

ESSD manuscript « Decadal ocean observations in the Northwestern Mediterranean: insights from the MOOSE-GE cruises »

Response to reviewer 1

Special comments

Line 48. The statement 'deep-water renewal time of only a few decades' seems to me to be a bit inaccurate. There are several works by Bethoux (see, for example, Behoux and Gentili 1999 - [https://doi.org/10.1016/S0924-7963\(98\)00069-4](https://doi.org/10.1016/S0924-7963(98)00069-4) and the references given therein) that lead to deep-water renewal times of several decades. I think it is appropriate to cite the reference by Bethoux and Gentili alongside that of Schroeder et al., 2016 (line 49). On the trends of the Levantine water it could be useful to also cite the work of Astraldi et al (1994): The Seasonal and Interannual Variability in the Ligurian-Provençal Basin - <https://doi.org/10.1029/CE046p0093> Digital Object Identifier (DOI) and of Sparnocchia et al (1994) The Interannual and Seasonal Variability of the MAW and LIW Core Properties in the Western Mediterranean Sea- <https://doi.org/10.1029/CE046p0117> Digital Object Identifier (DOI)

[These references have been added in the introduction section](#)

Line 83. Many acronyms HyMeX, MERMeC, ChArMEX, (not only here but throughout the article) Each of them must be accompanied by a brief description of the objectives and related bibliography.

[The paragraph has been modified and these acronyms have been removed \(see comments from reviewer 2\).](#)

Linea 92. The system is structured around four thematic work packages: is it a system or a programme? Does this only refer to MOOSE or also to the other HyMeX, MERMeX, and ChArMEX? It's unclear.

[Same comment. MOOSE is a French national observation program \(or service\) providing an integrated, multidisciplinary observing system for the northwestern Mediterranean Sea](#)

Linee 99 – 100. provide a yearly basin-scale overview in summer of the Northwestern Mediterranean Sea from surface to bottom. This introduction doesn't clearly identify the summer characteristics of the Ligurian-Provençal basin. Some information should be included.

[In page 4, we have added: "Conducted in summer, when the water column exhibits its strongest seasonal stratification, with a shallow thermocline isolating the surface mixed layer from the deeper Ligurian-Provençal and Gulf of Lion basins, these cruises capture the system at a critical hydrological state..."](#)

Linea 135. CNRM, S. Somot – under the responsibility of S. Somot? Please specify. Is there a publication by Somot that can be cited?

We have added Ruti et al. 2016, which is the founding paper of Med-CORDEX, an international climate modelling initiative for the Mediterranean. The paper highlights the importance of observations for evaluating models.

Ruti PM, Somot S, Giorgi F, Dubois C, Flaounas E, Obermann A, Dell'Aquila A, Pisacane G, Harzallah A, Lombardi E, Ahrens B, Akhtar N, Alias A, Arsouze T, Aznar R, Bastin S, Bartholy J, Béranger K, Beuvier J, Bouffies-Cloch   S, Brauch J, Cabos W, Calmanti S, Calvet J-C, Carillo A, Conte D, Coppola E, Djurdjevic V, Drobinski P, Elizalde-Arellano A, Gaertner M, Gal  n P, Gallardo C, Gualdi S, Goncalves M, Jorba O, Jord   G, L'Heveder B, Lebeaupin-Brossier C, Li L, Liguori G, Lionello P, Maci  s D, Nabat P, Onol B, Raikovic B, Ramage K, Sevault F, Sannino G, Struglia MV, Sanna A, Torma C, Vervatis V (2016) MED-CORDEX initiative for Mediterranean Climate studies. Bull. Amer. Meteor. Soc., 97(7), 1187-1208, July 2016, doi: <http://dx.doi.org/10.1175/BAMS-D-14-00176.1>

Linea 188 – 189. national projects (e.g., RIOMAR, FUTURE-OBS) and European initiatives involving several ERICs (e.g., Horizon EUROSEA, EA-RISE, and currently GEORGE). Please specify the purposes of these projects.

