Mapping the planktonic community across submesoscale physical features: the 2015 OSCAHR cruise in the NW Mediterranean.

A. M. DOGLIOLI[1], G. GRÉGORI[1], M. THYSSEN[1], T. WAGENER[1], P. MARREC[1], G. ROUGIER[1], N. BHAIRY[1], J. FENOUIL[2], A. DE VERNEIL[1], L. ROUSSELET[1], F. CYR[1], A. A. PETRENKO[1], J.-M. ANDRÉ[1], F. D'OVIDIO[3], A. PIETRI[3], F. NENCIOLI[1,4], L. JULLION[1], C. PINAZO[1], C. YOHIA[1] AND P. MARSALAIX[5]

[1]*Aix-Marseille Université, CNRS/INSU, Université de Toulon, IRD, Mediterranean Institute of Oceanography, Marseille, France;* [2]*Genavir, La Seyne sur Mer, France;* [3]*Sorbonne Université/CNRS/IRD/MNHN, Laboratoire d'Océanographie et du Climat, Institut Pierre Simon Laplace, Paris, France;* [4]*Plymouth Marine Laboratory, Plymouth, UK;* [5]*Laboratoire d'Aérologie, CNRS and Toulouse University, Toulouse, France*

In the past decade, submesoscale dynamics have been predominantly investigated through the analysis of numerical models. These studies suggest that submesoscale variability and the associated horizontal and vertical fluxes play an important role in ocean dynamics and physical-biogeochemical coupling. Modelers also generally highlight the need for in situ measurements at the submesoscale. Nevertheless, this represents a big challenge due to the ephemeral nature of submesoscale structures. Moreover, in order to study physical-biological coupling at the submesoscale it is crucial to perform biological measurements at high frequency.

The scientific objective of OSCAHR (Observing Submesoscale Coupling At High Resolution) is to characterize the structuring effect of a submesoscale-active region on the first trophic levels and the associated biogenic elements. Additionally, the OSCAHR dataset allows the validation of remote sensing measurements (altimetry, ocean color, reconstitution of planktonic assemblages). The cruise strategy utilizes an adaptive approach based on both satellite and numerical modeling data to identify the dynamical features of interest. Our methodology also includes the use of novel platforms of observation for sampling the ocean surface layer at a high spatial and temporal frequency. In particular, a MVP (Moving Vessel Profiler) is deployed with CTD, Fluorescence and LOPC (Laser Optical Particle Counter) sensors. Furthermore, a new version of automated flow cytometer is installed for real-time, high-throughput sampling of phytoplankton functional groups, from micro-phytoplankton down to cyanobacteria (including Prochlorococcus). Two sources of seawater have been used in OSCAHR: along with the onboard surface water intake, a new pumping system is developed and tested in order to sample the upper water column to one meter resolution.

The OSCAHR cruise has been conducted from 29 October to 6 November 2015 in the North-West Mediterranean Sea. The first leg sampled the coastal waters near the Côte d'Azur, characterized by the presence of the along-shore Northern Mediterranean Current. During the second leg, an offshore region characterized by strong temperature and chlorophyll gradients has been sampled in the middle of the Gulf of Genoa.

Our preliminary results suggest that the fine-scale structure of the physical field is a driver for the spatial organisation of the planktonic communities, which display sharp ecological transitions in correspondence of submesoscale fronts.

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MIO - Institut Méditerranéen d'Océanologie, Campus de Luminy - Case 901, 13288 MARSEILLE cedex 9, France. Email: andrea.doglioli@univ-amu.fr.