Anonymous Referee #2

Received and published: 27 May 2020

Note: All the frames contain the comments of referee R2, and have been identified by a number. Our answers are below each frame, and the underlined paragraphs in yellow correspond to new or modified paragraphs in the manuscript. R1 refers to answers common to comments by referee 1.

Major Comment 2.1
The manuscript presents a complete set of multidisciplinary data of zooplankton community structure and functioning from an oceanographic cruise in the Western Mediterranean Sea in late spring-early summer (May to June 2017) during two major dust events in the Algerian and Tyrrhenian basins. Investigating mesozooplankton structure in the western Mediterranean Sea is a classic but necessary marine science research approach to improve our knowledge on the mesozooplankton community and estimate the responses of this key trophic group in the pelagic ecosystem linking small primary and secondary producers to higher nektonic trophic levels. Furthermore this study significantly contributes on the effect of the Saharan dust deposition on the zooplankton community structure. Several papers have been produced in the scientific world and at the Mediterranean Sea level, dealing with mesozooplankton composition, distribution and structure. Nevertheless, this study pushes the analysis deeper up to mesozooplankton functioning and estimate zooplankton growth, ingestion and metabolism using allometric relationships. This paper is very well written and organized, but

We have tried to answer all your comments and have substantially rewritten several paragraphs of the manuscript. We appreciate all your comments and we acknowledge that they have encouraged us to explore further our data. We hope that now the revised version of the manuscript shows more consistency between the main aims and the presented results.

(Comment 2.1A) a clear scientific question or at least two hypotheses should appear in the introduction instead of a description of the objectives as general scientific tasks. For instance what do you expect during the Sahara dust deposition, what should be the effect of the Sahara dust to the zooplankton community and how your data can show this influence.

Answer to comment 2.1 A.
As the other referee raised a similar question (see comment R1.3A), this answer is common to both.

We agree with the referee about this comment which has been very stimulating in helping us to redefine various aspects of the focus of the paper.

We have now stated these general hypotheses:
H1: Is zooplankton structure impacted by dust deposition?. *We hypothesize that Saharan dust deposition events had an impact on the zooplankton community in the Mediterranean Sea, modifying its abundance, biomass, metabolic rates (no observed changes except in in* $C_{500\text{-}1000}$*) and diversity (The changes we observed are mostly related to community structure and taxonomic diversity (RFD) and to size distribution) .*

H2: Hydrodynamical regions versus dust impact region

- It is difficult to relate zooplankton response to regional differences (lack of stations). Response is due to dust deposition and mainly affect the species diversity (RFD) and size structure (p1/p2 ratio)

***H3 -** How long should we observe the zooplankton structure in a given area to clearly observe the dust impact (p1/p2 ratio)?.*

The results providing a basis to validate these hypotheses have been analyzed following several statistical treatments as detailed in the following answers. (See below comment R1.2B, R1.2C, R1.2D)

The following paragraph has been added at the end of the Introduction:
"These objectives will serve to test the following hypotheses: whether the Saharan dust events impact the zooplankton community structure following deposition (H1), and if so, whether the effect would be immediately observable or after a lag time (H2). Finally, whether changes in zooplankton structure driven by dust deposition exceed regional differences under oligothropic conditions (H3)."

Major Comment 2.1 (continue)
(Comment 2.1B) Also, the major part of the discussion is mainly based on regional differences and comparisons and less discussion has been made on the effect of Sahara dust on zooplankton estimated vital rates. Are there any differences of the vital rates before and after the Sahara dust events? What is the response of the zooplankton community after the Sahara dust deposition besides the changes in community structure?

Answer to Comment 2.1B
Concerning the potential changes in metabolic rates, our calculation based on empirical models did not show increased metabolic rates which could be linked to the dust events. Planned dedicated measurements should have been implemented to observe potential changes in metabolic rates.
With regard to the response of the zooplankton community after the Sahara dust deposition, we have developed in the revised version a more complete analysis of the RFD changes following the dust events.
This is detailed in the answer to the referee 1 (see answer to comment R1.17).

Please find below the detailed comments on the manuscript.

Comment R2.2
Introduction Line 47: Add also the reference Siokou et al., 2019.(Deep-Sea Research Part II 164 (2019) 170–189).

