

**pCO<sub>2</sub> - Eurec4a (2020) - Tara  
Microbiomes (2021 -2022)**

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**Impact des structures de mésoéchelle et des flux d'eau douce sur les flux air-mer de  $\text{CO}_2$**



A tropical sunset scene with palm trees in the foreground, a calm sea in the middle ground, and mountains on the horizon under a cloudy sky. The sun is low on the horizon, casting a warm glow.

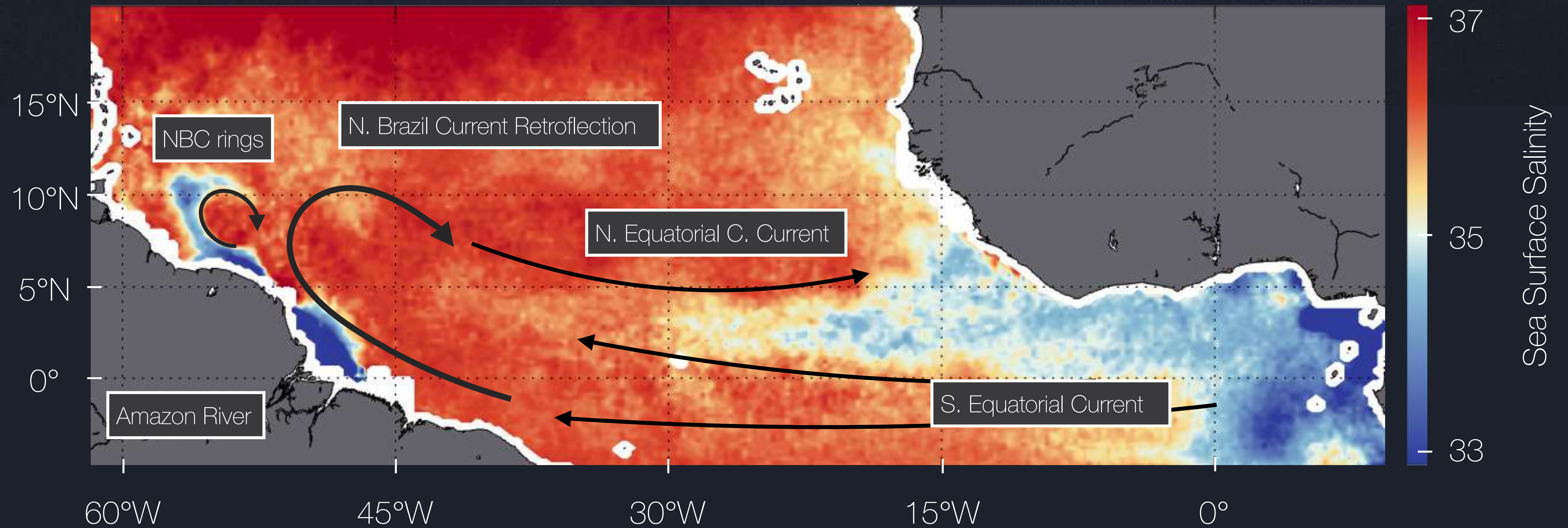
# **EUREC<sup>4</sup>A - Atlantique tropical Janvier-Février 2020**

Olivier et al., 2022, Biogeosciences, under review.

