Impact of NBC rings on the CO_2 air-sea flux variability in winter 2020

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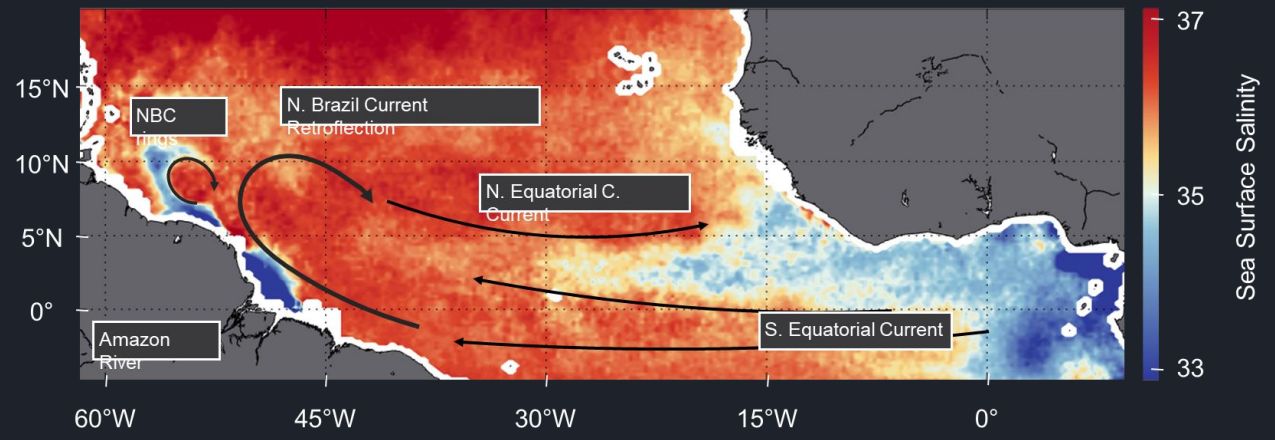
Doi : https://doi.org/10.5194/bg-2021-269, in review, 2021

A transition region highly dynamic



February 7th, 2017, CCI+SSS

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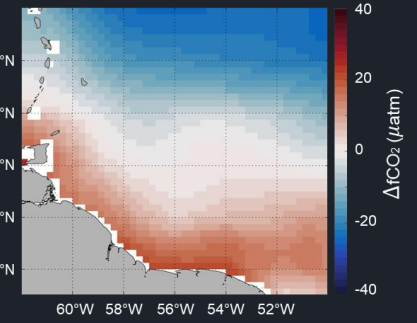
February ΔfCO_2 climatology

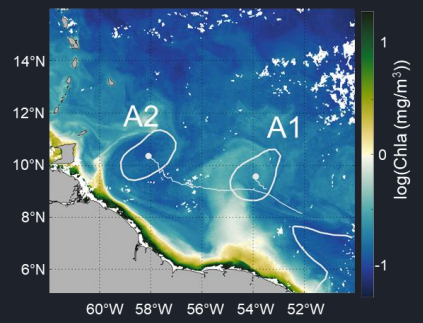


Landschützer at al., 2020

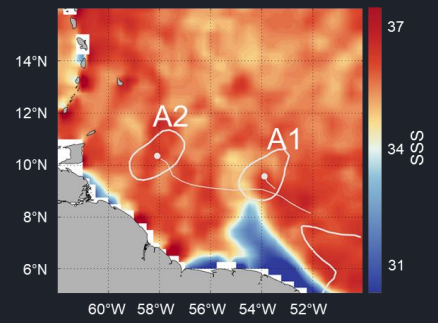
CO_2 sink generated by winter cooling in the North

CO_2 source close to the equator waters rich in CO_2

Satellite Chl*a* on Feb 6th 2020



Satellite SSS on Feb 6th 2020



SMOS (CATDS) + SMAP (RSS)

Problematics

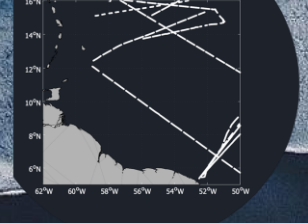
How do mesoscale and sub-mesoscale dynamics influence the regional CO_2 air-sea fluxes ?