This paragraph has been modified and simplified (see comments from reviewer 2)

Linea 240. quality code (WOCE code in most cases). Does this mean that in other cases authors are using different vocabularies (SeaDataNet?). Details please.

In section 3 some details have been added: "SeaDataNet quality flags (QF) for CTD and bottle data archiving (SISMER), OceanSITES QF for mooring time series (CORIOLIS) and Argo/OceanSITES scale for gliders with some specific real-time and delayed mode quality codes (Hebden et al., 2019)."

Other corrections

Linea 78 : led by CNRS-led (too many 'led')

This sentence has been removed (see comments for reviewer 2)

Linea 257: fluorometer (Chlesea), I suppose is Chelsea

Yes indeed it was modified

Response to reviewer 2

A geographical map showing all geographical names (Nice, Marseille, Sardinia, ecc...) cited in the text as well as major oceanographic features (i.e, northern current) is necessary for readers unfamiliar with the region

The map (figure 1) has been modified with geographical names and major oceanographic currents/fronts

Section 1 and 2 have several concepts repeated twice or more. The two sections should be harmonised so to avoid repetitions

The sections 1 & 2 have been harmonised to avoid repetitions

Several details are somewhat beyond a data paper, that is primarily meant to describe the dataset, not the cruises. Happy to read that the ships are hosting students (l. 182-l. 189) or that the ecological footprint is taken into account (l.191- l.198), however these information are just making the paper longer. Please consider compressing these info in a 1 - 2 lines long statement. There are many acronyms that are not spelled out, or cited Programmes' names that does not add much info to the reader. The national and international context, in my opinion, should be shortened/synthesised, presenting only the most relevant info.

Some sentences have been shortened to present mainly the relevant information of the program and the dataset

Section 3.10 Moorings: it would have been nice to see a figure with the design

Moorings design has been added in a new figure (Figure 2)

Section 3.11 happy to hear you that you have been deploying ARGOS, but this is not part of the core dataset. Maybe move (duly shortened) in the "strategy" section?

Section 3.11 have been removed and a condensed Argo floats strategy has been added in section 2 (line 166, bullet 3)

Section 5.1: the two paragraphs have similar concepts repeated twice (e.g., years with mixing down to bottom vs years w/out) Please harmonize and avoid repetitions.

Section 5.1 has been harmonised to avoid repetitions

Section 5.3. Much of this section should go to the "strategy" section, some into the "methods" section, very little remain about "results". I would expect more data exploitation, e.g., some exploratory statistics and plots. I wonder also if it is available more than what is presented already in Lescot et al., FMSR 2026.

We thank the reviewer for this constructive comment. We have moved the strategy and methods content from Section 5.3 to Sections 2 and 3.9 respectively. Regarding data exploitation, we agree that more analytical content strengthens this section. We have now explicitly cited and summarized the key findings from Lescot et al. (2026): plankton community structure in the 2017–2019 cruises was primarily shaped by organism size and water column depth; alpha diversity was highest in small size fractions (0.2–3 and 3–180 μm) at the surface and DCM; temporal differences between cruises were mainly detected in Niskin bottle samples (diatoms and dinoflagellates), while net tow samples showed weaker variability; and physical clustering revealed cross-shelf and basin-scale gradients aligning with community structure at OTU level for small fractions. Spatial structuring of zooplankton biomass and abundance (north–south gradient, three regional groups) is retained from Feliu (2021), which remains the

relevant reference for those findings. We have also explicitly noted that while Lescot et al. (2026) constitutes the main published analysis to date, a substantially larger volume of UVP and net-based imaging data collected across the full MOOSE-GE time series (2012–present) remains available in EcoTaxa/EcoPart, representing a significant opportunity for future exploitation. A new metabarcoding dataset from the four campaigns from 2021 to 2024 have been recently sequenced. Finally, we have added a reference to Llopis Monferrer et al. (2022, doi: 10.3389/fmars.2022.895995), which provides complementary results on siliceous Rhizaria diversity and distribution from MOOSE-GE cruises.