Doi : <https://doi.org/10.5194/bg-2021-269>



# A transition region highly dynamic

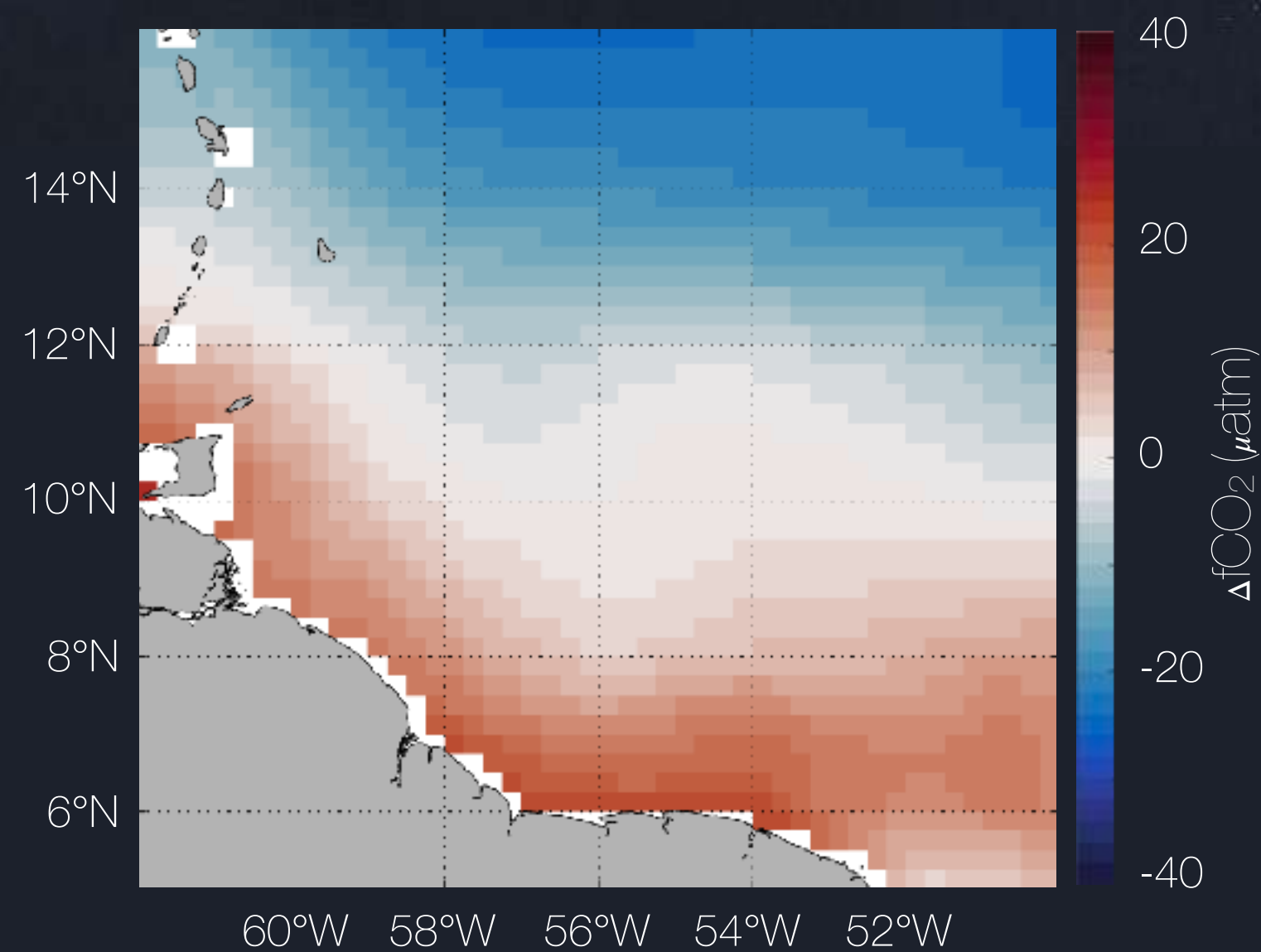


February 7<sup>th</sup>, 2017, CCI+SSS

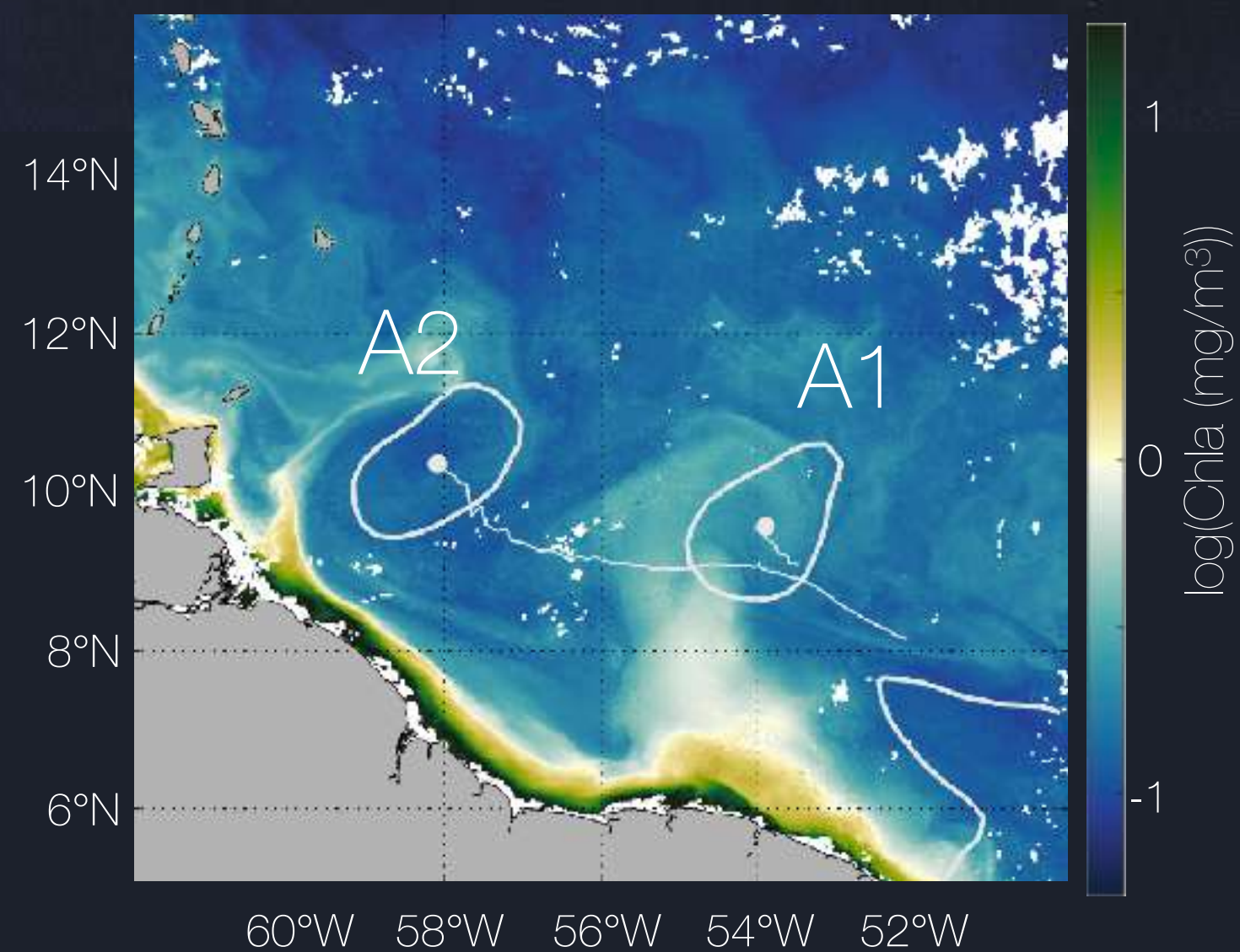


# A transition region highly dynamic

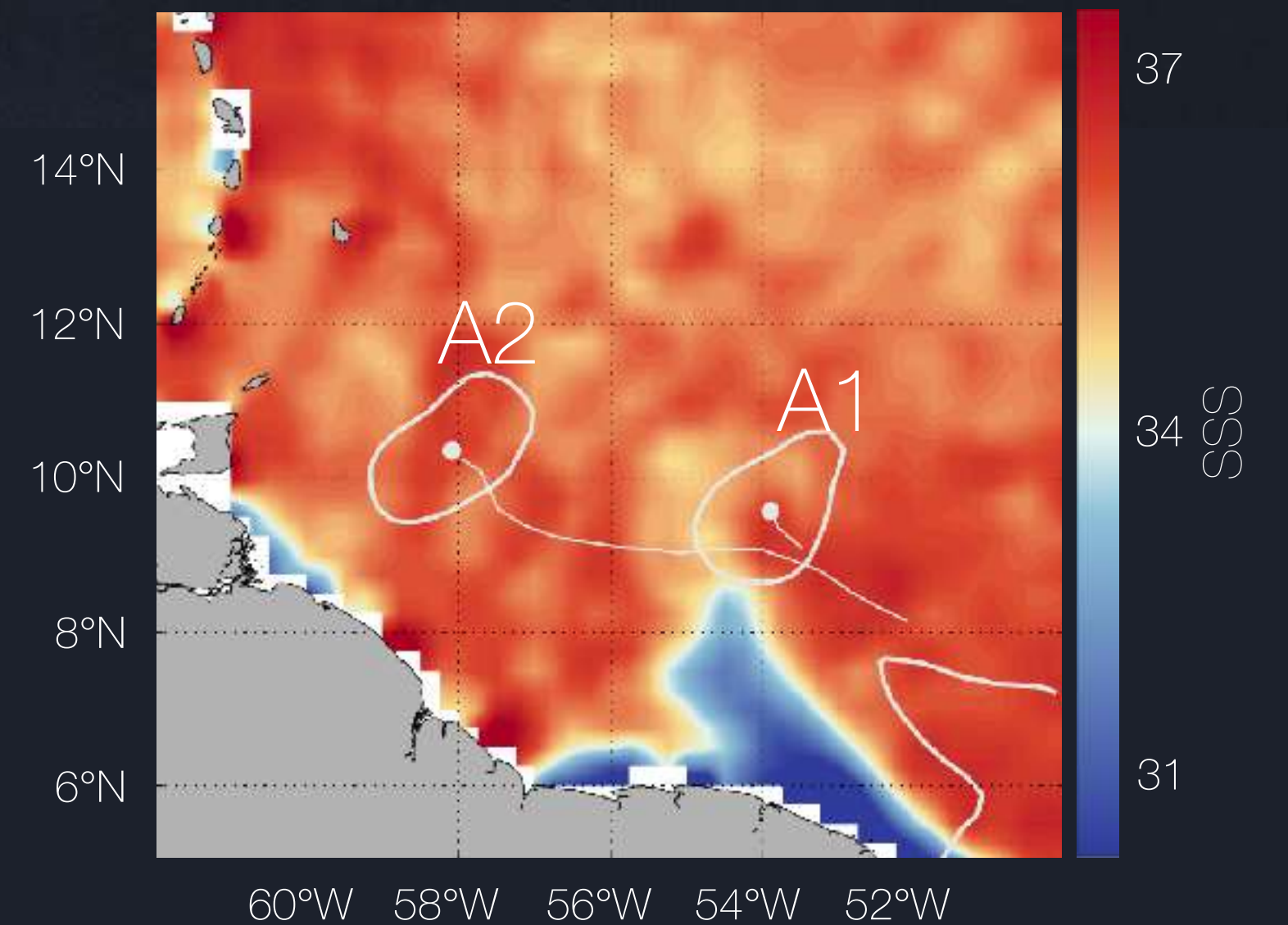
February  $\Delta f\text{CO}_2$  climatology



Satellite Chla on Feb 6<sup>th</sup> 2020



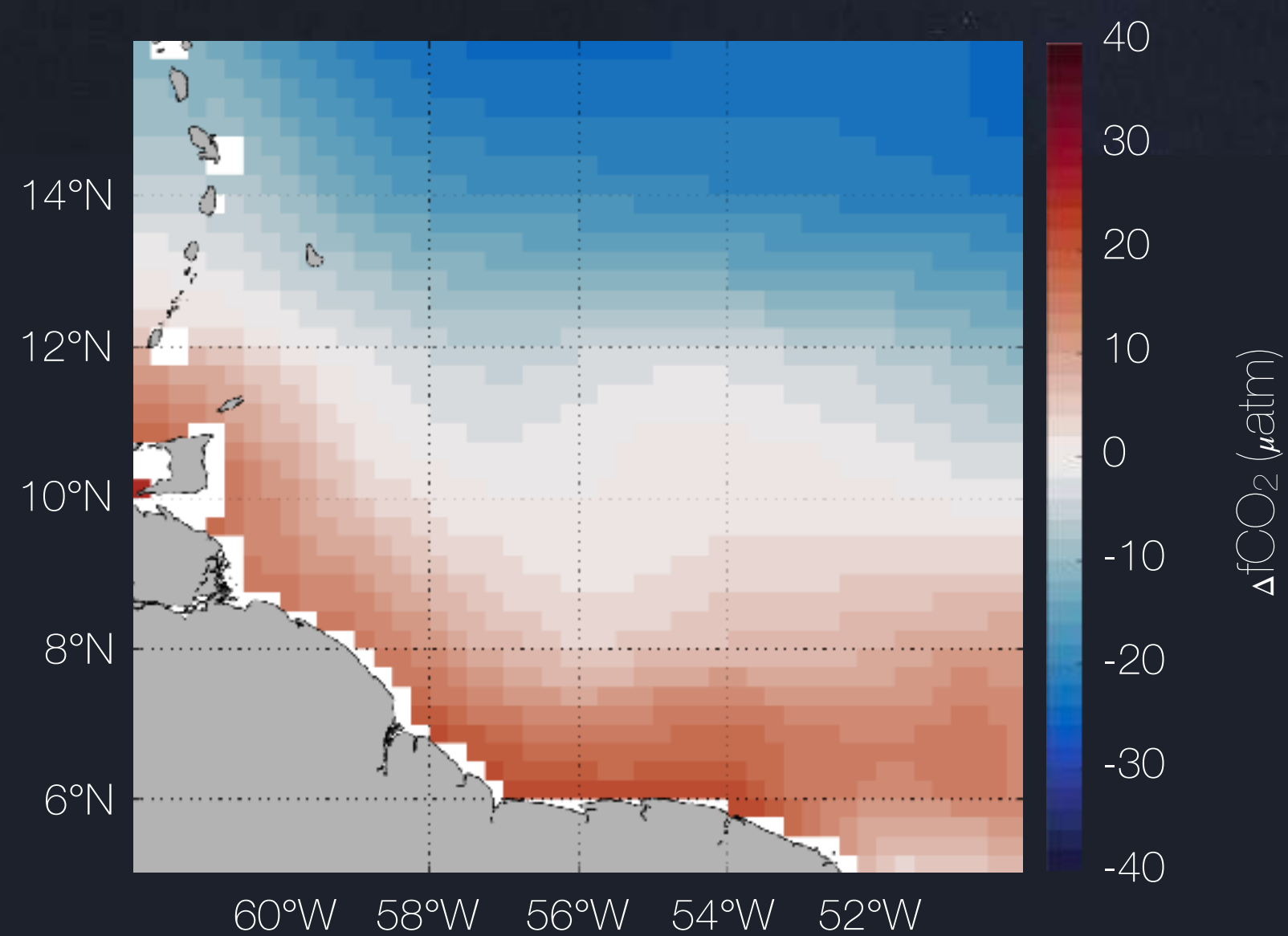
Satellite SSS on Feb 6<sup>th</sup> 2020





