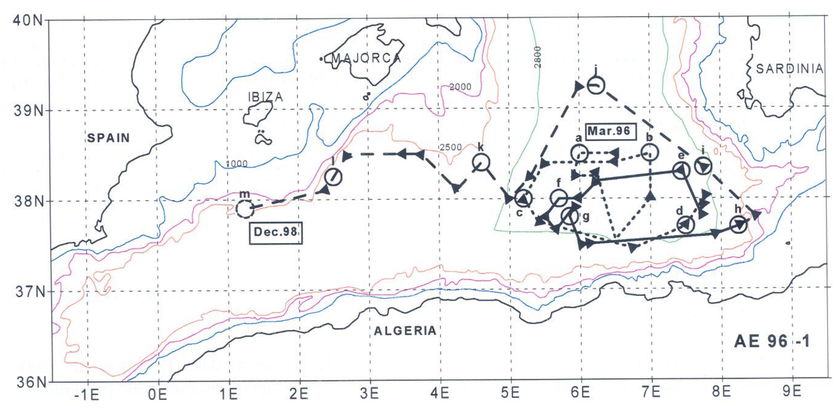
Time variability on hydrology and biogeochemistry induced by mesoscale eddies in the Algerian Basin: a one year high resolution and multiplatform experiment.

Authors Ingrid PUILLAT (1), Isabelle TAUPIER-LETAGE (2), Jean-Luc FUDA (3)

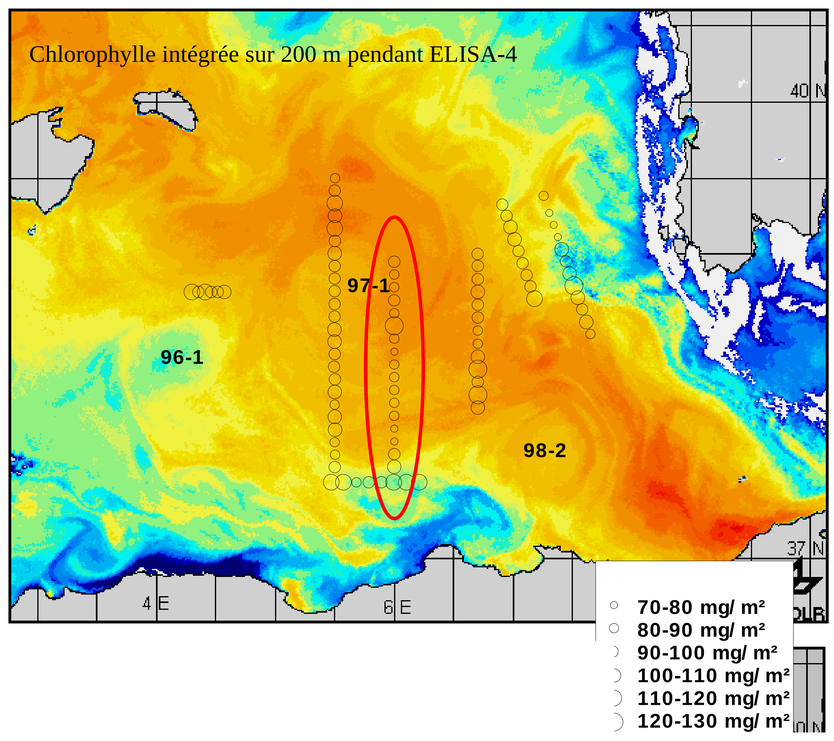
Background

The Algerian Basin (Western Mediterranean Sea): a strong mesocale activity associated the Algerian current instabilities.

- Drives the general circulation (e.g. Milllot 1999)
- Influences the biology functioning (e.g. Taupier-Letage et al., 2003).
- Long life anticyclonic eddies (a few months – a few years) (Puillat et al., 2002) Ø ~50-200km
- Short life smaller cyclonic eddies and filaments (a few weeks).



