ALTRAN OUEST

Atlantide

oceanflux ghg
support to science element

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Estimating the CO_2 fluxes over the North Atlantic subtropical basin using different tools and methods

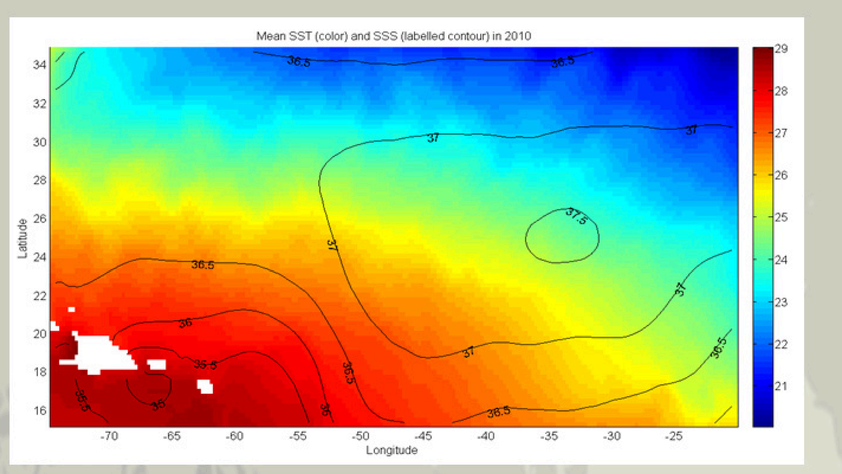
Context and scientific target

Area of study: North Atlantic subtropical gyre

Years of study: 1999-2010

Objective: Estimation of CO_2 flux from carbon fugacity :

$$F_{CO_2} = k \cdot \alpha \cdot dPCO_2$$



Comparison between several approaches: three methods (WG99, FW07, GF12) for calculating the heat transfer coefficient (k), two different datasets, two computation tools.

OceanFlux-GHG Tool

We remotely processed some of our air-sea CO_2 fluxes with the computation tool developed at the Cersat Cloud Facility, in the framework of OceanFlux-GHG project.

Main benefits are :

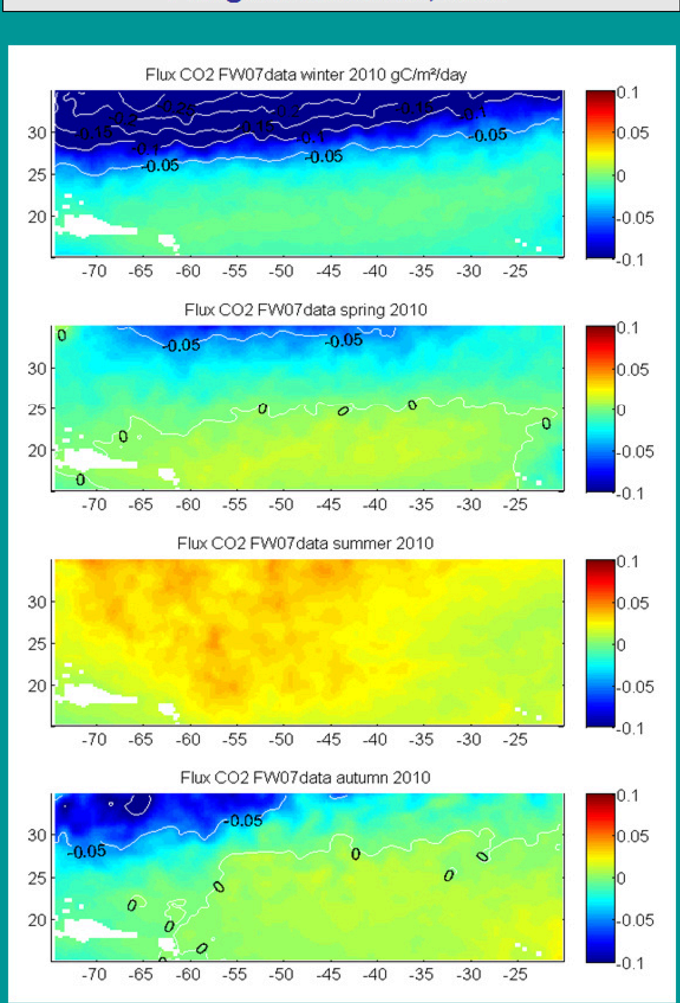
- ***Easy access*** with a virtual machine or a SSH client,
- ***Wide range of datasets*** (geophysical and biological parameters) to prepare user configuration,
- ***Easy processing*** by running a set of pre-installed program, free to be modify in the user account,
- ***Convenient output files (NetCDF)*** gathering air-sea fluxes results, data information, some useful indicators (region of low winds, etc).