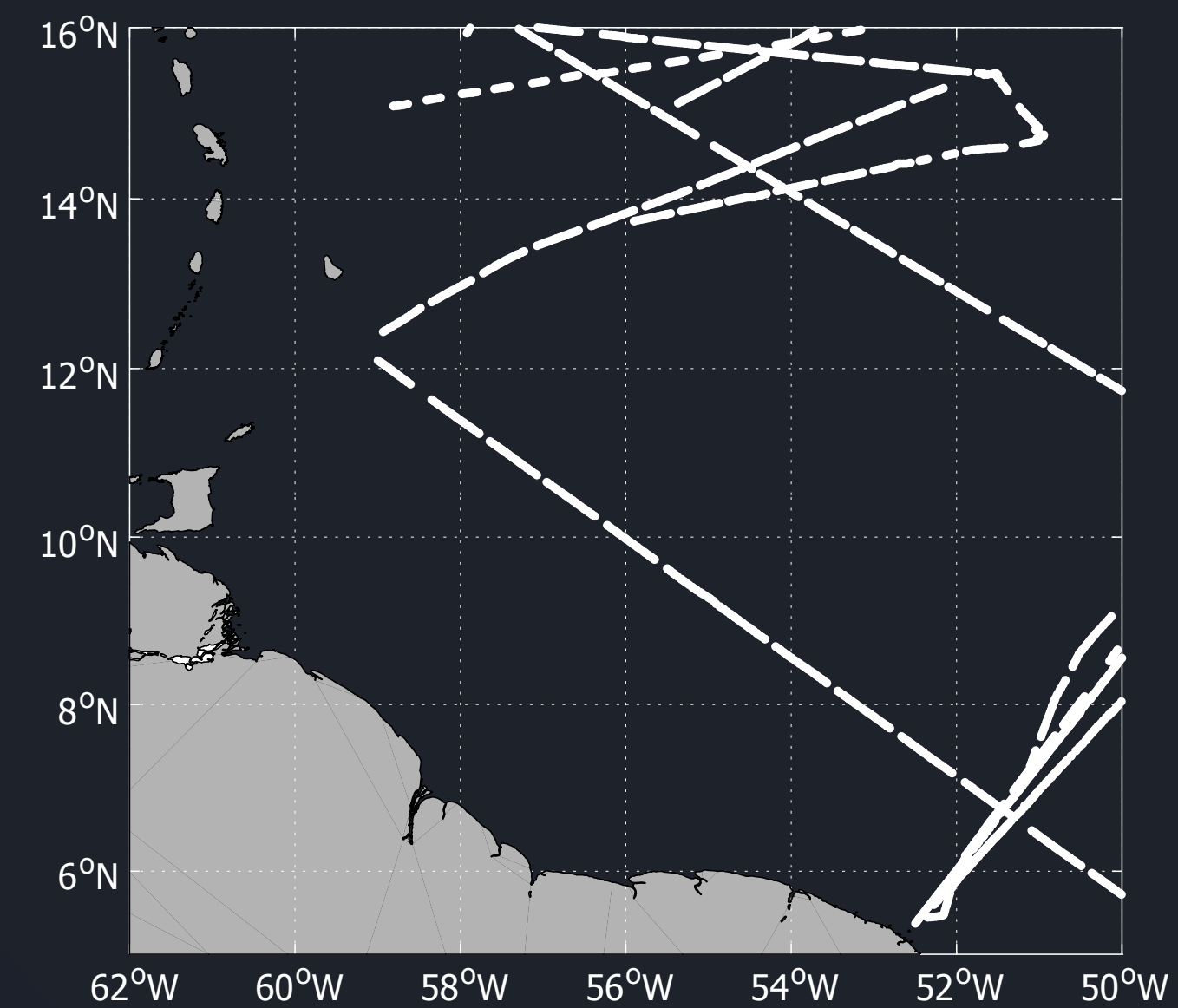
# A transition region highly dynamic

February  $\Delta f\text{CO}_2$  climatology



Landschützer et al., 2020

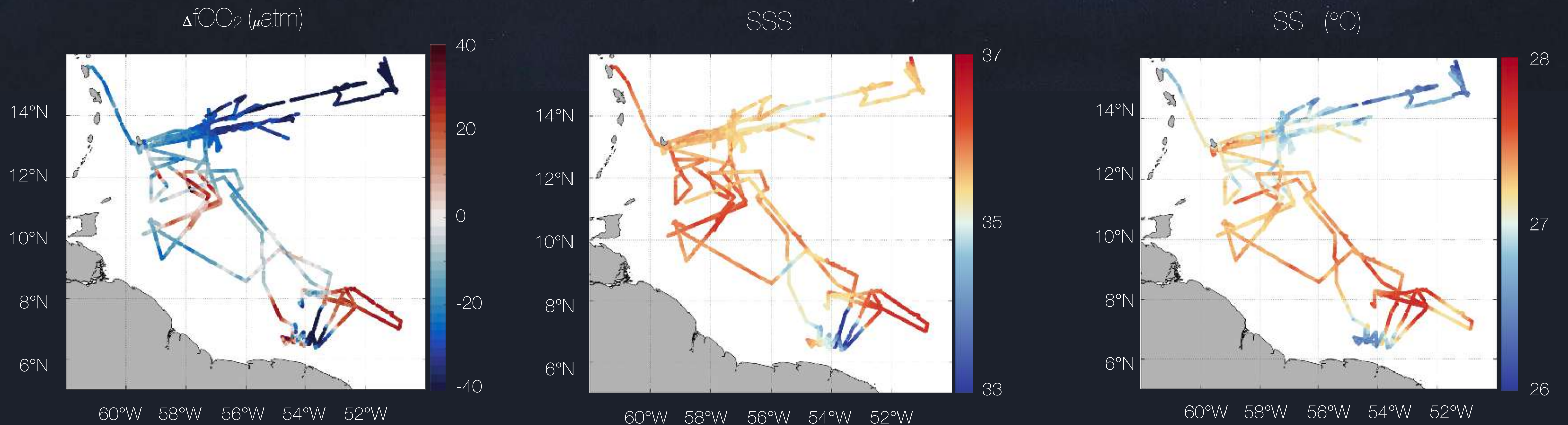
Available data in winter on the SOCAT database



1 transect south of Barbados  
crossing the region



# Data - The EUREC4A-OA cruise



January - February 2020 - 3 ships equipped with  $\text{CO}_2$  system - RVs Atalante- Merian- Ron Brown





# RV Atalante, RV Merian, RV Ron Brown

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Atalante

Equilibrateur  
+ Licor

Développée  
au LOCEAN,  
actuellement  
sur PIRATA

Echantillons  
AT/TC

Merian

Membrane +  
Licor

Ferrybox from  
SubCtech

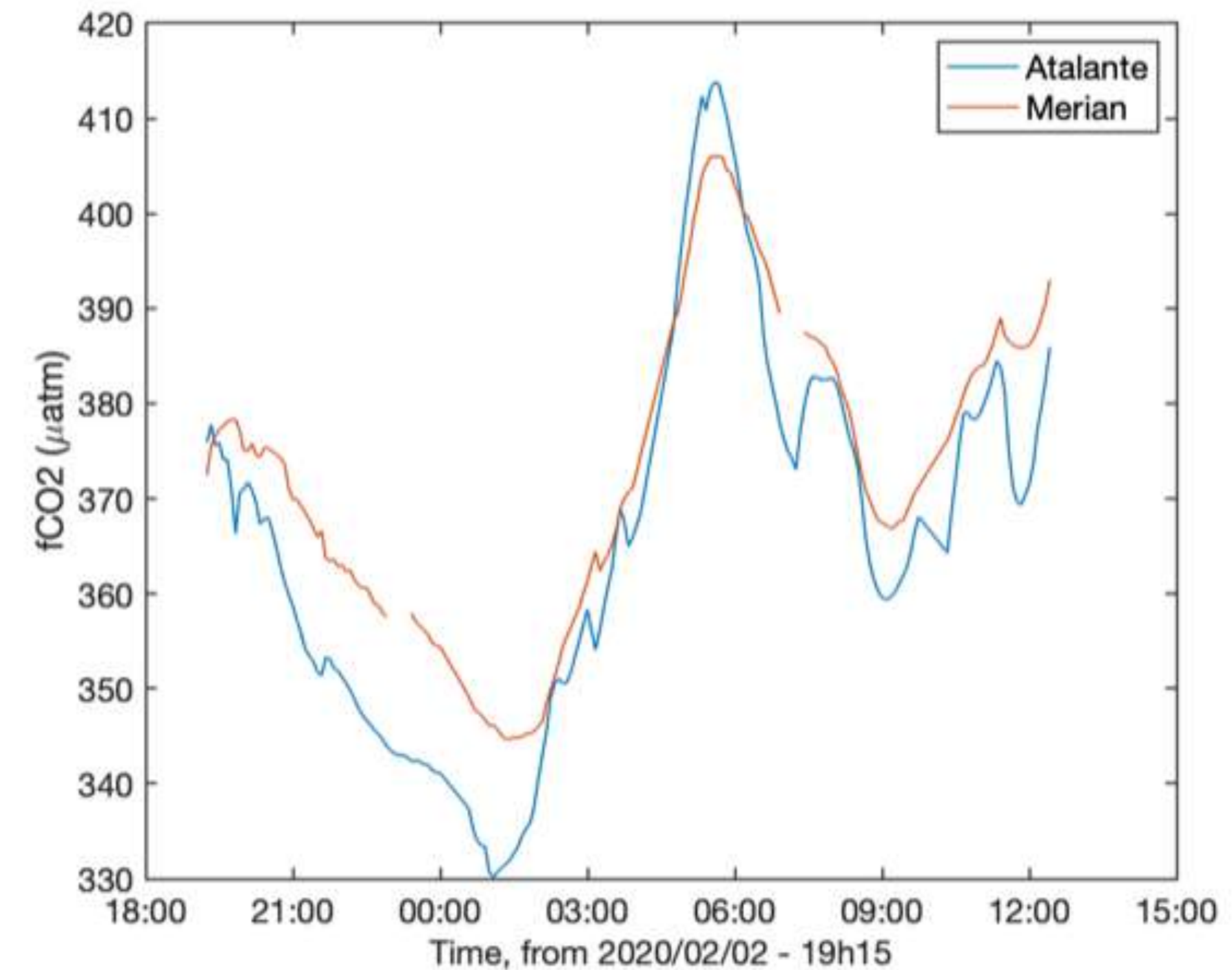
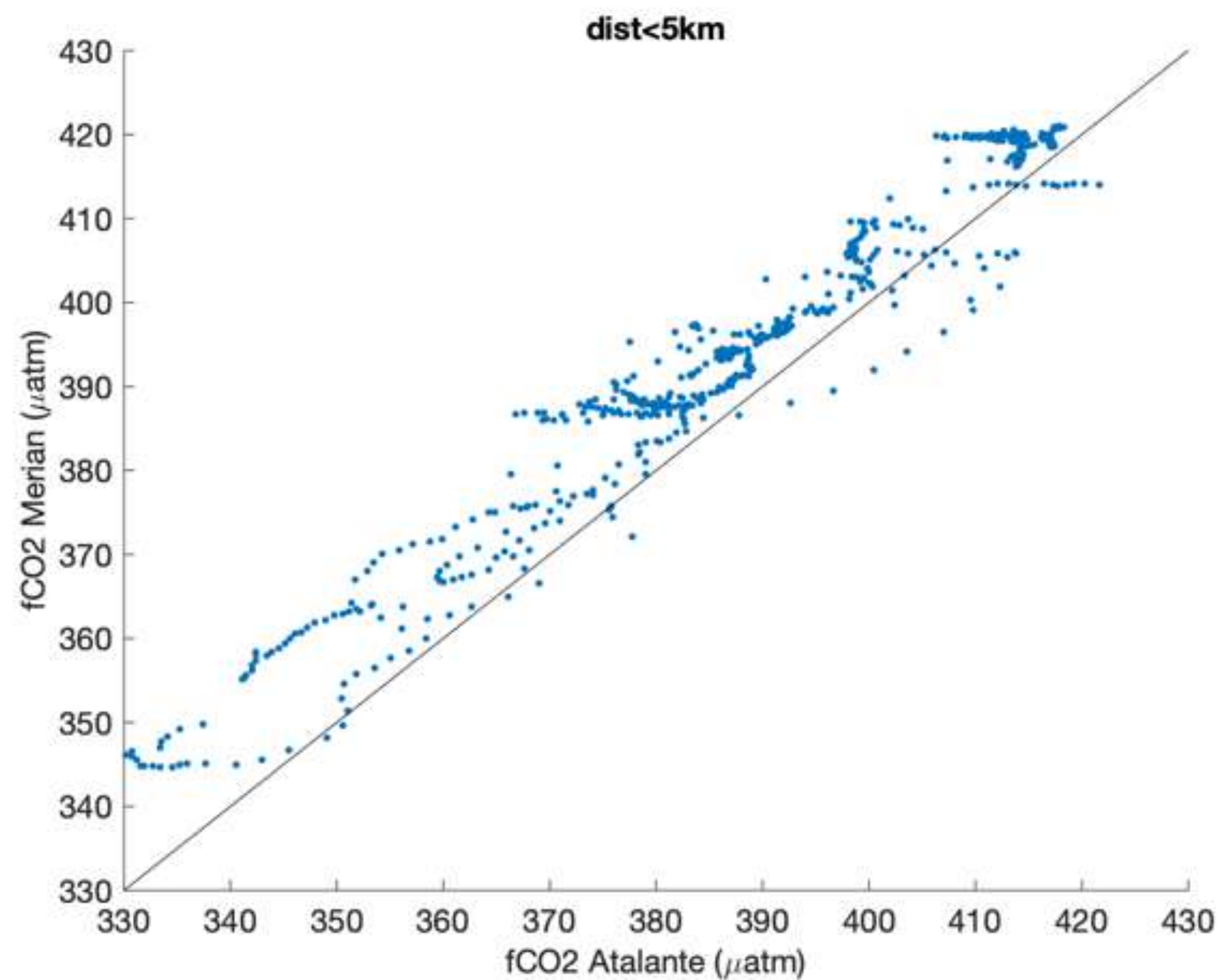
Ron Brown

