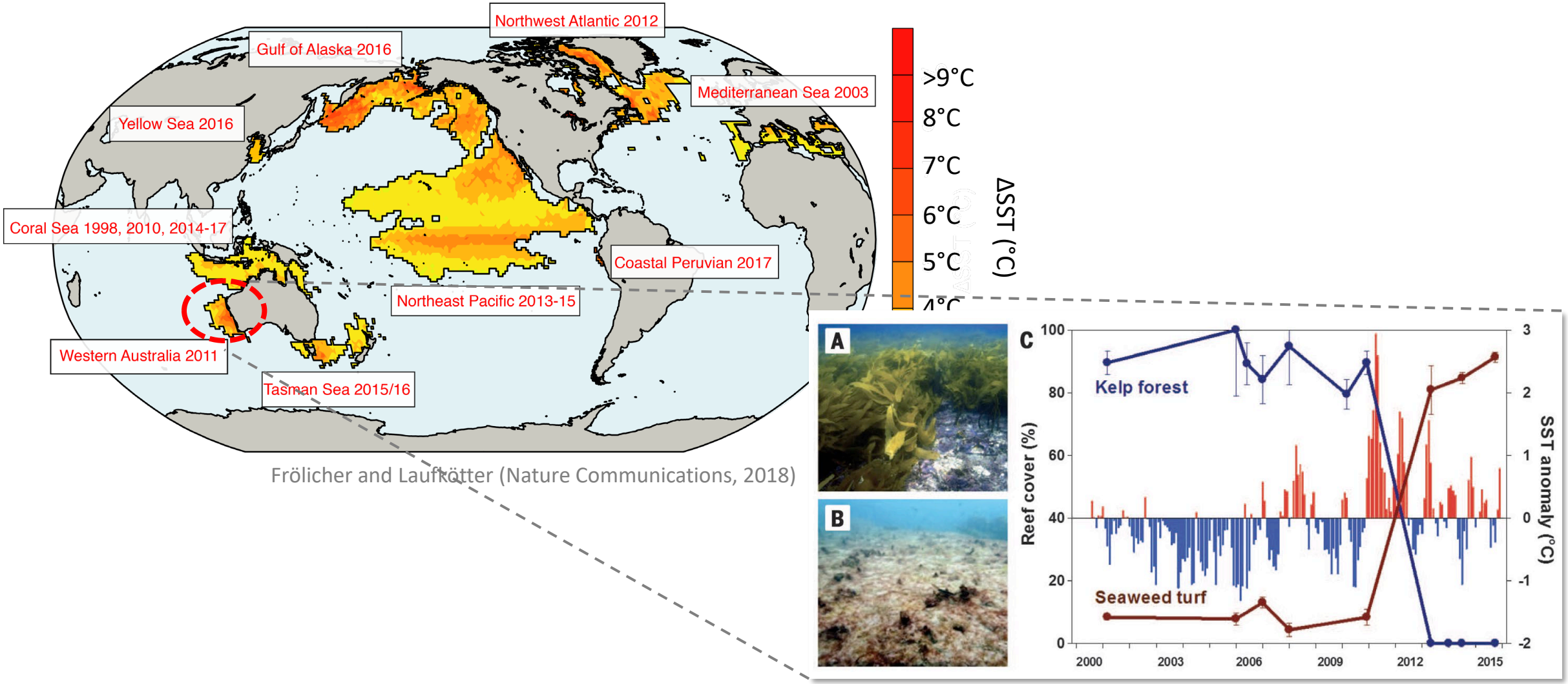

Frölicher and Laufkötter (Nature Communications, 2018)

Wernberg et al. (Science, 2016)

Observed regional impacts of marine heatwaves on sea-air CO_2 exchange

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- Globally, oceanic CO_2 uptake is reduced by 8% (3-19%) during MHWs. Regionally up to 30%.
- During MHWs (1990-2019), tropics decrease outgassing due to lower DIC, while mid-latitudes weaken uptake due to thermally induced rise in oceanic pCO_2

Li, Burger, Raible, Frölicher (under review)


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