Answer to comment R2.2
we agree with the referee's suggestion and the citation will be added. We propose this new sentence:
"... a succession of oceanographic surveys covering wide transects at different time periods of the year (Kimor and Wood, 1975; Nowaczyk et al., 2011; Donoso et al., 2017; Siokou et al., 2019).

New reference
Siokou, I., Zervoudaki, S., Velaoras, D., Theocharis, A., Christou, E. D., Protopapa, M. and Pantazi, M.: Mesozooplankton vertical patterns along an east-west transect in the oligotrophic Mediterranean sea during early summer, Deep. Res. Part II Top. Stud. Oceanogr., 164, 170–189, doi:10.1016/j.dsr2.2019.02.006, 2019.

Comment R2.3
Introduction Line 58: Explain better why this cruise should be "flexible". The manuscript Guieu et al., 2020 has not been published so it is difficult to understand the design of the oceanographic cruise.

Answer to comment R2.3

To address this comment, we have selected some paragraphs from the work done by Guieu et al. (2020) where the flexibility of the cruise is explained. This is now explained in the new table 2 in the manuscript.

"Based on the experience of the ChArMEx airborne campaigns (Mallet et al., 2016) and of previous oceanographic cruises needing an adaptive planning strategy based on observations and short-term forecasts (see section "Satellite monitoring of the ocean"), an operational server named the PEACETIME Operation Center (POC; http://poc.sedoo.fr/; last access 9 Feb. 2020) was set-up by the Service de Données de l'Observatoire Midi-Pyrénées (OMP/SEDOO, Toulouse, France) for the cruise. Guieu et al., 2020

"The actual positions of stations were discussed and determined on the basis of near-real time satellite data analysis (SPASSO) in order to account for local oceanic conditions (i.e. presence or not of mesoscale structures). In parallel, short- and middle-term forecast models of weather conditions and of dust transport and deposition were systematically analyzed to verify the conditions, and eventually start the Fast Action. The Fast Action strategy consisted in routing the ship towards an area of forecasted dust deposition event in order to tentatively document the respective roles of dynamics and deposition on marine biogeochemical conditions. The goal was to position the ship in the center of the area of dust deposition, at least one day (24 hours) before the event in order to sample the water column before, during and after the deposition, and collect and characterize the rain event. Several constraints had to be considered for the Fast Action decision." (Guieu et al., 2020)

"All these elements were simultaneously analyzed during a daily meeting between scientists involved on land and on ship, as well as with the crew. Each day, the initial plan was confirmed for the next 48 h or, eventually, modified" (Guieu et al., 2020).

Comment R2.4
Line 60: Add also the main questions and hypotheses of this study.

See Answer to comment 2.1A

Comment R2.5
Materials and Methods Line 80: Explain why did you calculate the depth of the Mixed Layer. In this study there is no information at all about the hydrology of the area so it is difficult to follow. Only at the end in the discussion chapter the authors clarified the hydrological features existing in the area.

Answer to comment R2.5
Mixed layer depth is an important parameter that defines quasi-homogenous regions of the ocean (Swain et al. 2006). We think that this provides valuable information to determine differences in the hydrology of the basins.
In previous works, MLD was also used (among other hydrological and trophic parameters) to define the habitat of epipelagic zooplankton (Donoso et al 2017, GJR 122): Illustrating physical separation between highly stratified/nutrient-poor and well-mixed/nutrient-rich areas.
To add more detail on the hydrological features of the area, we cite a key reference in the Discussion (Millot and Taupier-Letage. (2005). See answer to comment R2.14

Reference:

Donoso, K., Carlotti, F., Pagano, M., Hunt, B. P. V., Escribano, R. and Berline, L.: Zooplankton community response to the winter 2013 deep convection process in the NW Mediterranean Sea, J. Geophys. Res. Ocean., 122(3), 2319–2338, doi:10.1002/2016JC012176, 2017.

Millot, C., Taupier-Letage, I., 2005. Circulation in the Mediterranean Sea. In: (Ed.), The Handbook of Environ-mental Chemistry, vol. 1. The Natural Environment and the Biological Cycles, Springer, pp. 29-66.

Swain, D., Ali, M. M. and Weller, R. A.: Estimation of mixed-layer depth from surface parameters, J. Mar. Res., 64(5), 745–758, doi:10.1357/002224006779367285, 2006.