Equilibrateur  
+ Licor

General  
Ocenics



# RV Merian VS RV Atalante

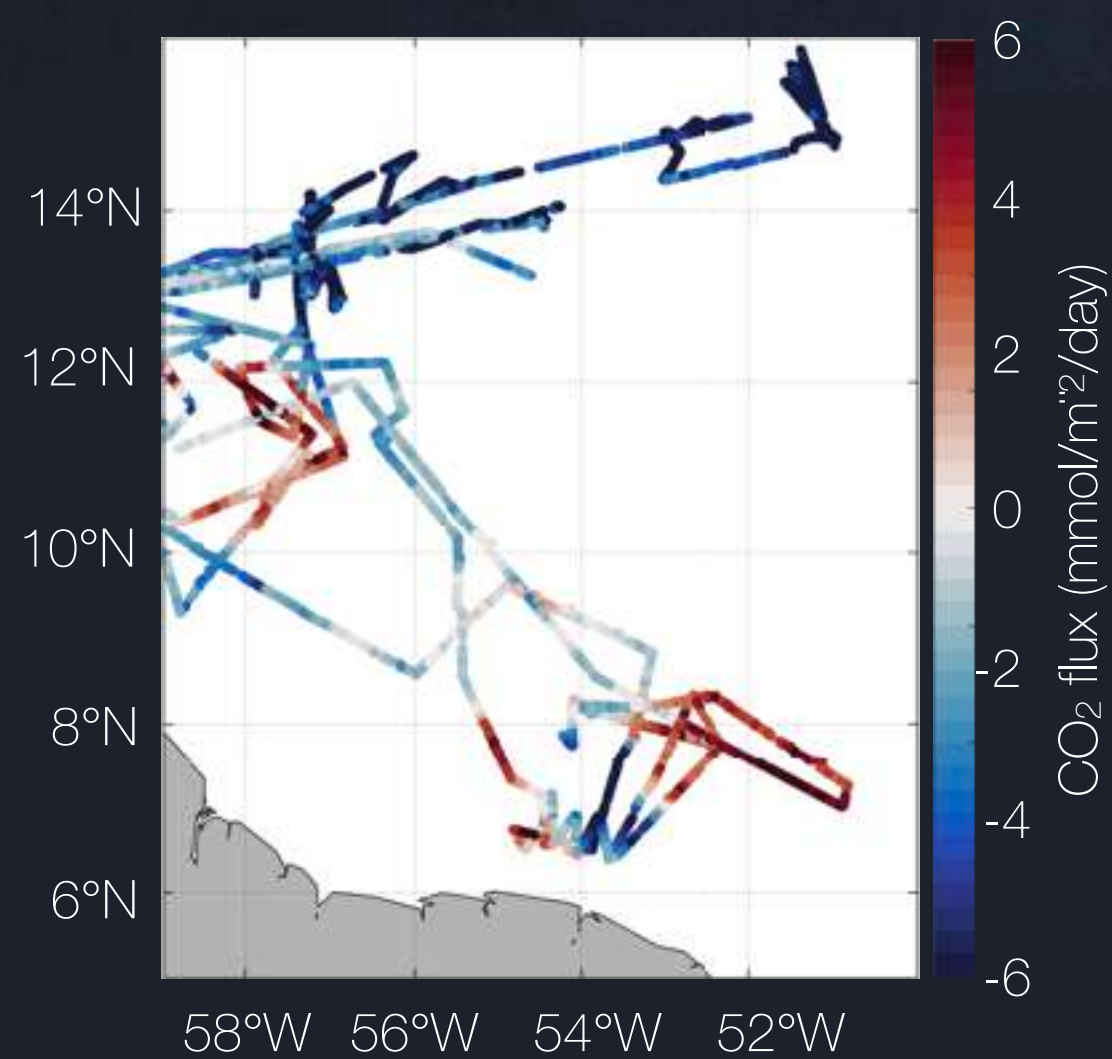


Biais of 6  $\mu\text{atm}$  that might be due to variability but also to the longer time response of the membrane system

