

Biogeosciences Discuss., referee comment RC1  
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## Comment on bg-2020-481

Anonymous Referee #1

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Referee comment on "Long distance particle transport to the central Ionian Sea" by Léo Berline et al., *Biogeosciences Discuss.*, <https://doi.org/10.5194/bg-2020-481-RC1>, 2021

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### Review to ms #bg-2020-481

entitled:

"Long distance particle transport to the central Ionian Sea"

By L. Berline et al.

submitted to *Biogeosciences*.

### General comments

The paper examines the heterogeneity observed in the central Ionian Sea with respect to hydrology, productivity and particle properties, using in-situ data collected in 2017 by ship survey as well as remote sensing and Lagrangian modelling data. The sampled biogeochemical and physical data are used to track the various sources and processes that contribute to the marine status of the central Ionian. The manuscript is interesting, however it would benefit by presenting the scope of the research in a more focused way. It is not clear to me if the scope is to show the complexity of the marine environment in the surveyed area or to show different water masses properties and the responsible mechanisms or maybe both.

General comments per Section are listed here below. The use of English is rather good; some "polishing" could be of help. Finally, the ms needs careful editing since there are many minor errors (see Specific comments).

#### 1 Introduction

Since the manuscript aims at focusing on the particle abundance of different water masses in the Ionian Sea, I would like to see a detailed introduction on the importance of studying particle abundance and their dynamics in the world ocean, the Mediterranean Sea, and the Eastern Mediterranean – Ionian Sea in particular. Following that, I believe a listing of methods employed so far to study particle properties should be presented, and then, the authors can present their own methods, combination of methods applied to better

describe the particle properties within different water masses.

## 2 Material and Methods

With respect to the methodological design (Section 2), the authors employed several classic and more advanced instruments/methods to study water mass characteristics and particle properties, resulting in the production of a hefty dataset, rather unique, and certainly not previously available for the Ionian Sea marine area.

## 3 Results

Results are adequately presented in brief manner (Section 3) and accompanied by a number of well-designed and informative figures. Given that several parameters and measurements are discussed, whilst certain parameters, such as MEP proportion and AI attenuation index are not so common, a moderately lengthier presentation would be beneficial for the reader.

With respect to Section 3.2, I do not think that the full depth T-S diagrams (fig. 6) shown are of any significant use in the ms since observations are focusing on the upper water layers. Consider removing. I would only keep the depth-limited vertical profiles (fig. 7).

The *origin of particles* presented in section 3.4 is not clear. Particles may be transported as part of water masses circulation, but particles are also introduced locally in the water column via atmospheric precipitation and primary production. Since the scope of the paper is about particles, it would be interesting to differentiate between transported and in situ particle origin. A 'particle properties signature' on water masses is a challenge, and I would appreciate if the authors could look deeper into their rich dataset to provide such information, if possible.

In several cases across the document, variable units are following the numerical values without a space (e.g. L171: 70m; L180: 20-90m, etc.). Please check and correct throughout the document. In addition, decimal separator used is sometimes a comma (e.g. L136: 0,09 mg.m<sup>-3</sup>) or point (e.g. L149: 38.2). Please decide and correct throughout the document. In the same context, units are sometimes given as fractions (e.g. L175 0.3 m/s) or as exponents (e.g. L177: 5 10<sup>4</sup> #.m<sup>-3</sup>). Please correct throughout the document.

## 4 Discussion

The circulation patterns and water mass distribution patterns are presented in the discussion sections 4.1 and 4.2. However, a lot of information seems to fit more nicely at the Results section, and hence should be moved there. That leaves very little a pure discussion to the section. The latter applies also to Section 4.3 on the biological history of water masses. Here, the authors claim that abundant aggregates of diameter larger than 100 µm maybe associated with intense primary production, which, however, does not seem to be the case in the Ionian Sea during the sampling period or some weeks earlier. The authors could consider the presence of Transparent Exopolymer Particles (TEP) as an alternative factor facilitating particle coagulation and thus aggregates formation.

