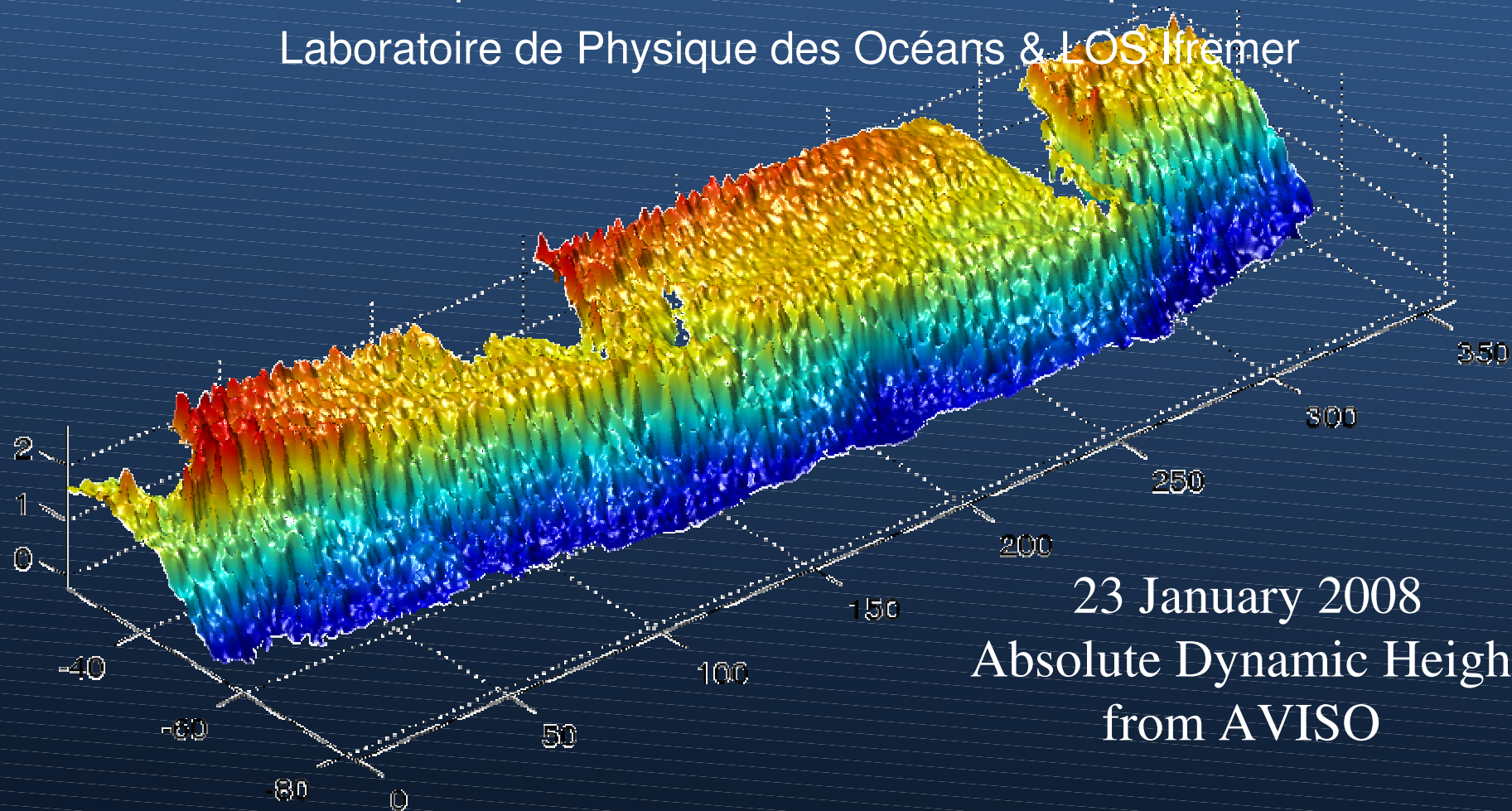


3D Dispersion driven by the submesoscales

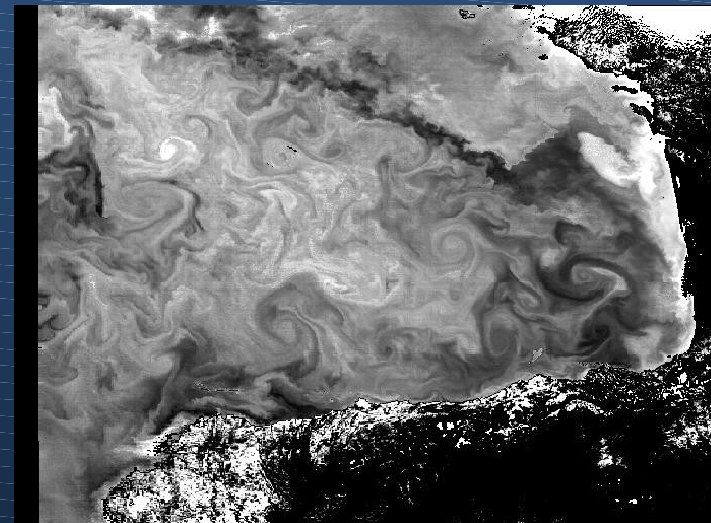
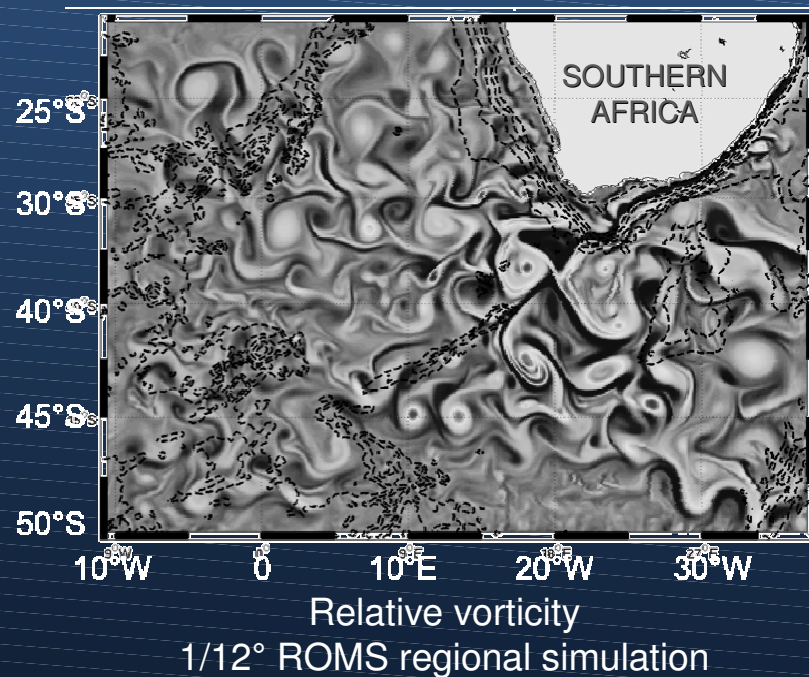
S. Speich, P. Klein, X. Carton, B. Chapron,
Laboratoire de Physique des Océans & LOS Ifremer



23 January 2008