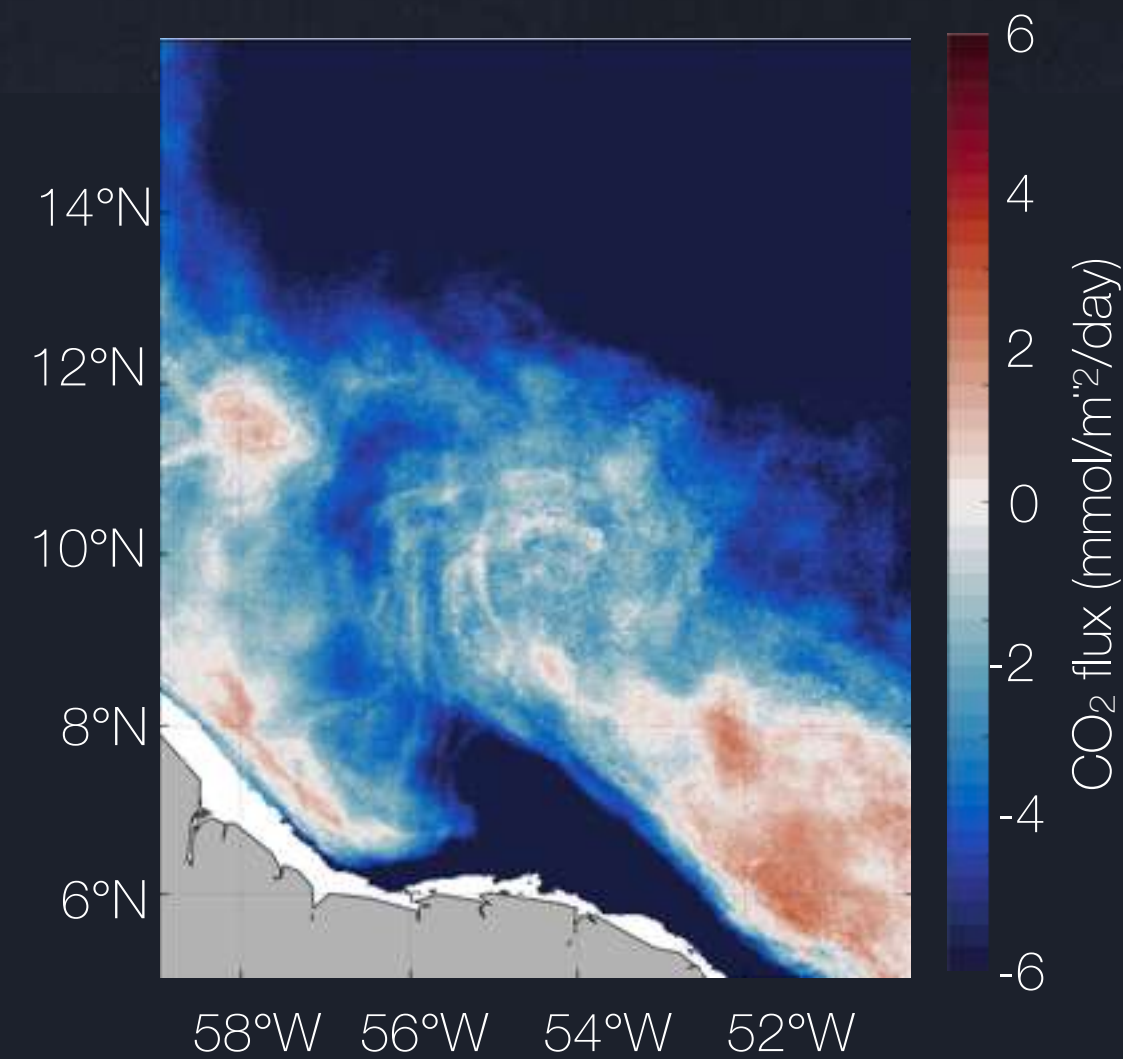


# Air-sea CO<sub>2</sub> flux

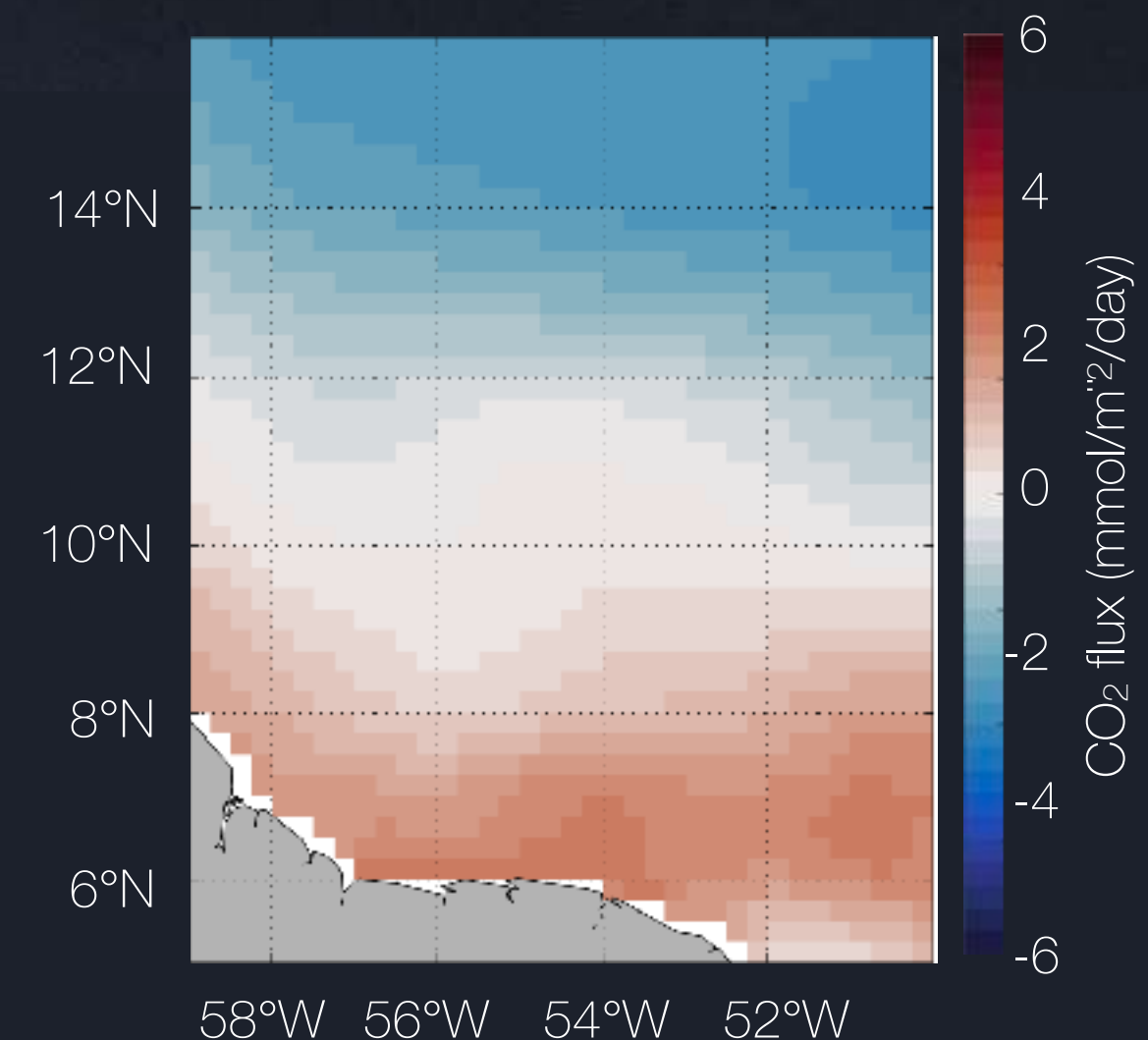
EUREC4A data



Reconstructed from satellites



Landschützer et al., 2020



Error on mean flux linked to uncertainty on ship measurements absolute calibration  $< 0.1$  mmol/m<sup>2</sup>/day

Error (noise) on individual pCO<sub>2</sub> estimate linked to interpolation and reconstruction  $\sim 4$  to  $9 \mu\text{atm}$





# ***Tara* Microbiomes** **De l'Amazonie à l'Antarctique**

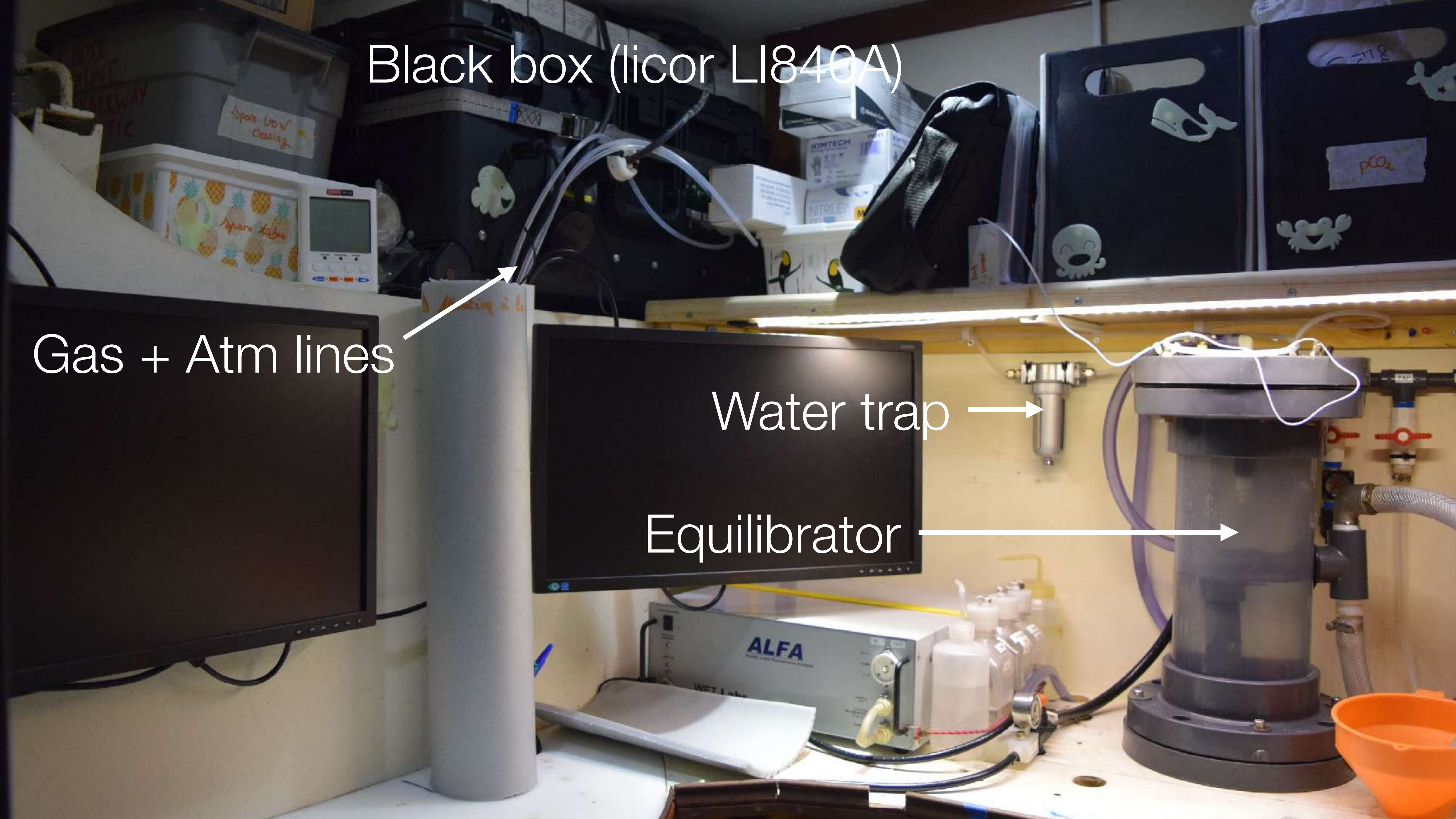


Black box (licor LI840A)

Gas + Atm lines

Water trap

Equilibrator









# Tara - Mission microbiome

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Instrument de l'**Université du New Hampshire**, collaboration avec  
Douglas Vandemark et Christopher Hunt

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Standards

Atmosphere

Eau de mer

Boite noire

Azote (0)