Section 5.4: this section is OK for reporting to the funding agency, but in a data paper it is loosely connected and just making the paper longer.

We do not agree with the reviewer on this aspect. Section 5.4 is an essential section to demonstrate the links between in situ observing system like MOOSE and various modelling applications. We list the various data usages made by the modelling community with the MOOSE dataset over the recent years with specific references to the literature allowing the reader to dig in a specific applications if needed. We consider that this section gives examples of original applications of in-situ data for modelling purposes such as model initialization, model validation, model development or model-observation blending.

Section 5.5. Again, as the previous remark. I wonder if this section wouldn't be more useful at the end of the "strategy" section, carefully shortened. Even as a closing remark of the conclusion section, duly synthesized.

Section 5.5 has been removed and a condensed version has been moved to the conclusion (section 6), as it addresses future perspectives such as OSSE work

Figure 2: there is clearly some OA in the background. Somewhere (in the main text? in the caption?) it should be acknowledged and a little bit detailed.

This is correct that the fig. 2 was unclear regarding the interpolation method. We have now added the required details to the figure caption.

References should be carefully checked. I have found some inconsistencies (e.g., l.169 Bosse et al., 2017 not listed in the references, or Schroeder et al., 2017 in the references is a repetition of Schroeder et al., 2016 ... maybe others, I didn't check all ... In addition, l. 265 "(Testor et al., 2010: MOOSE-GE cruise series, <https://doi.org/10.18142/235>)" should be just Testor et al., 2010... just as in l. 277 Bosse et al., (2024) is enough. Some manuals used for QC or protocols may be relegated in the references instead of being cited fully in the main text (e.g., l. 289).

References have been checked and updated

Data availability of biodiversity data: I had hard time digging into ECOTAXA (I am not familiar with), finally giving up. There is not a specific DOI to the dataset in the paper. Thus, I did not check this part of the dataset.

We thank the reviewer for this comment and apologize for the difficulty in accessing the imaging data. EcoTaxa is a web application for the taxonomic classification and management of plankton images, and all MOOSE-GE imagery data are publicly accessible through individual project pages organized by instrument and year.

The complete list of EcoTaxa projects for MOOSE-GE cruises is provided in a new table added to the Data Availability section of the revised manuscript (Table 4). It covers four instruments (ZooScan, UVP, FlowCam, and Planktoscope) spanning 2012–2024, with a total of over 5.6 million images across 34 projects. Each project is directly accessible via its URL. Validation status varies by project, reflecting the progressive nature of taxonomic annotation: ZooScan datasets are fully or largely validated (87–100%), while most UVP, FlowCam, and Planktoscope datasets remain at early validation stages and represent the raw imaging resource available for future exploitation.

79 “CNRS-led” Typo?
It has been removed

134 SYMPHONIE model. Ref?

Marsaleix P., F. Auclair, J. W. Floor, M. J. Herrmann, C. Estournel, I. Pairaud, and C. Ulses, Energy conservation issues in sigma-coordinate free-surface ocean models, *Ocean Modell.*, 20, 61–89, 2008.

135 ref for the long term climate modelling instead of CNRM, S. Somot?

Samuel et al., 2006: Somot, S., Sevault, F. & Déqué, M. Transient climate change scenario simulation of the Mediterranean Sea for the twenty-first century using a high-resolution ocean circulation model. *Clim Dyn* 27, 851–879 (2006). <https://doi.org/10.1007/s00382-006-0167-z> - correct ?

259 something is wrong with the grammar: missing words?

This sentence has been corrected: "For each cruise, sensors had been recently calibrated by the manufacturer (Seabird) and rotated every year, while the general system configuration remained exactly the same, except on occasions where sensor damage required temporary substitution"

Response to reviewer 3

Line 262

The citations Uchida et al., 2010 and McTaggart et al., 2010 are missing from the reference list.