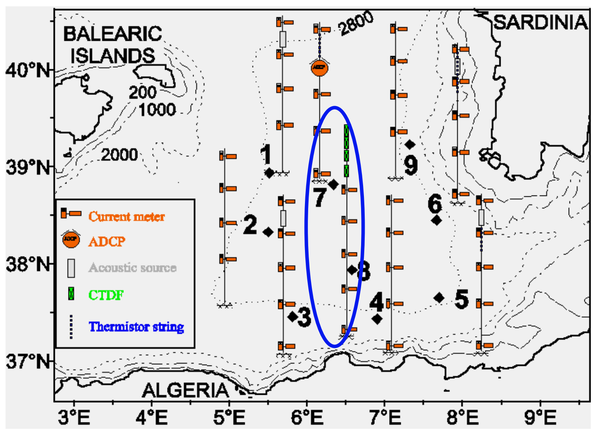
Question: Relative contribution of the mesoscale activity to the variability in time and space on the dynamics and the biology?

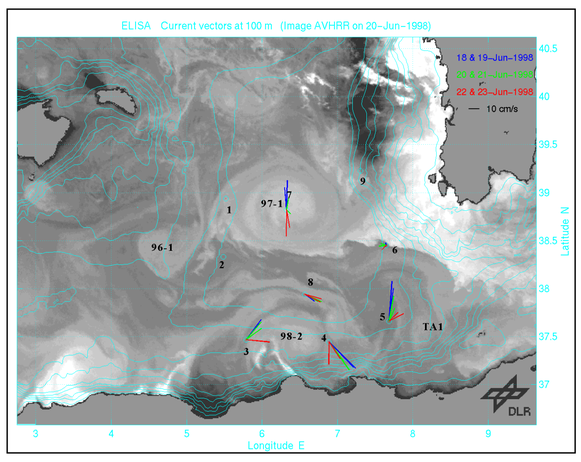


Experiment

The ELISA project (1997-1998, MAST-3/MTP/MATER program)

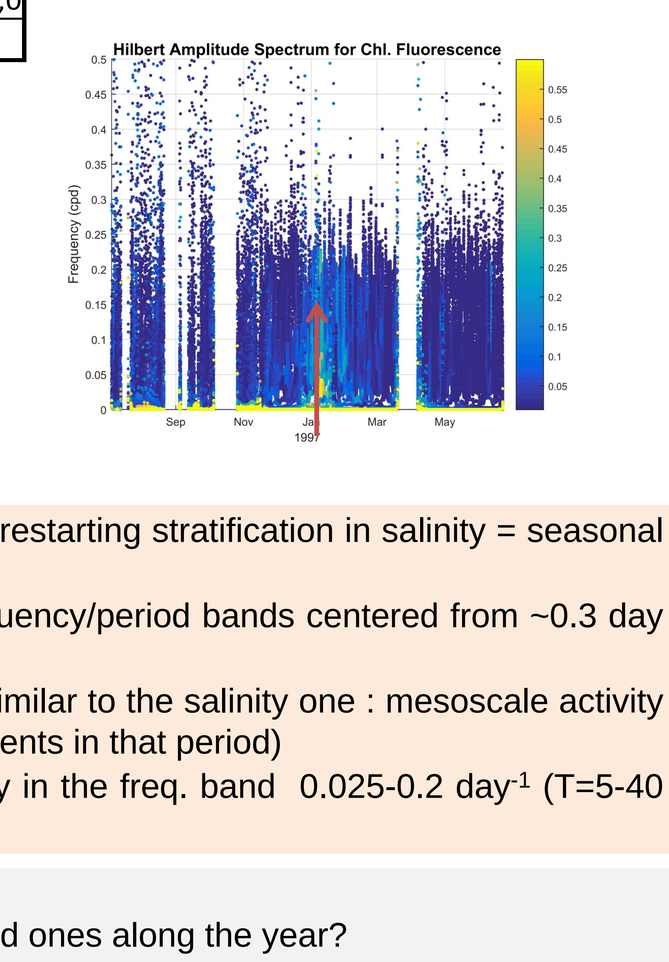
- ✓ 9-mooring network (lines ~50 km-spaced), ~50 current-meters down to the bottom: 1-year high frequency time series acquired from the surface down to ~3000m.
- ✓ 3 main cruises (vertical section + other investigation types)
- ✓ a multidisciplinary and multiplatform experiment
- ✓ 2 specific Anticyclonic Eddies (AEs) tracked by satellites images during 4 years