Comment R2.6
Materials and Methods Lines 85-86: Explain why do you perform. the zooplankton sampling from the surface until 300 m? Is it due to the euphotic zone? Is it due to the hydrological features of the area?

Answer to comment R2.6: As the other referee raised a similar question (see comment R.1.9) this answer is common to both.

During the PEACETIME cruise there was no zooplankton specialist on board due to the high pressure of other tasks (Atmospheric and oceanic sampling, on board mesocosm studies).
The zooplankton net sampling strategy had to be defined before the cruise and the time devoted to zooplankton sampling was short, only for one tow between CTD casts.
Under these conditions, the best compromise based on previous studies (See table 3 in the manuscript) in these regions was to sample in the epipelagic water column.
This depth was chosen to be sure that the zooplankton community in the epipelagic layer was collected.
Considering that bad meteorological conditions could affect the verticality of the net, using a 200 m cable length could not sample the whole epipelagic layer.
Also note that the observed impact on zooplankton is more significant because it integrates the whole water column

Comment R2.7A
Materials and Methods Line 140: Explain what negative and positive values of the NBSS slopes means.

Answer to comment R2.7A
We agree with the referee's suggestion and to explain the values of the NBSS slope, we propose this new sentence in section 2.4:
"The slope of the NBSS reflects the balance between small and large individuals, a steeper slope corresponding to a higher proportion of small individuals (bottom-up control) and a flatter slope corresponding to a higher proportion of large individuals (top down control) (Donoso et al., 2017; Naito et al., 2019)".

Comment R2.7B
Materials and Methods Line 153: Explain why did you use the conversion factor of C:Chla=50 and add the reference. For oligorophic waters are more suitable to use the conversion factor/equation of Malone et al 1993, which is used the different Chl-a values according to depth.

The ratio C:Chla varies between 20 and 100 (Malone et al 2013; Marañón 2005) and 50 is often taken as an average value (Romero et al., 2011; Gomez et al. 2015).

Many factors influence the value of C:Chla ratio (light, depth, nutrients status community composition, etc., and finally regions and seasons), resulting in lower values than 50 in the productive zone or productive seasons, and higher values in oligothropic conditions (Malone et al 2013; Marañón et al., 2015).
Concerning the Mediterranean sea, values of C:Chla ratio in the Eastern basin are usually around 60 and above (Lagaria et al, 2016), and in the Western basin they vary between 20 and 50 (Delgado et al 1992; Van Wambeke et al., 2002). Several works in the Med. Sea also used the C:Chla ratio of 50 as conversion factor (e.g. Christou., et al 2017).
The equation of Malone et al. (Malone et al., 1993) is an empirical formulation adapted from observed data in the Sargasso sea, we have no available data to calibrate it for the PEACETIME stations. Moreover we mainly need to have a rough estimation of zooplankton carbon demand in the water column.

References.

Christou, E. D., Zervoudaki, S., Fernandez De Puelles, M. L., Protopapa, M., Varkitzi, I., Pitta, P., Tsagaraki, T. M. and Herut, B.: Response of the Calanoid Copepod Clausocalanus furcatus, to Atmospheric Deposition Events: Outcomes from a Mesocosm Study, Front. Mar. Sci., 4, 35, doi:10.3389/fmars.2017.00035, 2017.

Gomes, A., Gasol, J. M., Estrada, M., Franco-Vidal, L., Díaz-Pérez, L., Ferrera, I. and Morán, X. A. G.: Heterotrophic bacterial responses to the winter-spring phytoplankton bloom in open waters of the NW Mediterranean, Deep. Res. Part I Oceanogr. Res. Pap., 96, 59–68, doi:10.1016/j.dsr.2014.11.007, 2015.

Lagaria, A., Mandalakis, M., Mara, P., Papageorgiou, N., Pitta, P., Tsiola, A., Kagiorgi, M. and Psarra, S.: Phytoplankton response to Saharan dust depositions in the Eastern Mediterranean Sea: A mesocosm study, Front. Mar. Sci., 3(JAN), 287, doi:10.3389/FMARS.2016.00287, 2017.

Malone, T., Pike, S. E. and Conley, D. J.: Transient variations in phytoplankton productivity at the JGOFS Bermuda time series station, Deep. Res. Part I, 40(5), 903–924, doi:10.1016/0967-0637(93)90080-M, 1993.