Absolute Dynamic Height
from AVISO

The Mid- to High latitude Ocean : A turbulent dynamics

Spontaneous emergence of ≈ 10 km submesoscale fronts and vortices in between the ≈ 100 km mesoscale eddies.



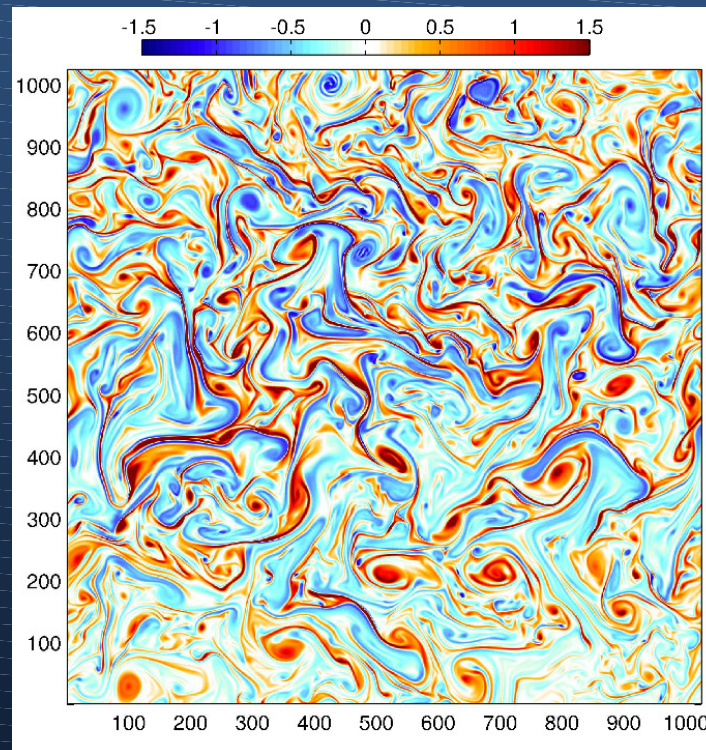
Thermal Satellite Image
Of the Gulf of Biscay