## 5 Conclusions

This Section briefly summarizes all findings: heterogeneity, water masses origin, particle behavior and implications. What about the initial hypothesis, can we characterize and identify water masses by their particle properties and abundance?

### Specific comments:

**Abstract:** The abstract needs some restructuring. I suggest the last sentence (lines 27-30) could move at the beginning of the abstract. I leave this to authors' decision.

Line 12 and throughout the text. MAW and AW acronyms are both used for Atlantic water in the ms. Since (mostly in older literature) MAW stands for Modified Atlantic Water and in the ms it stands for Mediterranean Atlantic Water (the latter is not used in literature), I strongly suggest that whenever you refer to Atlantic Water you should use the acronym AW.

Lines 12 and 19: What is "young AW"? Is there an "old AW"?

Line 20: Try replacing the word "intermediate" with another one to avoid confusion with layer-depth meaning. I suggest "moderate" instead.

Line 42: **The** Ionian Sea (check and correct throughout the manuscript)

Line 55-59: Please provide information regarding station SAV, which appears to be isolated both from other stations and the transect area. Based on what properties was SAV selected?

Line 61: Change "salinity" to "conductivity" which is what the sensor directly reads.

Line 62: State if the fluorometer was calibrated to report chlorophyll-a concentration in  $\text{mg m}^{-3}$

Line 63: The primary parameter measured is light transmission (LT, %) and then the beam attenuation coefficient ( $c$ ,  $\text{m}^{-1}$ ) is estimated according to the path-length ( $L$ ) of the transmissometer according to:  $c = -1/L \ln(\text{LT}/100)$ . Please describe in more detail or give references.

Line 70: WetLabs

Line 78: I cannot find ST8-Tr in figure 1.

Line 70: What is the depth reached by LOPC? Give a range.

Line 85: TSG most probably means ThermoSalinoGraph. Please expand the acronym to its proper meaning.

Line 122: Same as above for SVP.

Line 123: Consider replacing "numerical" with "simulated". "Numerical particles" sounds a bit strange.

Line 131: Please provide link for the database.

Line 136: Provide value for maximum chlorophyll-a concentration

Line 147: Please provide a range for "low, high" salinity.

Line 159: I do not think that the altimetry shows anticyclonic circulation "across" the basin.

Line 163: Please state that  $\sim 0.4^\circ$  refers to longitude. Same throughout the text.

Line 168: Maybe 'water mass' properties

Lines 169-171: This is confusing. You could say that the surface layer which reaches depths up to 30 or 70 m in this or that area, carries a low salinity AW signal, below which salinity increases to more than 39 etc. Please rephrase.

Line 180: terms

Line 186: The density values refer to potential density? Please state in the text. Moreover here and throughout the text density units are missing. Please correct.

Line 196: Replace "carousel" with "CTD". I do not think that the water sampling at discrete levels from the carousel/rosette can produce continuous profiles as in fig. 7. These are most certainly the product of CTD sensors.

Line 216: Paragraph 3.4 is a bit repetitive. Please restructure.

Lines 261-2-3: I am not sure if the presentation of specific density values here has any particular meaning. Consider omitting.

Line 318: Change "*This eddy may have trapped waters from the eastern Ionian, more oligotrophic (Casotti et al 2003),...*" to "*This eddy may have trapped waters from the more oligotrophic eastern Ionian (Casotti et al 2003),...*".

Line 321: The acronym UVP is used here with no explanation. Please add full meaning: Underwater Video Profiler.

Line 364: Correct 4 to 5

### **Figure captions:**

Fig. 1: What is the difference between full and dotted lines?

Fig. 7: Please add variable names at all x axes

Fig. 8: In the phrase "*Black dots are the final positions*", the word "final" possibly refers to the positions of the particles calculated at the beginning of one month before the sampling. If that is true, then "final" should be replaced with "starting" or something similar to avoid confusion.