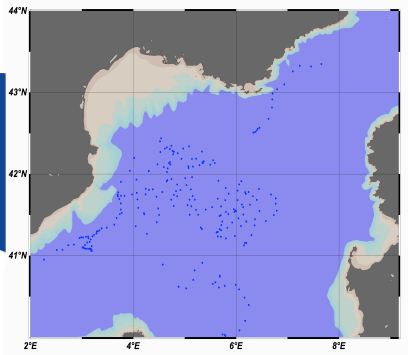


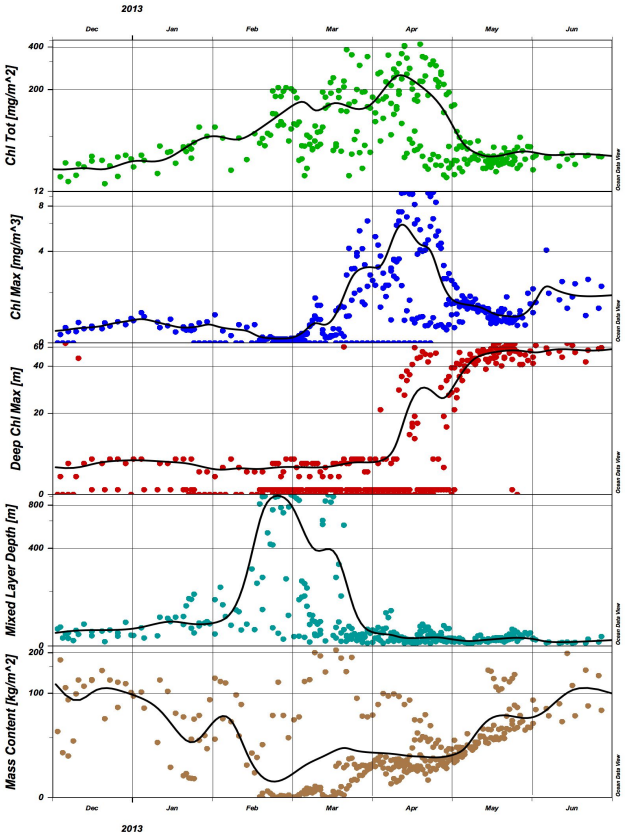
The NW Med winter 2013 has been monitored by 5 profiling floats

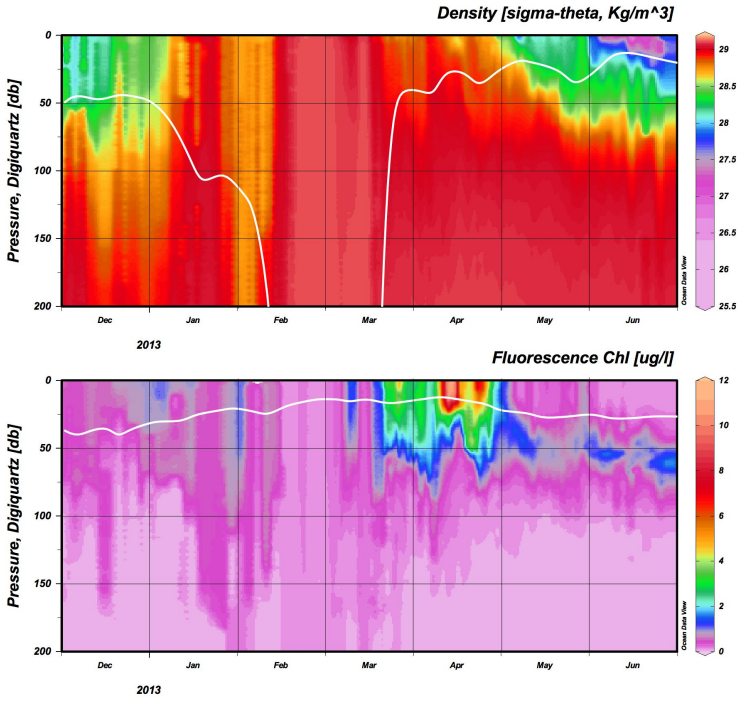
The NAOS program provided 3 provBioII* – new generation of Argo floats embarking bio-optical sensors together with the CTD – to sustain the emerging BioArgo observing system of the northwestern Mediterranean basin. This fleet performed an unprecedented presence in open sea during the sharp winter 2013 and collected high quality observations of the upper ocean ecosystem.