Impact of the amazon plume in a low outflow period ?

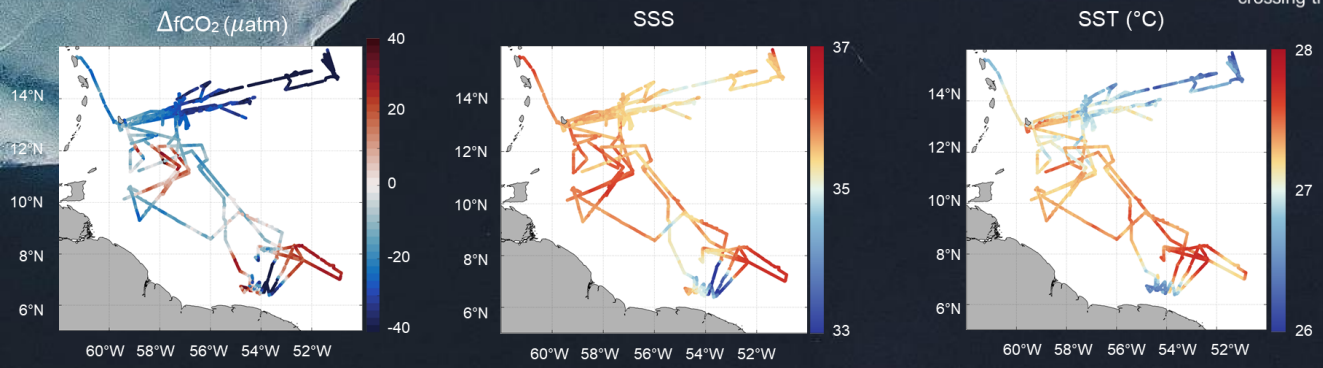
What is the impact of NBC eddies on the CO_2 fluxes ?

Data

The EUREC⁴A-OA cruise

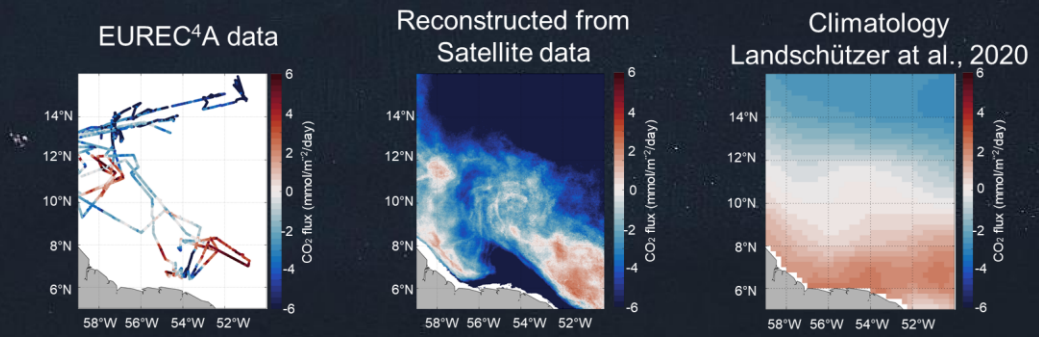


1 transect south of Barbados crossing the region



January - February 2020 - 3 ships equipped with CO_2 system - RVs Atalante-Merian- Ron Brown