Prise d'eau, **2m**

Licor LI840A

500 ppm

Equilibrateur

Valves

Pont avant

Mat Avant

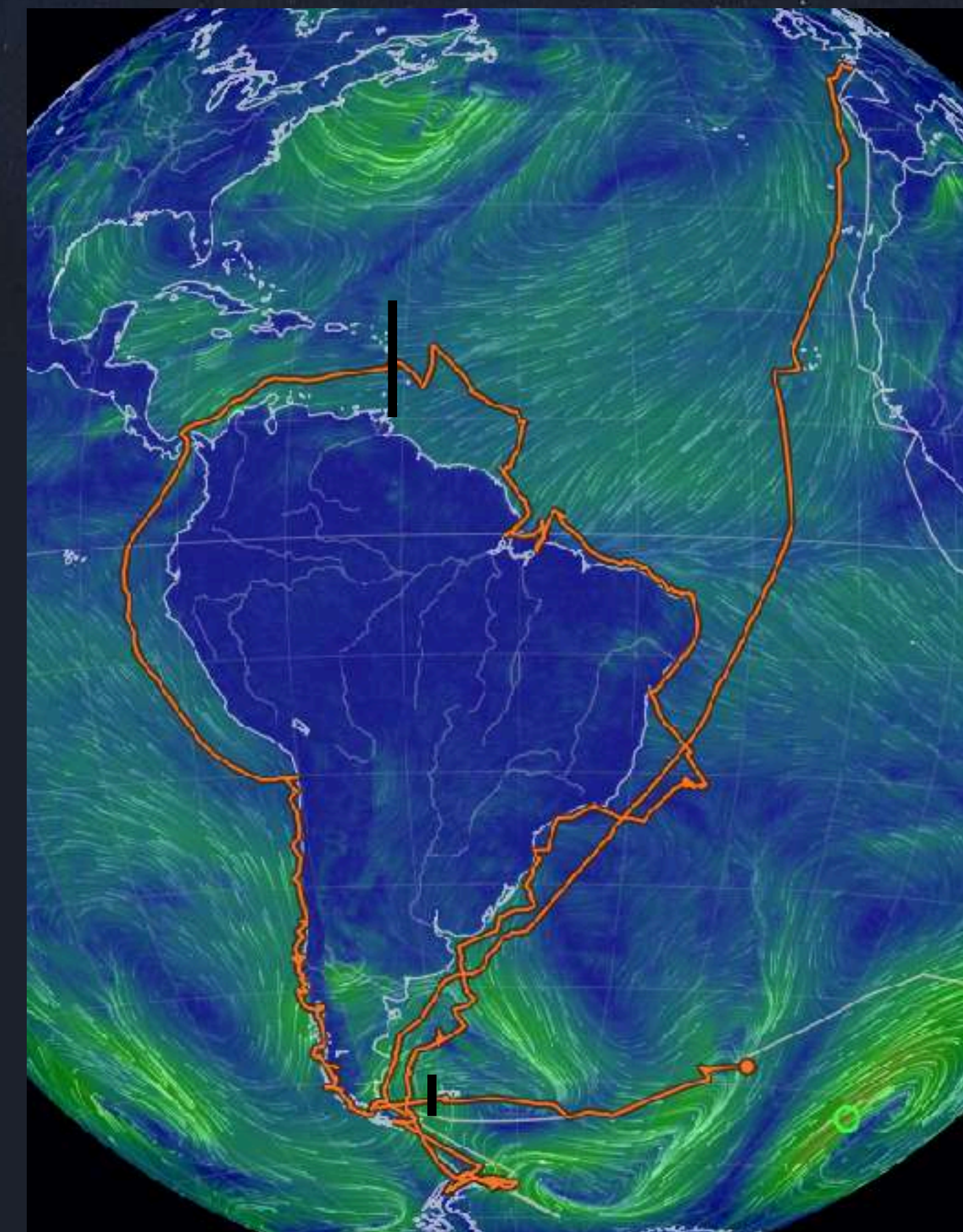
Underway lab

Pompe et contrôleur de débit

Underway lab

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Installé en Martinique en Juillet 2021 - enlevé à Punta Arenas en Mars 2022  
5 mois actif