Analysis of the chlorophyll fluorescence signal together with the evolution of the stratification revealed the loss of biomass in February when convection processes cancelled the upper layer stratification: mixed layer depth promptly decreased while buoyancy flux toward atmosphere was activated, which lead to the dilution of chlorophyll maxima.

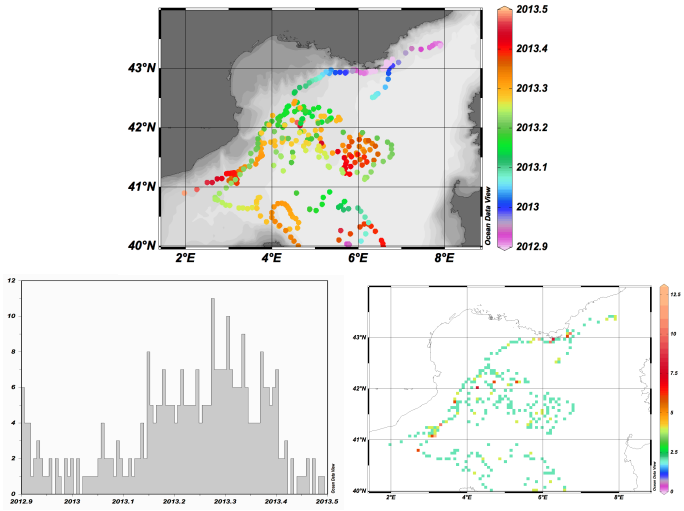
On the other hand, mid-March was marked by a sharp growth of biomass while early stratification at surface appeared and the euphotic depth rose up. The phenology of this bloom is quite disparate though: initiation times, maximum chlorophyll values and duration of surface productive regimes (shown by DCM time series) are not homogeneous even if the set of observations stays confined in 3° x 3° box.

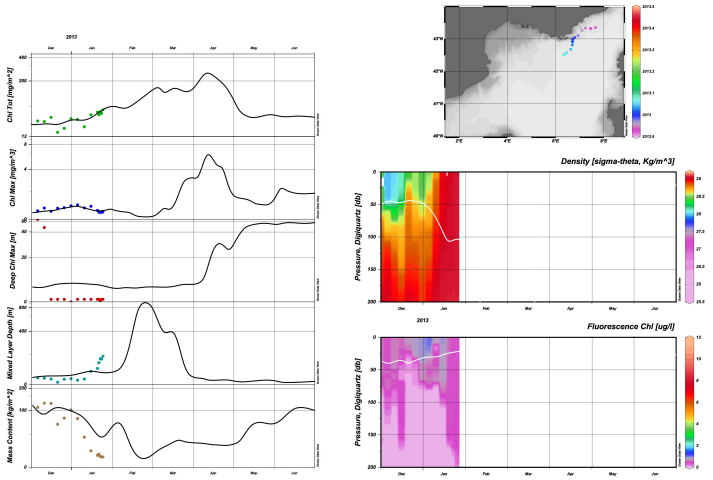
The opportunity of gathering 5 observing points within this region can be exploited to understand such dispersion patterns on the responses of ecosystems to local physical forcings.