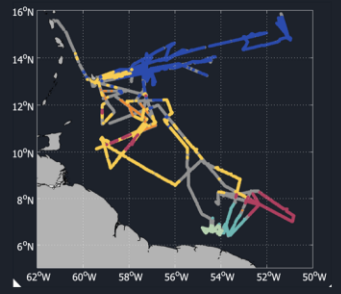
Air-sea CO_2 flux

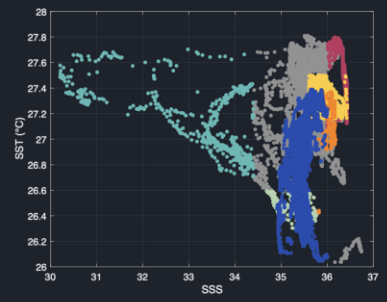


Error linked to ship measurements < 0.1 mmol/m²/day

Error linked to interpolation and reconstruction ~ 4 to 9 μatm

Water masses identification



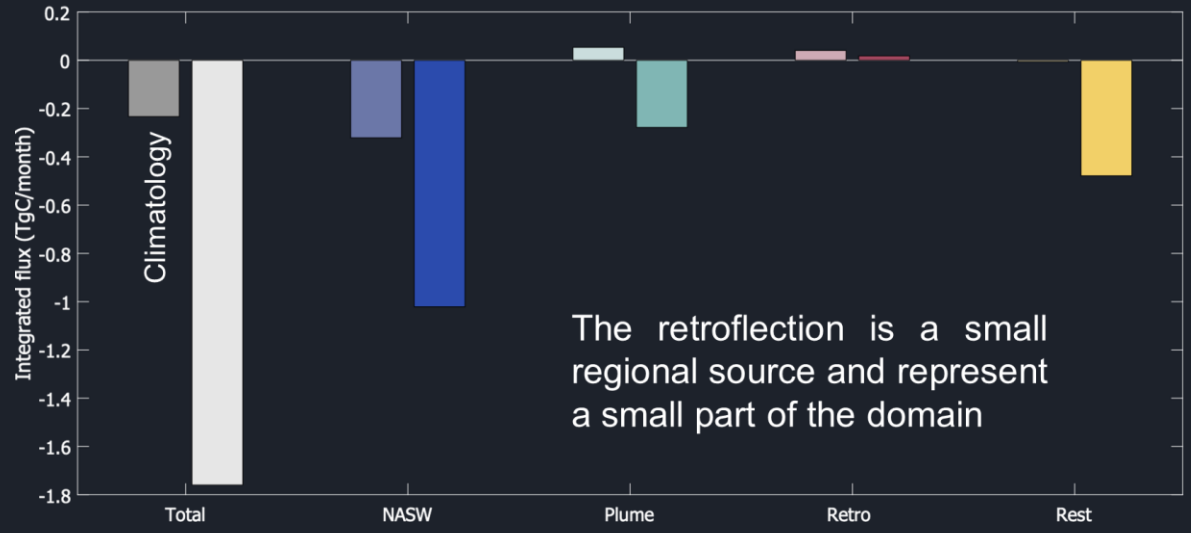


Identification using SSS, SST and colocalised satellite Chl*a*

Boundaries varying in space and time

North Atlantic Surface Water | Fresh plume | NBC water | Modified NBC | Shelf | Filament

Integrated air-sea CO_2 flux



The retroflection is a small regional source and represent a small part of the domain

Conclusions

The NBC retroflection is a source of carbon to the Atmosphere:

-the signal of the NBC rings is dampened over time, but conserve high fCO_2 near the centre

-the main effect of NBC rings is through the filaments they stir, even in period of low Amazon outflow on the shelf

The Fresh plume, often not taken into account in Jan-Feb, accounts for 20 % of the total sink.

The NASW represents 60 % of the total sink: this strong sink compared to the climatology can be due to interannual variability or a lack of data in global datasets

The regional ocean carbon sink is underestimated by a factor 10 in the climatology, due to a lack of data and of small scale representation

Perspectives

Study of the summer season from recently acquired Tara Microbiome data in August-September 2021

Better characterization of the role of the NBC rings and of the Amazon plume in a strong outflow period