Marañón,E. PhytoplanktongrowthratesintheAtlanticsubtropicalgyres. Limnol. Oceanogr. 50,299–310.doi:10.4319/lo.2005.50.1.0299. 2005.

Romero, E., Peters, F., Marrasé, C., Guadayol, scar, Gasol, J. M. and Weinbauer, M. G.: Coastal Mediterranean plankton stimulation dynamics through a dust storm event: An experimental simulation, Estuar. Coast. Shelf Sci., 93(1), 27–39, doi:10.1016/j.ecss.2011.03.019, 2011.

Van Wambeke, F., Heussner, S., Diaz, F., Raimbault, P. and Conan, P.: Small-scale variability in the coupling/uncoupling of bacteria, phytoplankton and organic carbon fluxes along the continental margin of the Gulf of Lions, Northwestern Mediterranean Sea, J. Mar. Syst., 33–34, 411–429, doi:10.1016/S0924-7963(02)00069-6, 2002.

Comment R2.8
Line 157: Add equation model for ammonium, phosphorus excretion and oxygen consumption rates as you did with the other relationships.

Answer to comment R2.28: As the other referee raised a similar question (see comment R.1.14) this answer is common to both.

We agree to better describe the model used following the referee suggestion. To do that, we show the explanatory equation:
We propose this new paragraph:

"Ammonium and phosphorus excretion and oxygen consumption rates were estimated using the multiple regression model by Ikeda et al. (1985) with carbon body weight and temperature as independent variables.

$$\ln Y = a_0 + a_1 \ln X_1 + a_2 X_2$$

Where ln*Y* represent the ammonium excretion, phosphorus excretion or oxygen consumption. a_0, a_1 and a_2 are constant (see Ikeda et al. 1985), X_1 is the body mass (dry weight, carbon, nitrogen or phosphorus weight) and X_2 is the habitat temperature (°C)".

Comment R2.9
Line 200: Throughout the text, there are several definitions for the small zooplankton, sometimes<1mm, <300, <500 _m. Please clarify in order to avoid any confusion.

Answer to comment R2.9
We agree with the referee's suggestion and have defined small to zooplankton as the organisms < 500 µm

Line 16: "with a noticeable contribution of the small-size fraction (< 500 µm) of up to 50 % in abundance and 25 % in biomass"

Line 202 "Abundance of zooplankton smaller than 300 µm is dominated by cyclopoid and calanoid copepodites"
(this sentence has been rewritten in order to talk about the fraction <300 µm but now we don't refer to it as "the small zooplankton size class")

Line 208 "The ratio between copepods with length smaller than 1 mm and larger than 1mm ranges from 2.8 to 8.3 (5.1 on average)"

Line 287 "the small size classes ($C_{200-300}$ and $C_{300-500}$) of mesozooplankton have been optimally sampled using a 100 µm mesh size net (N_{100})"

Line 435: "In our study, this strategy also enabled us to show the importance of small forms (< 500 µm of ESD) both in terms of stocks and fluxes."

Comment R2.10
Line 221: you wrote "due to higher relative abundance of small copepods" please specify what species and which size. Also ostracods are not copepod species. Pontellidae family is written twice, and some species in Pontellidae are not small. Please specify if possible which species.

Answer to comment R2.10
We agree with the comment of the referee and we have replaced the original sentence:
"This differentiation of ST7 and 8 from the ION sampling dates in the NMDS analysis is mainly due to higher relative abundance of small copepods (Figure 5), and specifically to several taxa such as

Mesocalanus spp. (more abundant), Pontellidae spp. and ostracoda (less abundant), Clytemnestra spp. (absent in ION) and Pontellidae spp. (absent atST7 and 8)"

… by this new sentence:
"This differentiation of ST7 and 8 from the ION sampling dates in the NMDS analysis is mainly due to differences in relative abundance of *Mesocalanus* spp. (more abundant), ostracoda (less abundant), *Clytemnestra* spp. (absent in ION) and *Pontellidae* spp. (absent at ST7 and 8)".

Comment R2.11
Line 225-229. The explanation for the strong variations of the NBSS that is due to the migration of the larger species is not very clear, According to the Fig.4 the abundances of large species are quite similar between day and night sampling. Unless, you will approve that there is statistical significant differences between the night and day samples.