# *Tara* - Mission microbiome

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## Echantillons

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AT/CT

En station

DIC/C13

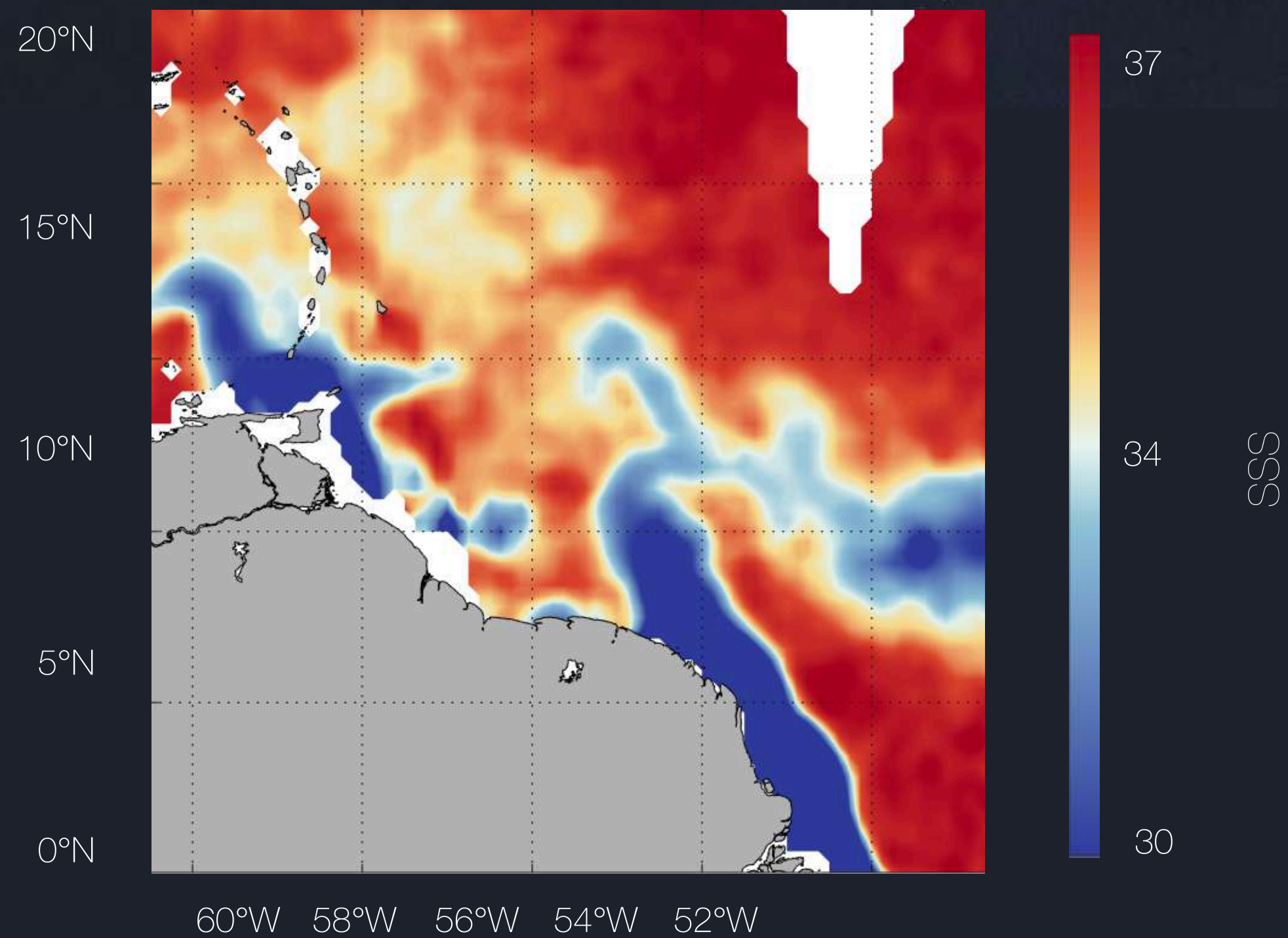
En station  
+ underway



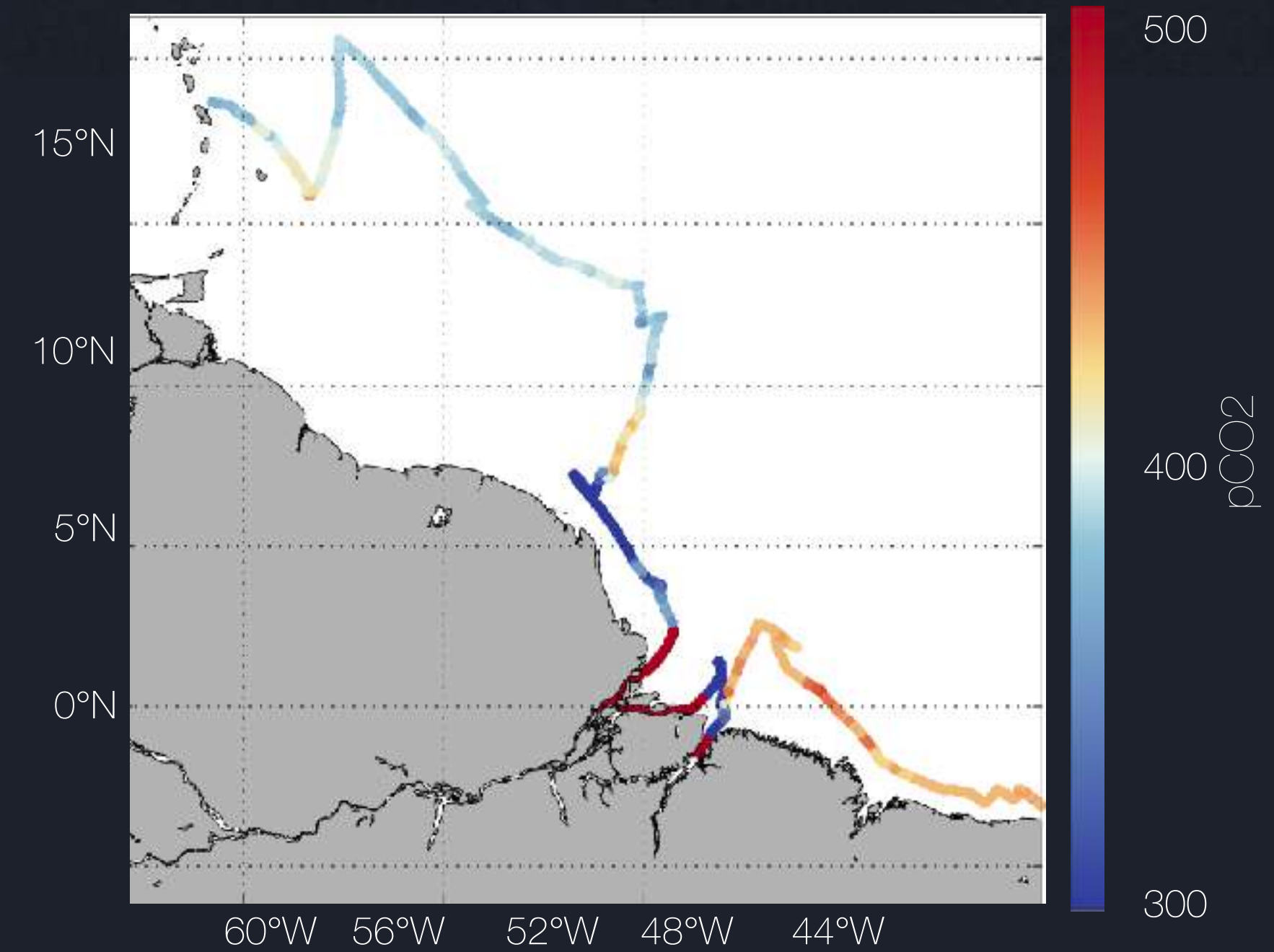


# Tara - Mission microbiome

September 1st



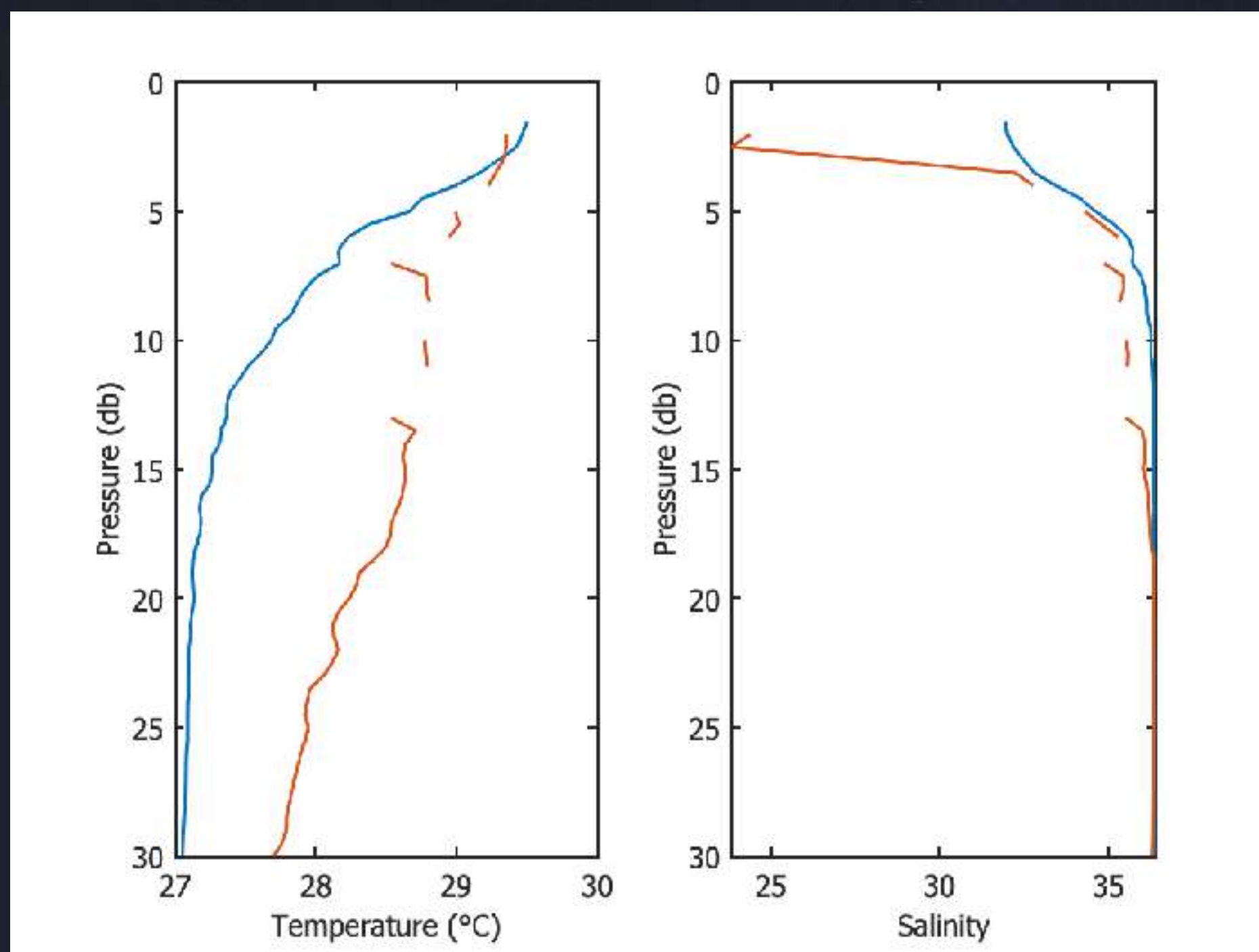
August-September *Tara*



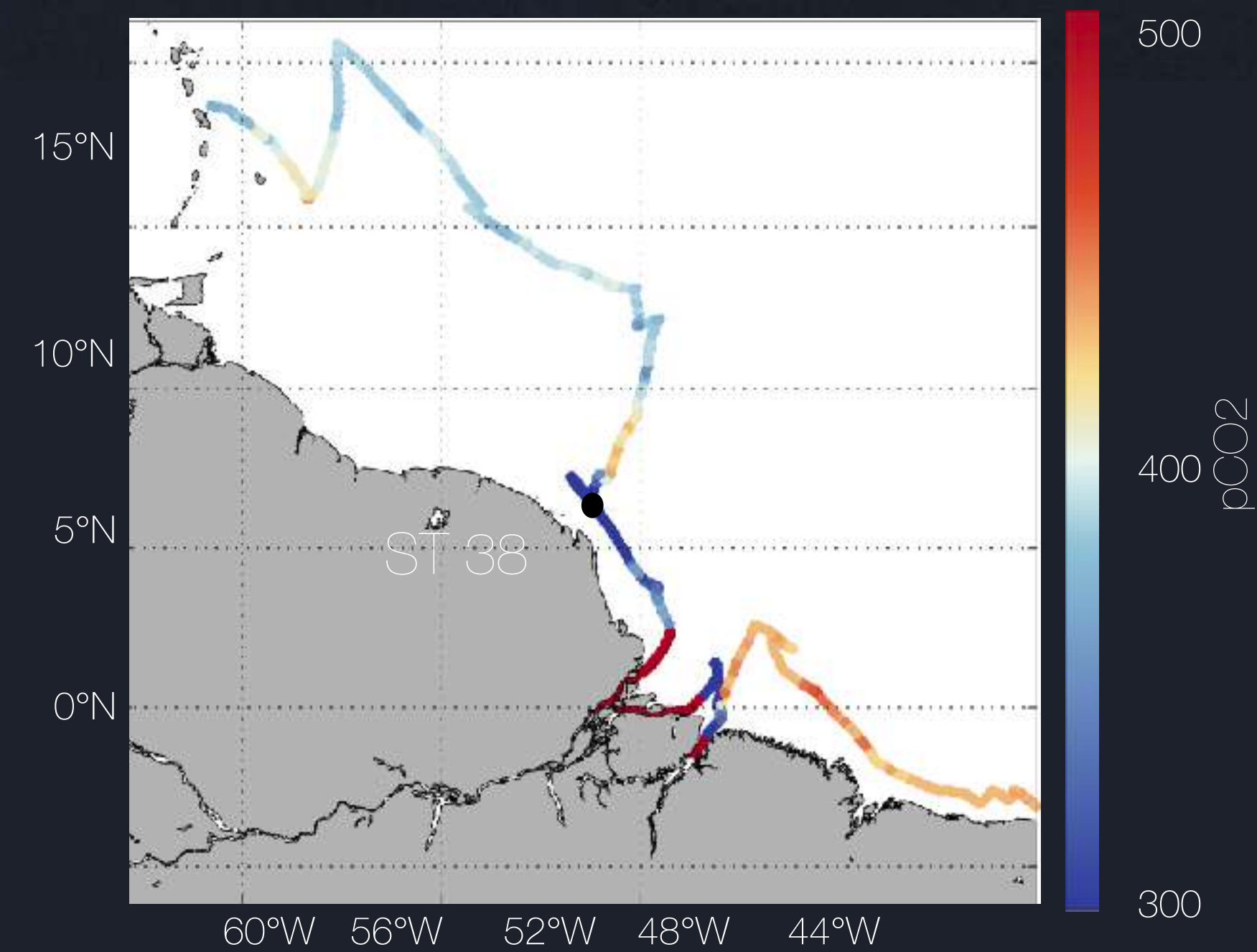


# Tara - Mission microbiome

Station 38 (Amazon plume)



August-September Tara



Salinity at 3m (22 pss) VS salinity at 5m (33 pss)



