HAL open science

Study of fine-scale dynamics and their coupling with biogeochemistry - FUMSECK cruise

S. Barrillon, Caroline Comby, Jean-Luc Fuda, Anne Petrenko, Melilotus Thyssen, Gérald Grégori, Anthony Bosse, Roxane Tzortzis, Nagib Bhairy, Frédéric Cyr, et al.

To cite this version:

S. Barrillon, Caroline Comby, Jean-Luc Fuda, Anne Petrenko, Melilotus Thyssen, et al.. Study of fine-scale dynamics and their coupling with biogeochemistry - FUMSECK cruise. EGU General Assembly 2021, Apr 2021, Vienne, Austria. 10.5194/egusphere-egu21-7199 . hal-03375185

HAL Id: hal-03375185

https://hal.science/hal-03375185v1

Submitted on 16 Nov 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Distributed under a Creative Commons Attribution 4.0 International License

EGU21-7199, updated on 16 Nov 2021
https://doi.org/10.5194/egusphere-egu21-7199
EGU General Assembly 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Study of fine-scale dynamics and their coupling with biogeochemistry - FUMSECK cruise

Stéphanie Barrillon[1], Caroline Comby[1], Jean-Luc Fuda[1], Anne Petrenko[1], Melilotus Thyssen[1], Gérald Grégori[1], Anthony Bosse[1], Roxane Tzortzis[1], Nagib Bhairy[1], Frédéric Cyr[3], Hubert Bataille[4], Francesco d'Ovidio[2], and Andrea Doglioli[1]

[1]Aix Marseille Univ., Université de Toulon, CNRS, IRD, MIO, UM 110, 13288, Marseille, France
[2]Sorbonne Université, CNRS, IRD, MNHN, Laboratoire d'Océanographie et du Climat : Expérimentations et Approches Numériques (LOCEAN-IPSL), Paris, France.
[3]Fisheries and Oceans Canada, Northwest Atlantic Fisheries Centre
[4]IRD,13572, Marseille, France

FUMSECK (Facilities for Updating the Mediterranean Submesoscale - Ecosystem Coupling Knowledge) is a one-week cruise, which took place in spring 2019, in the gulf of Genoa (NW Mediterranean Sea), onboard the R/V Téthys II. It was conducted in preparation of the BioSWOT-Med cruise in the SW Mediterranean Sea in 2022, planned as part of the ``Adopt a Cross Over'' initiative organising simultaneous oceanographic cruises around the world during the SWOT fast sampling phase. During FUMSECK we tested various technological innovations for the study of fine-scale dynamics and their coupling with biogeochemistry.

By their interactions, the fine scales could induce some ageostrophic and tridimensional dynamics, which are a critical point for the understanding of the vertical exchanges and their effect on biogeochemistry. Therefore, the fine scales play a key role in the oceans global balance and, despite their low intensity, clearly impact processes such as nutriment vertical transfer and carbon export. However, their ephemeral nature complicates their in situ measurements, which are nevertheless essential for their understanding and for the confirmation of the models' prediction and the satellite observations. Furthermore, measuring vertical velocities in situ represents a real challenge since they are several orders of magnitude below the horizontal ones.

The FUMSECK cruise benefited from the automatic Lagrangian SPASSO treatment of the satellite data with an onshore team providing a daily bulletin of analysis and guidance on the fine-scale structures in the studied area. The distribution of phytoplankton functional groups at a small spatio-temporal scale was measured by automated flow cytometry with imaging. This technology allows to address the distribution of phytoplankton at fine scales within its hydrodynamic context. Several methods of measuring vertical velocities have been deployed, using different ADCP at fixed depth and in profile, FF-ADCP (Free Fall ADCP), the VVP (Vertical Velocities Profiler) prototype developed at MIO, and a SeaExplorer glider. These methods have shown promising results for in situ measurement of vertical velocities. Overall results show an abrupt change of population associated with a fine-scale structure appearance in relation with a storm event.

In addition, in order to study the physical part of the biological carbon pump, we experienced the release, following, pumping and detection by cytometry of a sample of biodegradable micro-particles that mimic the phytoplankton, and established a proof-of-concept for this method. Finally, we studied the MVP (Moving Vessel Profiler) instruments behaviour and reduced significantly a rotative effect.

We will describe the instrumental and analysis methodology deployed during FUMSECK in the study area of the Ligurian Sea, including the Northern Current, and present the results on the fine-scale dynamics and their impact on biology.