Main results

FW07 method + Altran tools

Data "manually" collected from CERSAT servers and transferred to local PC. Computations done on local PC.

Fanghor et Woolf, 2007

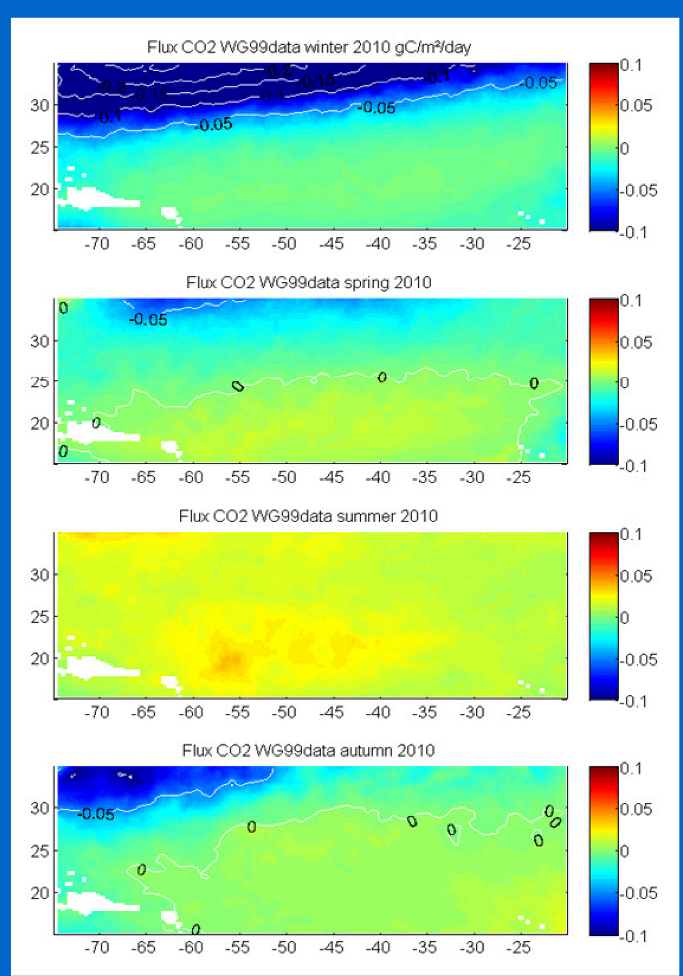


Mean CO_2 flux : -0.014 gC/m²/day

WG99 method + Altran tools

Data "manually" collected from CERSAT servers and transferred to local PC. Computations done on local PC.