Answer comment R2.11: Yes. that is true. But the NBSS was performed only on mesozooplankton. Zooplankton higher >2000 µm was removed in order to have a continuous set of data, so when we explain that "the variation of the NBSS that is due to the migration of the larger species" is larger within the mesozooplankton (200-2000 µm).
This information has now been added in the legend of the relevant figures (6 and 7).

Comment R2.12
Line 234: Clausocalanus and Oithona species according to the literature are not herbivorous species.
Answer to comment R2.10

Answer to comment R2.12
We agree with the referee's remark and propose these new sentences.
Line 233. At all three TB stations, RFDs are characterized by high dominance of filter-feeding zooplankton Para/Clausocalanus spp. and Oithona spp. in 1st and 2nd position with a strong drop in abundance for the following ranked taxa.

Line 311 ST1 and ST2 are clearly differentiated from all others with deeper MLD, higher chlorophyll-a concentrations and a zooplankton community dominated by typical filter-feeding copepods of PB (Centropages, Para/Clausocalanus, Acartia, etc), as mentioned by Gaudy et al. (2003) and Donoso et al. (2017)

Comment R2.13
Line 253: Add in your Methods how or who did the Primary Production measurements.

Answer to comment R2.13
We propose to add the following sentence in line 75.
"The primary production was measured with the14C-uptake technique, following the methods detailed in (Marañón et al., 2000)".

Comment R2.14
Line 316:Specify the hydrological features of the area. A short chapter for the study area could be very helpful.

Answer to comment R2.14
We agree to add a key reference which details all the hydrological features in the area.
We propose this new sentence:

"AB and TB are very closely related to each other in terms of hydrological features and chlorophyll-a, but slightly differentiated in salinity and zooplankton taxonomy, probably because they are both strongly influenced by the Modified Atlantic Water (MAW) and its associated mesoscale features (Millot and Taupier-Letage., 2005)."

Reference: Millot, C., Taupier-Letage, I., 2005. Circulation in the Mediterranean Sea. In: (Ed.), The Handbook of Environ-mental Chemistry, vol. 1. The Natural Environment and the Biological Cycles, Springer, pp. 29-66

Comment R2.15
Line 370: In methodology you wrote that the contribution to nutrient regeneration by zooplankton was estimated using the values of primary production and converted to nitrogen and phosphorus requirement using Redfield ratio. However, the calculation doesn't follow the Redfield ratio of C:N:P = 106:16:1. Have you used this, or did you use the ratio that you found during the study? Please clarify.

Answer to comment R2.15

We use Redfield ratio as used by Alcaraz et al. (2010) on their Table 5.

Reference: Alcaraz, M., Almeda, R., Calbet, A., Saiz, E., Duarte, C. M., Lasternas, S., Agustí, S., Santiago, R., Movilla, J. and Alonso, A.: The role of arctic zooplankton in biogeochemical cycles: Respiration and excretion of ammonia and phosphate during summer, Polar Biol., 33(12), 1719–1731, doi:10.1007/s00300-010-0789-9, 2010.

Comment R2.16
Line 392: Delete "species composition" since no data is shown in Table 2.

Answer to comment R2.16
We agree with the referee's suggestion and we propose this new sentence:
"... an increase in primary production from FAST1 to FAST3, but with no visible changes in phytoplankton biomass (see Table 2)."

Comment R2.17
Line 410: Please add also the taxa that correspond to each stage of succession.

Answer to comment R2.17 The RFD presented synoptically in figure 10F are the same as those presented in the previous scatted panels of figure 10, with the indication of the taxa.

Comment R2.18
Lines 417-420: Explain how do you know that at the beginning you had small phytoplankton and then large? Because, according to Line 396 (pers. comm. J. Uitz), size and species composition of the phytoplankton community in FAST did not show any change after the dust.

Answer to comment R2.18
We have now added more detail regarding the phytoplankton changes after the two dust events in the table dedicated to detail the information on the dust event (see comment R2.20). This table shows an increase of micro- and nano-plankton after the dust events.

Consequently the sentence in line 395-398 reads:
"Size and species composition of the phytoplankton community in FAST did not show any change after the dust (pers. comm. J. Uitz), but there were potential increases in food competition with *Para/Clausocalanus* spp. (Lombard et al., 2010) and/or in predation by chaetognaths and siphonophores (Purcell et al., 2005)"

... was changed by the new sentence:

"Size and species composition of the phytoplankton community in FAST suggest a change toward larger cells (see supplementary table S1) poorly edible by appendicularians and inducing filter clogging. There were also potential increases in food competition with *Para/Clausocalanus* spp. (Lombard et al., 2010) and/or in predation by chaetognaths and siphonophores (Purcell et al., 2005)."