These references have been added in the revised manuscript

Lines 475–478 / Table 3

The full list of datasets should be presented clearly in a table (e.g., Table 3), but there are several issues:

- *The DOI provided for CTD and bottle sampling is identical and leads to a cruise list page (MOOSE-GE) where datasets are not directly accessible.*
- *Another link (line 477) points to the DYFAMED dataset, which includes CTD and bottle sampling.*

This needs clarification: where can users access the complete and correct datasets? Overall, the dataset presentation is confusing and poorly organized.

The cruise DOI refers to a list of the cruises (including CTD profiles and bottle sampling). Each annual cruise has its own DOI, accessible through the SISMER web page where data are accessible (.ctd and .bot files in MedATLAS, NC or ODV format)

The DYFAMED DOI refers to the DYFAMED mooring time series on SEANOE. It also includes monthly ship-visit bottle datasets, which have been compiled and re-qualified for CANYON-MED training

Data Accessibility and FAIR Compliance

Datasets should be organized so that users can easily access them through specific DOIs linked to well-described resources. Each dataset should include proper metadata and use common vocabularies (e.g., for mooring data such as DYFAMED and LION).

Line 240 (WOCE reference)

The manuscript refers to WOCE-style bottle sampling, but corresponding datasets are not clearly available in the links provided (Table 3).

This sentence has been removed. See comments from reviewers 1 and 2

Table 3

The table should be reorganized:

Explicitly link datasets to EOVs/EBVs

Provide correct DOIs that directly resolve to datasets

Some datasets (e.g., UVP, nets, metaB sequences) appear to be missing—this is a critical gap. For some entries, only project numbers are given instead of DOIs

Table 3 provides DOIs by group of sampling and/or platform, associated by time series and DOI (e.g. mooring, ship visits, L-ADCP...). It would have been too confusing or complex to group them by EOVs/EBVs. Table 3 has been modified and now shows (in order): CTD/bottle datasets, ADCP, mooring time series and biological datasets

The new Table 4 contains all annual MOOSE_GE datasets available on ECOTAXA. Some links have been changed.

EOV Consistency (Lines 94–96, 125, 229)

EOVs are mentioned multiple times; however, the use is not fully consistent. Harmonization between the text and tables is necessary.

These sentences have been modified. See comments from reviewers 1 and 2

Table 2

This table should be revised to:

Link variables to EOVs/EBVs where applicable (e.g., subsurface salinity)

Include standardized vocabularies such as NERC L05 (parameters) and L22 (instruments)

We agree that linking the measured variables to the GOOS Essential Ocean Variables (EOVs) and, where relevant, to the GEO BON Essential Biodiversity Variables (EBVs) strengthens the interoperability and FAIRness of the dataset. Table 2 has accordingly been revised to add a column mapping each variable to its corresponding EOV (and EBV class for the biological variables). We have further linked the variables to the BODC Parameter Usage Vocabulary (NERC P01, with P02 at the discovery level) and the instruments to the SeaDataNet Device Categories (NERC L05) and the SeaVoX Device Catalogue (NERC L22).

Figures and Redundancy

The cruise page (DOI: <https://doi.org/10.18142/235>) contains figures that are very similar to those presented in the manuscript (e.g., Figure 1 and Figure 6). It would be preferable to modify or remove duplicate material and instead cite the original source.

The figures shown on the SISMER MOOSE-GE cruise page were used in an internal French Oceanographic Fleet (FOF) report and have never been published. Figure 1 has been modified, and the source of Figure 6 is acknowledged in its caption.

Results Section

Since the dataset has already supported numerous publications, the Results section should be reframed to highlight the scientific impact of this long-term observation effort, including key achievements and contributions to the field.

Lines 658–665 should be moved to the Methods section

Lines 670–680 should also be moved to Methods

The section 5 has been revised and some paragraphs have been moved to the Methods section as suggested by reviewers 1 and 2