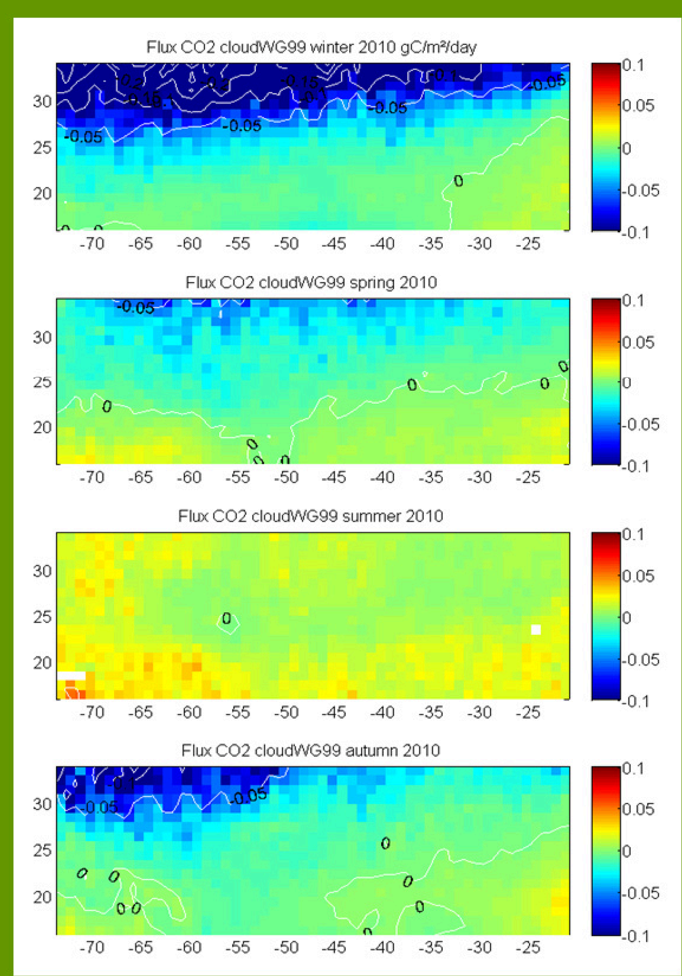
Wanninkhof & Mc Gillis, 1999



Mean CO_2 flux : -0.010 gC/m²/day

WG99 method + Cloud tools

No Data transferred. Computations done on CERSAT servers. Dataset different from Altran tools.

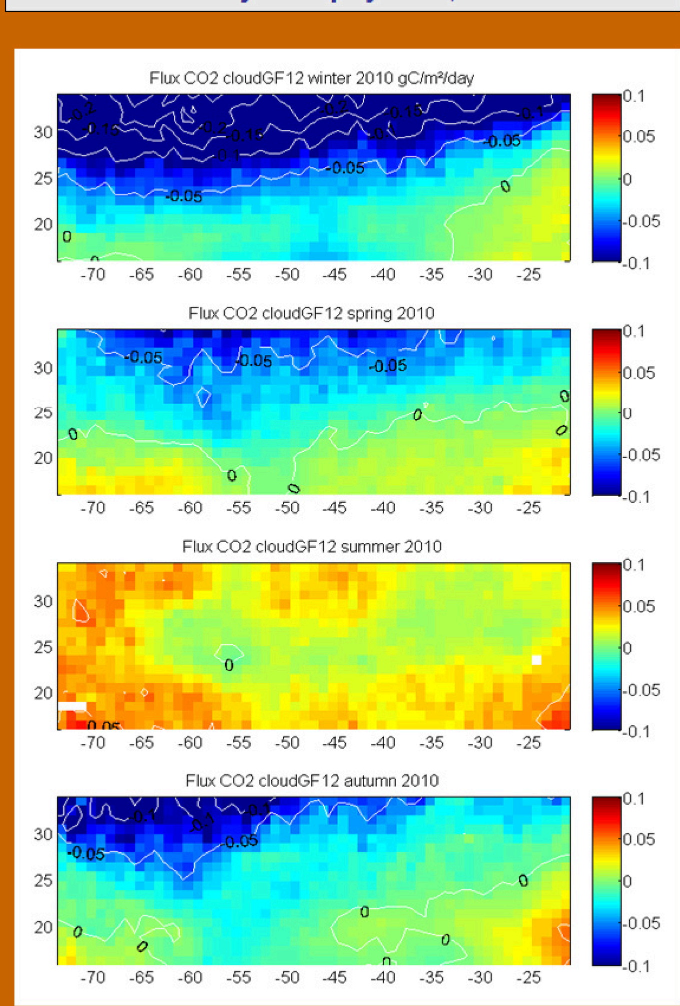


Mean CO_2 flux : -0.013 gC/m²/day

GF12 method + Cloud tools

No Data transferred. Computations done on CERSAT servers. Dataset different from Altran tools.

Goddijn-Murphy et al., 2012



Mean CO_2 flux : -0.020 gC/m²/day

Conclusion …

CO_2 fluxes computed from various methods show global release from the ocean to the atmosphere in the North Atlantic subtropical gyre. A clear seasonal signal is observed, with ocean absorbing CO_2 in winter and releasing CO_2 in summer. The mean CO_2 flux appears to be highly related to the computation method for the transfer velocity (from -0.010 gC/m²/day to -0.020 gC/m²/day).

… and Outlook

Our results show that it is clearly necessary for climate study to have confidence interval that relies on several computation methods for the various phenomena (here transfer velocity). The CERSAT tool, thanks to a remote computation methodology, enables multiple computations, using different data sets and different algorithms. It makes it easy to build robust results with a clear overview of the confidence on them.

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