Which is consistent with the content of Line 417 (unchanged): "State 1 before the dust event is characterized by oligothropic conditions with low nutrients, low phytoplankton concentration dominated by small size cells and their typical zooplankton grazers (e.g. appendicularians and thaliaceans), leading to a convex RFD shape (like FAST1 Figure 9F) reflecting a mature community (sensu Frontier, 1976). State 2 is characterized by a nutrient input linked to the dust event stimulating larger phytoplankton cells and their herbivorous grazers (copepods) and attracting carnivorous migrants leading to a more concave RFD shape (like FAST3, ST5 and TYR Figure 9F) typical of a disturbed community (sensu Frontier, 1976)."

Comment R2.19
Lines 410-425: This paragraph could be the main hypothesis of your study.

Answer to comment R2.19: see answer to comment 2.1A.

Comment R2.20
Table 1: Add information about the dust events to follow better in the text.

Answer to comment R2.20: As the other referee raised a similar question (see comment R.1.2) this answer is common to both.
We produce now a full synopsis of the Saharan dust deposition events encountered during PEACETIME. A lot of information are now presented in accepted and submitted papers of the special issue including the introduction paper by Cecile Guieu.
We present this new information in an additional paragraph in the Methods section.

Guieu et al., introductory paper) detailed how they used three regional dust transport models to identify major dust events during the PEACETIME cruise. Two major wet dust events occurred during the period (Table 2). The first concerned the whole southern Tyrrhenian basin, with predicted flux > 1g m-2 (Desboeufs et al. in prep.), and started on May 10, several days before the arrival of the vessel in this area. The dust event was confirmed by aluminium, iron and lithogenic Si measured in sediment traps at TYR with a lithogenic flux between 200 and 1000m of 150-200 mg m-2 (Bressac et al., in prep.). The second was located in the area between the Balearics and the Algerian coast and occurred from 3 to 5 June, with predicted flux of 0.5 g m-2 (Guieu et al., accepted) after the arrival of the vessel in this area (station FAST). The dust event was confirmed by on-board atmospheric dust deposition samples (Desboeufs, in preparation this special issue), water column observations (nutrients, trace metals) (Tovar-Sánchez et al. 2020) and tracers of dust deposition in sediment traps (pers. comm. C. Guieu). The highest aerosol mass concentrations (around 25 µg m-3) with the highest iron content (245 ng m-3) were measured at FAST between 1 and 5 June, and subsequently the highest trace metal concentrations in the surface micro-layer were measured on 4 June (Co: 773.6 pM; Cu: 20.1 nM; Fe: 1433.3 nM; and Pb: 1294.7 pM) (Tovar-Sánchez et al 2020). The chemical composition of rain samples at FAST confirmed wet deposition of dust reaching a total particulate flux of 0.012 g m-2 (Fu et al., in prep.). The Ionian basin was the only southern area not impacted by dust deposition during the PEACETIME cruise, and results obtained at the long-duration station ION will be used for comparison.

More details about the total trace metal concentrations in the dusty rain collected by Fu et al., (in preparation) were presented in (Tovar-Sánchez et al 2020): Trace metals values ranged from 180pM for Cd to 343nM for Fe (Cd: 180 pM; Co: 1380 pM; Cu:18.1 nM; Fe: 343 nM; Ni: 9.9 nM; Mo: 875 pM; V: 26.9 nM; Zn: 345 nM; and Pb: 788 pM)" (Tovar-Sánchez et al 2020).

This information is summarized in the table below.

New Table 2. Overview of the main characteristics of the wet dust events occurring during PEACETIME. Zooplankton sampling was carried out very close to a CTD cast except at FAST2 where the sampling was done between two casts respectively 9 hours after the first cast (a) and 16 hours before the second (b) .