With benefit of the study of the spatial distributions, when an AE flowed on M8, it is possible to comprehend its signature at fine spatio-temporal scale. The presented analysis focus on the temporal signal induced by these eddies recorded on 4 autonomous CTD/Fluorometers, located in the central mooring of the network, in the upper layer.

Data return after a 1-year acquisition on mooring #8



Results

EMPIRICAL MODE DECOMPOSITION (EMD)

periode (d)	IM1	IM2	IM3	IM4	IM5	IM6	IM7	IM8	IM9	IMF10	IMF11
fluo	0,3	0,4	0,7	0,8	1,7	4,8	8,8	18,1	56,4	61,1	136,0
temp	0,2	0,3	0,3	0,7	2,2	3,4	4,2	13,8	25,2	69,8	
sal	0,2	0,4	0,5	0,9	1,3	2,3	4,6	8,0	24,1	33,0	44,0
dens	0,2	0,4	0,6	0,9	2,1	3,5	8,7	13,3	52,8		

T_{fluo7} = 8.8d F_{fluo7} = 0.11d $^{-1}$
T_{sal7} = 4.6d F_{sal7} = 0.22d $^{-1}$

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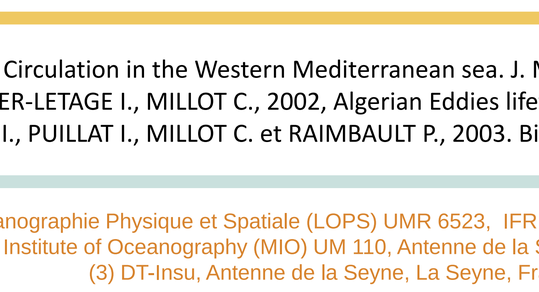

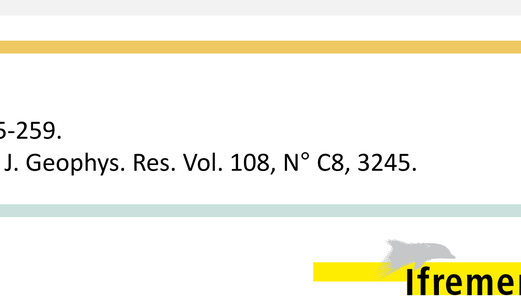

- ✓ « Spring » Bloom of phytoplankton in Jan. – early Feb. 1998.Chl. with restarting stratification in salinity = seasonal pattern (T=1 year).
- ✓ This bloom is concomitant with an increased variability at several frequency/period bands centered from ~0.3 day (IMF1) to 4-10 days (IMF7).
- ✓ On a variability at 2-5 days, the fluo. signal in that season is strongly similar to the salinity one : mesoscale activity (cyclonic eddy) and submesoscale events (no main large mesoscale events in that period)
- ✓ The HSA spectrum: the bloom concomitant with an increase of energy in the freq. band 0.025-0.2 day^{-1} (T=5-40 days) the time induced submesoscale variability.

❖ Conclusions and next steps:

- ✓What is the contribution of the submescoscale induced variability relative to the mesoscale and seasonal induced ones along the year?
- ✓Evolution of the correlation between phytoplankton and salinity along the year?

Ref.

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(1) Laboratoire d'Océanographie Physique et Spatiale (LOPS) UMR 6523, IFREMER centre de Brest, Plouzané, France. **ingrid.puillat@ifremer.fr**
(2) Mediterranean Institute of Oceanography (MIO) UM 110, Antenne de la Seyne, La Seyne, France. **isabelle.taupier.letage@univ-amu.fr**
(3) DT-Insu, Antenne de la Seyne, La Seyne, France. **jean-luc.fuda@dt.insu.cnrs.fr**