** © NKE Electronics nke-instrumentation.fr*



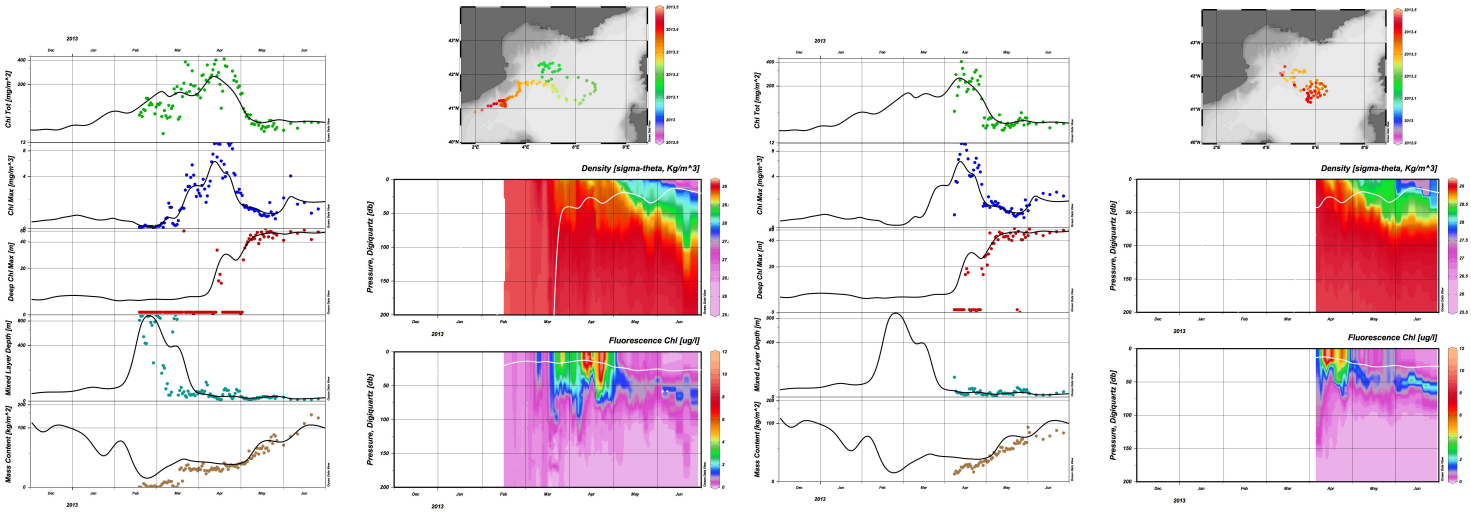


The observing system covered the central area during the top period.

The winter and early spring (green and orange dots) have been intensively sampled in the central area. The intrinsic dispersion of the floats toward the surroundings has been balanced by new deployments and lower cycling rates (set down to 5 days).

Bonaparte merely sampled the winter preconditioning period.

The first provBioII was deployed in the Ligurian Sea in December; communication stopped after 20 cycles while entering in the top period. It confirms the slight increase of productivity seen by the *Navis* along the same path. Last observations located offshore clearly identify the abrupt mixing event of mid-January.