Stations impacted by dust and cruise visit duration	**Crusie strategy with regard to dust events**	**Dates, geographical characteristics and intensity of the dust events predicted by the model and by observations**	**Zooplankton sampling Date**	**Iron in aerosol ng m^{-3}**	**Nutrients below the nutricline NO3 (n mol/l) PO_4 (n mol/l)**	**Surface Primary production mg C m^{-3} d^{-1}**	**Water column (0-250) average Chl-a concentration mg m^{-3}**	**Depth range of the DCM strata (m)**	**Mean concentration of Chl-a on DCM strata mg m^{-3}**	**Ratio fluorecence phytoplankton F_{micro}:F_{nano}:F_{pico} within the DCM strata**
Wet dust event FAST 02 to 07 June	Station FAST schedule and position detemined on board acording to metereologial event	**From 3 to 5 June;** **Impacted area: Betwen Baleares and Algerian coast;** **Predicted flux from models: 0.5 g m^{-2} (Guieu et al., accepted, Supp Info figure SI5);** **On-board atmospheric dust deposition observations confirmed a weak wet dust deposition of 0.012 g m^{-2} (Guieu et al., accepted). In sediment traps lithogenic flux was 40-60 mg m^{-2} between 200 and 1000m.** **Water column observations (nutrients, trace metals) (van Wambeke et al., in prep, Tovar-Sánchez et al. 2020, Bressac et al., in prep) show a clear imprint of the atmospheric deposition.**	FAST1: 04-06-2017	245.3	224 246	2.44	0,12	60-90	0,42	27:45:28
			FAST2: 06-06-2017	266.0	808 239	2.85	0,14 [(a)] 0,18 [(b)]	60-100 [(a)] 70-90 [(b)]	0,38 [(a)] 0,86 [(b)]	25:43:32 [(a)] 50:30:20 [(b)]
			FAST3: 08-06-2017	44.9	135 113	2.04	0,10	70- 90	0,42	20:49:31
Wet dust event Tyrrhenian 16 to 22May	TB stations schedule before the cruise. Model predicted a dust event 6 days before the arrival	From 10 to 12 may; Impacted area: whole southern Tyrrhenian sea; Predicted flux from models: >1 g m-[2] (**Desboeufs et al. in prep**) **Dust event was confirmed by alumimium, iron and Lithogenic Si measured in sediment tramps at TYR with a lithogenic flux between 200 and 1000m was 150-200 mg m^{-2} (Bressac et al., in prep.)**	ST5: 16-05-2017	57.3	841 148	1.68	0,12	70-80	0,55	21:48:30
			TYR: 19-05-2017	162.3	n.d 127	1.77	0,11	70-80	0,61	33:40:27
			ST6: 22-05-2017	189.8	488 136	1.66	0,07	70-80	0,36	7:44:49
References of the data	Dulac (pers.com) Desboeufs et al. (in prep) Guieu et al. (accepted) .	**Desboeufs et al. (in prep)** **Guieu et al. (accepted)** **Bressac et al. (in prep)** **Tovar-Sánchez et al. (2020)** **van Wambeke et al. (in prep)**		Tovar-Sánchez et al. (2020)	van Wambeke et al. (in prep)	E. Maranon and M. Perez-Lorenzo	J.Uitz, C. Dimier	J.Uitz, C. Dimier	J.Uitz, C. Dimier	J.Uitz, C. Dimierl

Comment R2.21A

Line340-375: In this chapter the authors are reported several times the different vital rates of the zooplankton size fractions. However, these data are not provided in Table2.

Comment R2.21B

It could be useful to add biomass data of the total zooplankton as well as of the different size fraction in the Table 2.

Table 2: Add biomass data of total zooplankton and size fractions.

Answer to comment R2.21A.

We propose to put the value by size fractions as supplementary material. See supplementary table S1

Answer to comment R2.21B

Biomass per class is already shown in figure 4b and now is also available as supplementary material. See supplementary table S1

Comment R2.22
Table 3: Add Siokou et al., 2019 and make the comparison

Answer to comment R2.22
We agree with the referee's suggestion and propose this new addition to table 3

Area	Sampling period	Net mesh size (µm)	Layer (m)	Biomass (mg m^{-3})	Abundance (ind m^{-3})	Reference
NWMS - Provencal sea	Jul 1999	200	0-300		383	Siokou et al. (2019)
SWMS- Algerian sea	Jun 1999	200	0-300		197	Siokou et al. (2019)
Ionian sea	Jun 1999	200	0-300		146	Siokou et al. (2019)

****