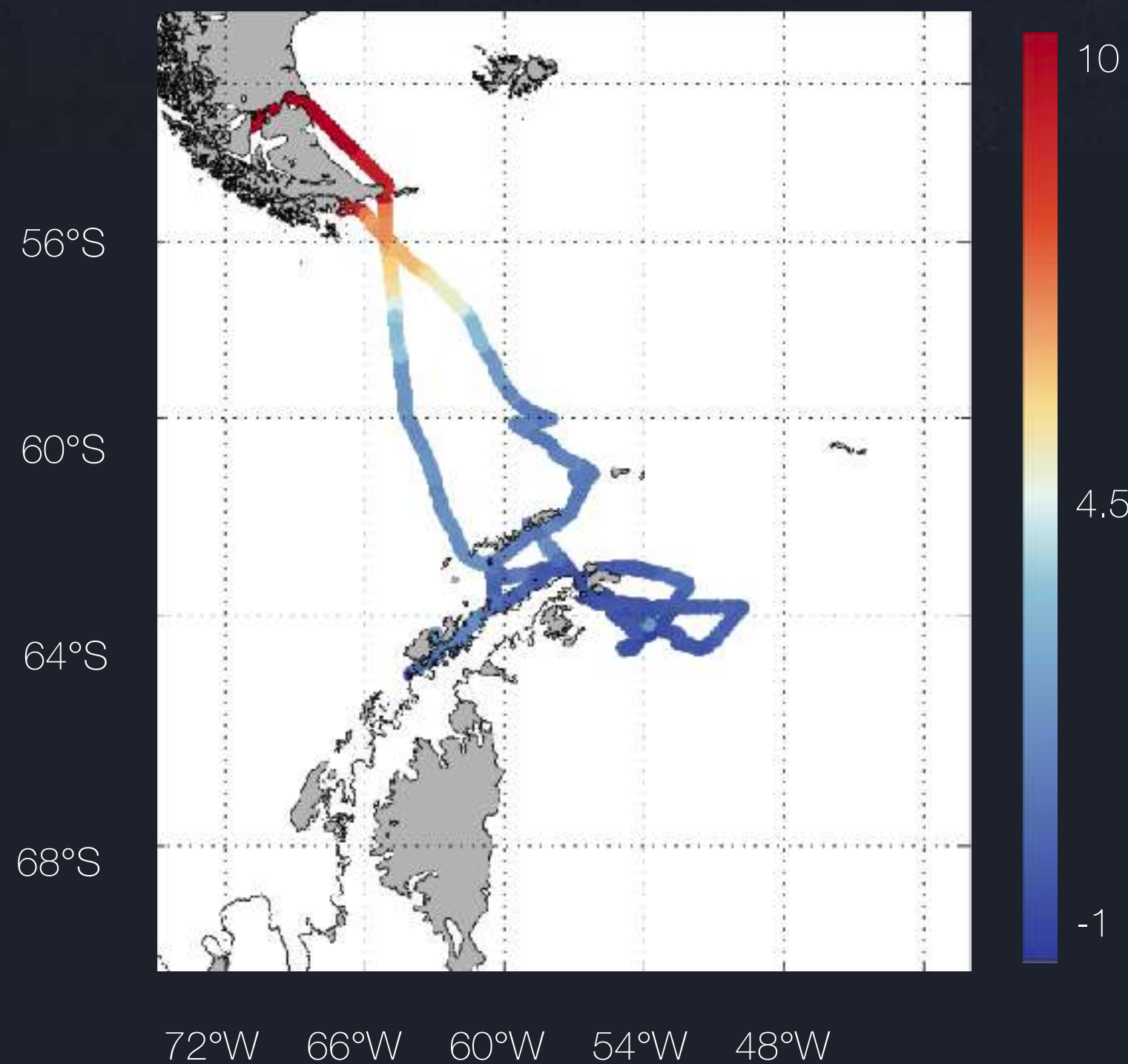


***Tara* - Antartique**  
**King George Island - Punta Arenas**

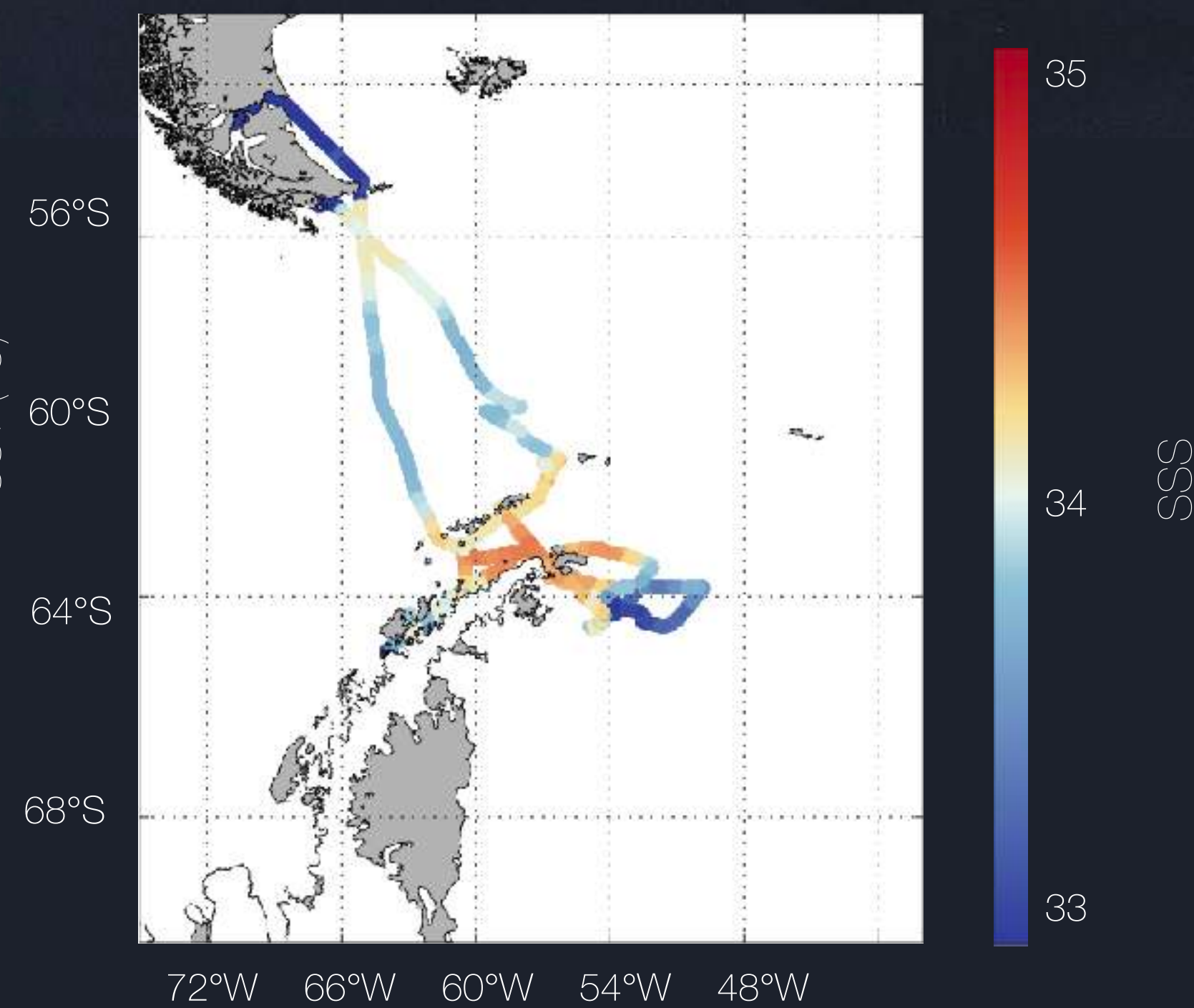


# Tara - Janvier-Février 2022

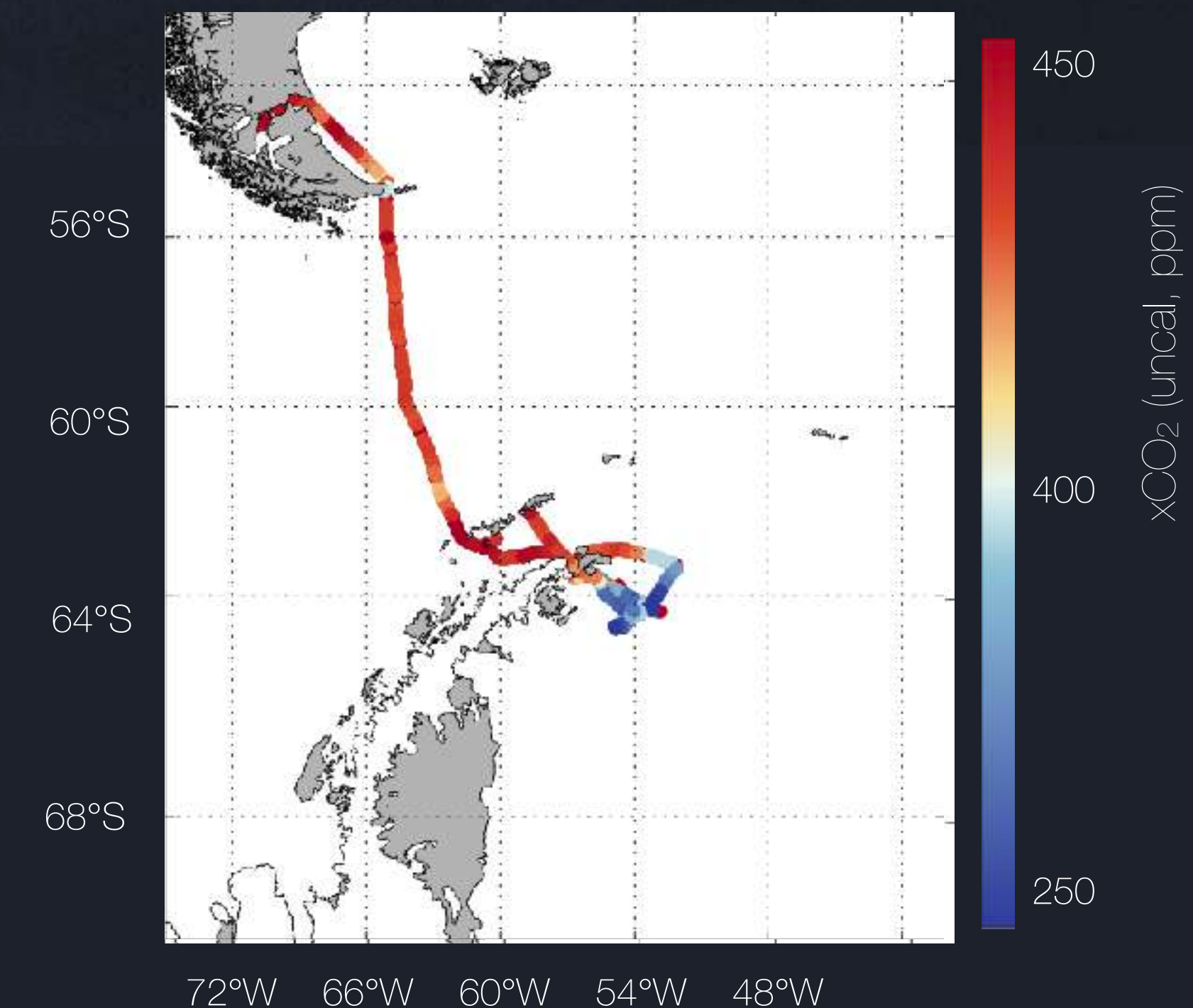
SST *Tara*



SSS *Tara*



xCO<sub>2</sub> uncalibrated *Tara*



Forts gradients de température, salinité, et période de fort bloom d'été en Mer de Weddell



# *Tara* - Mission microbiome

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Passage de Drake aller - Fin du 500 ppm

*Leg 11*

1 standard (0) + ATM

Passage de Drake retour - Fin du 0 ppm



# Conclusions

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Eurec4a: 3 ships represent the strong small scale variability of the CO<sub>2</sub> in the area, even in low amazon outflow period

Tara: study of (coastal) high variability area, with big contrasts  
Measurements close to the surface are important  
Worked well for months before Drake passage



Merci !

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Demain dans les kiosques !