

The article, 'Global distribution of photosynthetically available radiation on the seafloor', by Jean-Pierre Gattuso, presents a 21-year time series of benthic PAR. The dataset is an improved version of a prior data set (Gattuso et al., 2006). The current dataset estimates benthic PAR using ocean color and bathymetry data. The time series is four times longer with improved spatial and bathymetric resolution. The article presents a unique dataset, useful for a variety of ecological studies of the benthic community and is therefore of relevance to the scientific community. The time-series does include state-of-the-art ocean color data available to the scientific community. However, the authors are requested to consider the following comments and suggestions.

Major issues

- Depth range in the coastal zone ranges from about 0 – 100/150 m (Fig 4). Considering satellite receives signal only from a top layer of the ocean (referring to the concept of optical depth, the depth from which satellite receives 90% of its signal) and so K_{dpar} obtained from satellite data represents attenuation from this top layer, kindly explain in the manuscript how PAR obtained using equation 6 is actually bottom PAR. May be provide a schematic to explain the concept.
- A list of symbols and abbreviations used in the article is missing. Add one if possible and maintain consistency with Gattuso et al. 2006 for ease of the reader. For example, Gattuso et al. 2006, used K_b and the present article uses K_d
- Page 4, line 25 states spectral composition is not considered in the study. But, throughout the manuscript irradiance is used in place of PAR.
- Page 2, line 2: A number of references (old as well as new) are available that provide relationships between Secchi depth and attenuation.
[https://doi.org/10.1016/S0380-1330\(88\)71564-6](https://doi.org/10.1016/S0380-1330(88)71564-6)
<https://link.springer.com/article/10.1007/s10750-012-1084-2>
<https://doi.org/10.1016/j.rse.2015.08.002>
<https://link.springer.com/article/10.1007/s10201-008-0246-4>
- Page 3, section 2.1: describe the Globcolor project in a sentence or two for info.
- The article, throughout, refers to the present study as 2019, it needs to change to 2020 or else only stick to 'present study' and avoid mentioning the year.
- Figure panels need to be labelled throughout the manuscript.
- Figure 1 caption: **Availability of remote sensing data (monthly mean) over the 21 years' time-series expressed on percentage**. The other half of the caption regarding surface of the coastal zone is not clear and difficult to understand. Please explain in a different sentence.
- Page 13, Figure 5: P1 P2 P3 not explained in the caption. Y axis refers to irradiance or PAR? Units refer to PAR.
- Page 14, Table 3: $Z_{1\%}$ refers to depth at which benthic irradiance or benthic PAR equals 1% of surface?

- Table 4: Could the increased PAR in the Arctic be attributed to increased sea ice melting? Possible to check and provide evidence if this increase is more prominent in the last decade?

Technical comments

Page 1, line 1: Abstract (delete the period)

Page 1, line 2: global distribution of ~~light~~ (photosynthetically available radiation; PAR)

Page 1, line 3: to estimate benthic irradiance or benthic PAR?

Page 1, line 3: avoid using references in the abstract

Page 1, line 16: lowest levels of **food** web

Page 2, line 7: **However, in the coastal ocean, primary production also occurs at the bottom, when enough light reaches the sea floor.**

Page 2, line 10: in the past 10 years. (delete the period)

Page 2, line 14-15: Irradiance or PAR?

Page 2, line 19: Glud et al. ??

Page 2, line 20: a data layer of benthic irradiance for modelling of species distribution as part of

Page 2, line 31: the characteristics of products used by Gattuso et al. (2006) and **of those** in the present study

Page 3, line 1: Table 1. ~~Main~~ characteristics of the products used in Gattuso et al. (2006) and **of those** in the present study.

Page 3, line 21: at level-2 of the processing

Page 4, line 7: It **was** carried out

Page 4, line 13: **(Morel and Belanger, 2006)**

Page 4, line 21: Benthic Irradiance or Benthic PAR?

Page 4, equations 2, 3: explain each of the terms

Page 7, table 2 caption: Values reported in Gattuso et al. (2006) are shown in parentheses for **comparison.**

Page 7, line 14: The surface area of the ocean with **depth** less than 200

Page 7, line 16: **the** Antarctic (60 to 90°S) ~~regions~~, respectively covering 24.1, 75.5, and 0.6% **surface area** of the global coastal zone.

Page 8, line 4: **In the Arctic and the Antarctic, sunlight is available only during the 5 summer months of the year, i.e., June to October and November to March respectively.**

Page 8, line 5: **Furthermore**, data availability is higher in mid-summer than in

Page 8, line 12-13: **In contrast, there is a clear dominance of Case 1 over Case 2 waters (70 vs 30%) in the non-polar region whereas it was more even (55 vs 45%) in Gattuso et al. 2006.**

Page 8, line 15: The present study **uses** remote...

Page 9, line 10: The distribution of PAR_B has changed in the present study compared to Gattuso et al. (2006),

Page 9, Figure 2 caption, delete 2019

Page 10, Figure 3: left and the right panel not mentioned in the caption. Y axis in the right panel refers to 2019? check the axis title

Page 11, Figure 4: left and the right panel not mentioned in the caption

Page 11, line 4: ~~As shown in fig. 3,~~ In the non-polar region, higher the irradiance threshold, larger the difference.