Impacts

on mixing, ventilation, air-sea interactions, biogeochemistry & ecosystems

The Mid- to High latitude Ocean : A turbulent dynamics

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Impacts on :

Mixing, ventilation, air-sea interactions, biogeochemistry & ecosystems

Scientific Questions

1. What is the contribution of fine scales dynamics (**MESO & SUBMESO**) to 3D ocean exchanges

- a. Lagrangian studies from ocean observations suggest **MESOSCALE** is characterized by 2D dispersion
- b. Numerical and Lagrangian observations suggest that **SUBMESOSCALES** act:
 - By changing scale laws (i.e., different dispersion behavior)
 - By generating important vertical velocities at least in the first 500m of the water column

2. What is the signature of mesoscales at the sea surface (*i.e.*, in the Mixing Layer) ?

- a. Satellite altimetry suggests a KE slope $\approx k^{-2}$ (geostrophy) while *in situ* observations suggest a KE slope $\approx k^{-3}$;
- b. No SQG relation between SSH and surface density (SST).

3. What are the impact of these scales on air-sea exchanges ?

Objectives

1. Horizontal dispersion is higher in the presence of submesoscale dynamics . What are then the observations needed to evaluate such a behavior?
 - a. SSH (SWOT mission)
 - b. Surface current

Importance for Oil spill, pollutant dispersion, ...

2. What is the phase relationship between the horizontal dispersion and the vertical velocity field?

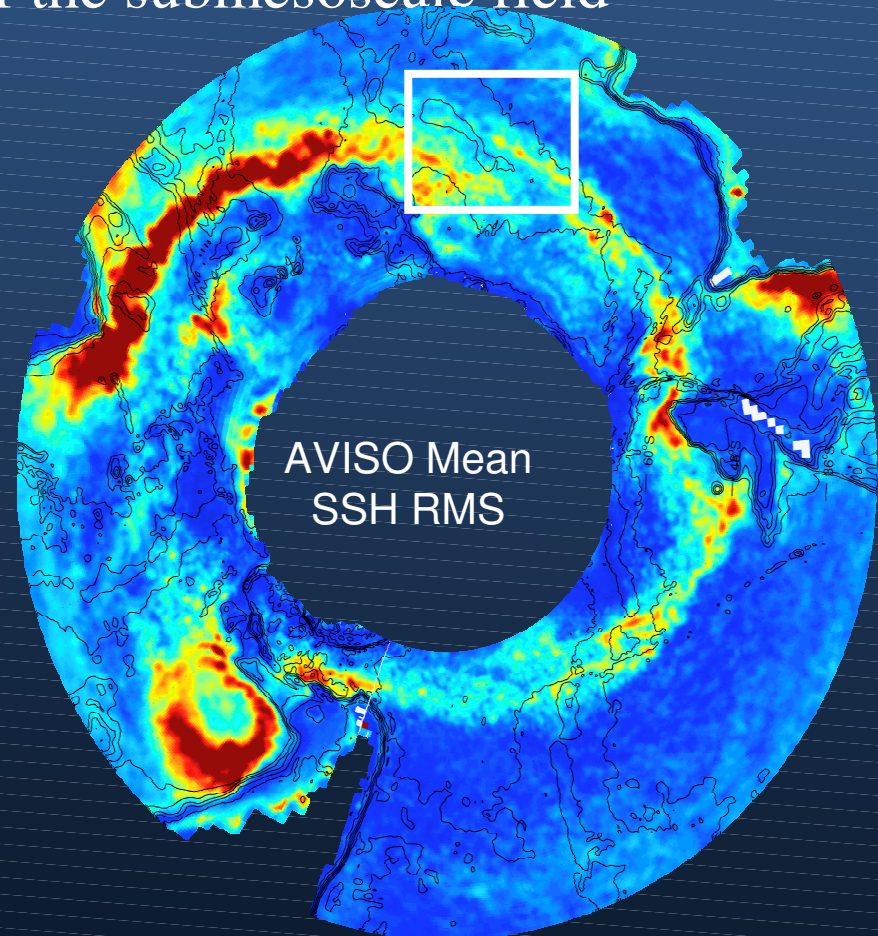
This has an impact on:

- a. Marine biogeochemistry (*e.g.*, impact on nutrients supply)
- b. Marine ecosystem partition
- c. Vertical heat fluxes