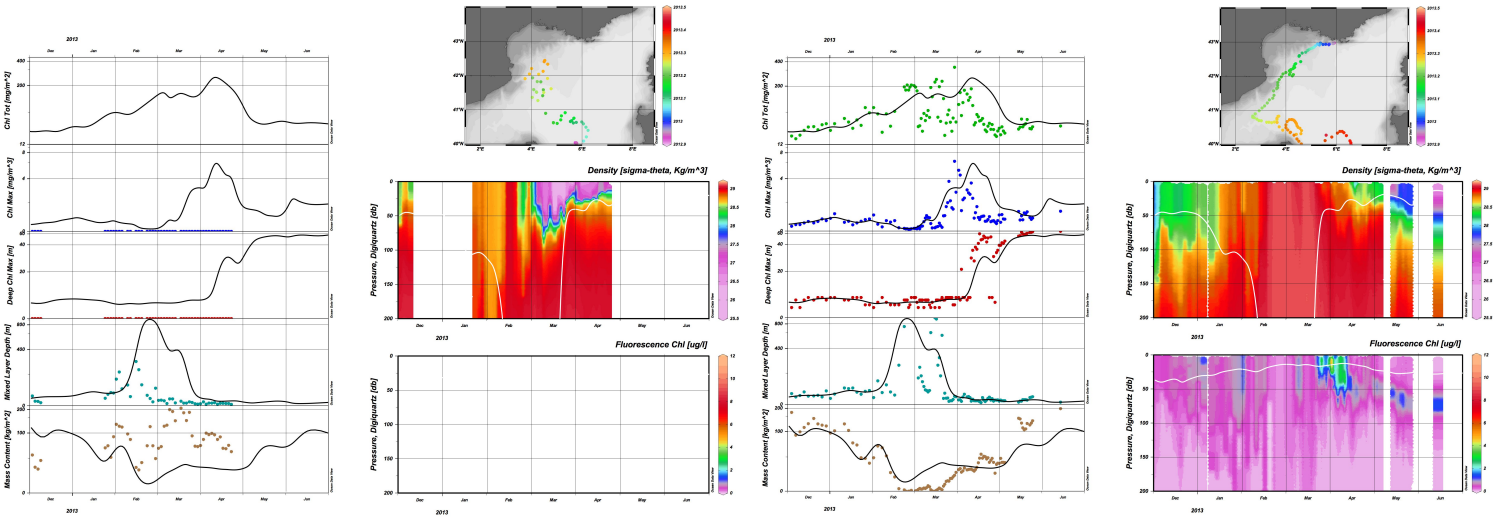


Napoleon collected benchmarks for the winter convection period.

Starting in the core of the first mixing event of winter, this time series of 1-day resolution shows up in details the response of the ecosystem to short term variations in mixed layer conditions, crescendo in productivity from early March to its maximum in mid-April.

Mortier retailed after the winter-spring transition.

Intense eddy activity and sampling rate shortened the residence time in the area and required new deployment. This new time series confirmed the phenology of the bloom for its transition to a DCM regime in May. A short peak of production appeared in late May, signing a mesoscale effect of a cyclonic eddy in which the float was trapped.



*proNUTS** crossing northward the area shows up an active convection regime.

This prototype float without fluorimeter collected relevant observations of the meridional extension of well-mixed conditions during this winter, until it ended up inside the jet circulation along the shelf.

** © NKE Electronics nke-instrumentation.fr*

*Navis** fastened the western edge thanks to the jet-like circulation.

Here around the physical forcing has been close to its general pattern (black and white lines), with an intense mixing and a quick initiation of the bloom when the first 20m stratified. The high production period is however shorter and DCM regime set up earlier in mid-April while the float drifted southward and eventually exited the area.

** © Sea-Bird Electronics navis.sea-birdscientific.com*

Conclusion and perspectives

A robust time series of high resolution to characterize a spring bloom in temperate areas

The objective of the observing system to collect a benchmark time series of the preconditioning and phenology of the spring bloom in the northwestern Mediterranean has been achieved. The robustness of this unique observation can be assessed assembling the measure of the 5 available time series acquired in the area. However, the intense eddy activity occurring during winter needed to closely follow the efficiency of the observing system, and to find a compromise between sampling rate and new deployments.

A benchmark observation for basin-scale annual budgets and for new insights of small-scale processes

The first perspective that opens from this result is quantitative, with the evaluation of biogeochemical budgets for the basin. To do so, a spatial extension of this time series would be achieved considering synoptic observations from in-situ surveys and ocean color images.

The second perspective is process-oriented: the high sampling rate of 1 day recorded short term variations of hydrological states and its response on chlorophyll concentration. The interplay of atmospheric forcing, vertical or horizontal advection of water masses, onto the mixed layer contents would be studied at small scales and might provide new insights on their effects in the productivity of temperate areas.