

## **Reply to reviewer**

**Manuscript Title** : Hyperspectral ultraviolet to shortwave infrared characteristics of marine-  
: harvested washed ashore and virgin plastics  
**Authors** : Garaba S.P. and Dierssen H. M.  
**Journal** : Earth System Science Data (ESSD)

**Elizabeth C Atwood (Referee)**

### **Referee comment - 1**

#### **General Comments**

The submitted data description paper contains important baseline measurements of both macro- and microplastics, the latter in both weathered, dry and wet, as well as virgin form. This is an important dataset for the field of remote sensing of marine plastics and the authors are highly applauded for making such a dataset public. We all thank you for making this available to everyone.

#### **Author response - 1**

We appreciate your kind words and taking the time to carefully review our manuscript.

### **Referee comment - 2**

I still have some comments as to how this data should be presented, especially with respect to questions that remain open as to what these data represent.

#### **Specific Comments**

Light has different penetration depths dependent on wavelength. This has been somewhat accounted for in the analysis in that wet microplastics were also measured, but a direct discussion of this fact is missing from the entire manuscript (I made note of this being missing at lines 20/21 in the Abstract and at the end of Section 3.2). This point should be addressed in more depth in the manuscript.

#### **Author response - 2**

Thank you for pointing this out. We have appended text to elucidate more on this ([See section 4 Discussion of the revised manuscript](#)).

### **Referee comment - 3**

It would also help to make the above-mentioned point if in Fig. 4 the 30 ppt saltwater absorption curve over the same wavelengths range would be shown. Furthermore, the maximum penetration depth of light at each particular wavelength could be presented. This would aid in better representing the limitations of the dataset.

#### **Referee comment - 3**

We have now included the absorption coefficient of pure water to further explain the wavebands affected by absorption of water ([See Figure 5 and 4 Discussion of the revised manuscript](#)).

### **Referee comment - 4**

There is no discussion of what different plastic types are represented in the microplastic samples and in what proportions. I noted this first at line 10 in Section 2.1, where the samples are being separated by size (which never comes up again in the following analyses, so that step is somewhat moot? Consider removing it). This is especially frustrating since you thereafter present the spectral curves for different virgin plastic types.

#### **Author response - 4**

The text has been removed as suggested.

### **Referee comment - 5**

The discussion of microplastic spectral curves (first paragraph Section 3.1) focuses only on different colors of the plastic measured, despite the fact that different polymer types play a very important role for spectral curve shape in the NIR-SWIR range. The plastic types of the macroplastics needs to be listed.

**Author response - 5**

That is correct, polymer type plays a key factor in the spectral shape. Future sampling is expected to consider recording these additional critical descriptors: object color, shape, polymer composition, date of manufacture, dimensions. We now further acknowledge this limitation in the revised manuscript ([See section 4 Discussion of the revised manuscript](#)).

**Referee comment - 6**

I furthermore find it misleading to use 1 standard deviation in Fig. 3 and 4 to represent the variability in the data. The 1 s.d. curve is only truly representative of the data distribution if the data are normally distributed. In my experience, spectral measurements at any particular wavelength more often tend to be skewed in one direction or the other. Given this issue, I find the upper and lower percentage errors much more informative (one could still use the +/- 34.1% quantile around the mean to remain close to the 1 s.d. idea).

**Author response - 6**

We agree that it can be misleading to provide datasets with 1 standard deviation. We added text to make this caveat clear in the manuscript ([See section 4 Discussion of the revised manuscript](#)).

**Referee comment - 7**

In Fig. 4, it is confusing that the error curves for the different sampling curves overlap and look exactly the same (both exactly the same type of dashed line).

**Author response - 7**

We improved the representation of the figure ([See Figure 5 of the revised manuscript](#)).

**Referee comment - 8**

Section 3.3 brings back the importance of my point above about proportion of different polymer types in the microplastic samples. Given the measured virgin polymer plastic curves, one could perform a spectral unmixing analysis of the dry and wet microplastic samples to determine proportion of different plastic types. One could then validate this separately by analyzing the microplastic samples down to plastic type. Maybe it doesn't make a difference to know what the different proportions of polymer types are in a sample, but I haven't come across a convincing study yet that makes this point.

**Author response - 8**

A good point, the spectra from these virgin pellets can be used to expand the spectral reference library by performing unmixing with various combinations and proportions of the polymers. It is an area of interest to be further investigated ([See section 4 Discussion of the revised manuscript](#)).

**Technical Corrections**

No technical corrections were found needed.