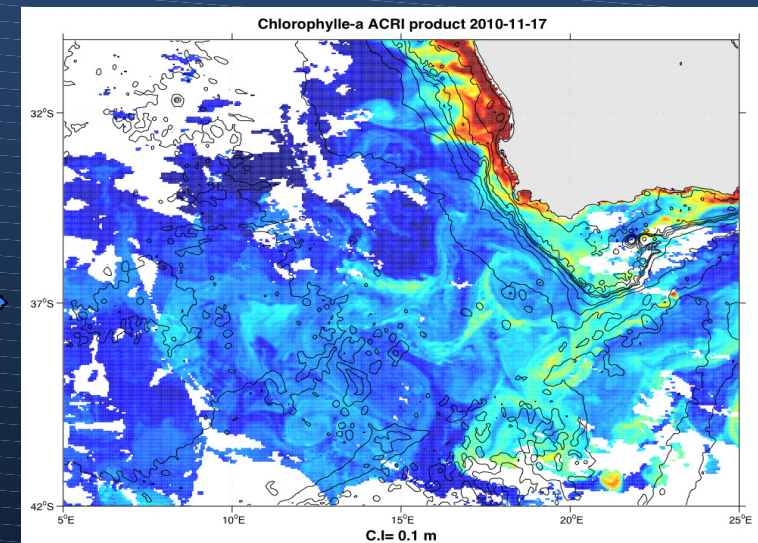
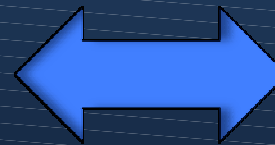
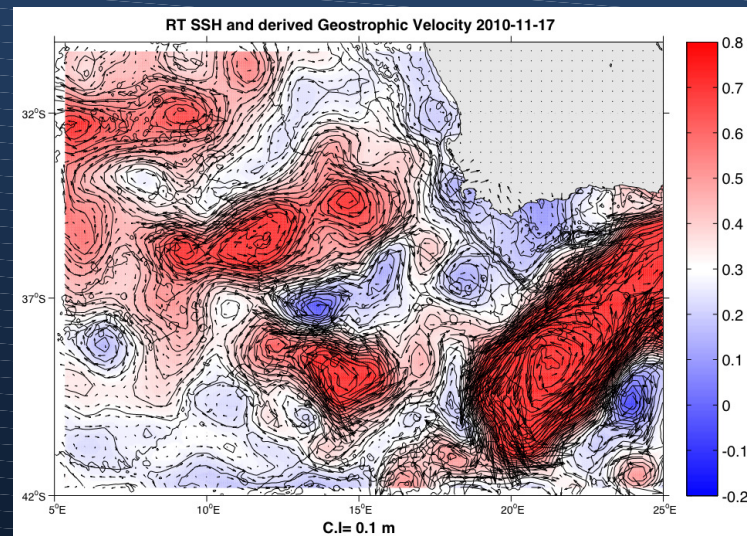
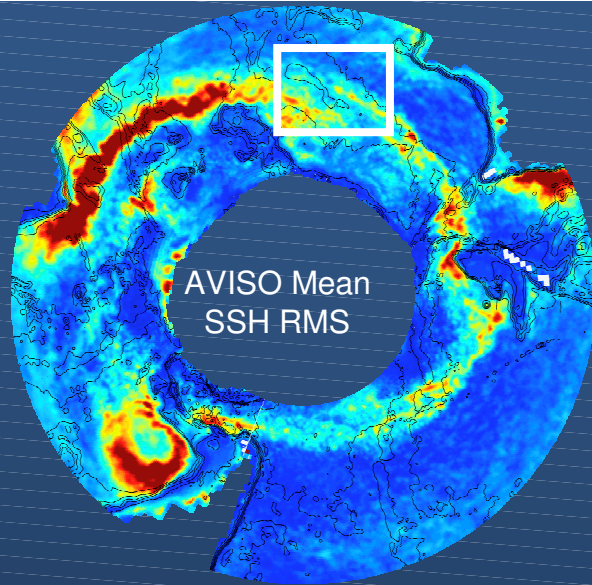
Satellite and in situ field experiment south of Africa

In complement to modelling, to observe and quantify the
dynamics and structure of the submesoscale field

Ocean dynamics in
the Cape Basin
South West of
Africa: a region of
high eddy activity &
no mean current/jets



Satellite and in situ field experiment south of Africa



Satellite and in situ field experiment south of Africa

An underway multidisciplinary *in situ* & satellite
experiment

