Reply to reviewer

Manuscript Title : Hyperspectral longwave infrared reflectance spectra of dry anthropogenic plastics and natural materials
Authors : Garaba, Acuña-Ruz and B. Mattar
Journal : *Earth System Science Data* (*ESSD*)

Anonymous Referee #2

Comment	Response	Revision Implemented
C1. This manuscript describes an interesting database of reflectance/emissivity spectra of some manmade plastics and natural materials. Because laboratory measurements include a wide spectral range (UV-VNIR-SWIR-TIR), this dataset can be used for identification of plastics with a number of remote sensors. The manuscript is well organized, and description of dataset is clear (and it is also freely available in PANGEA).	**R1.** We appreciate the positive feedback and the time taken to review our manuscript.	None
C2. I have some minor suggestions to the authors: Section 2.2: the measurement protocol is a key factor in this research. I think the section could be expanded by providing more info on the instrument (e.g. Signal-to-noise ratio for each port, etc.)	**R2.** Thank you for pointing this out. To the best of our knowledge, there are eight HyLogger-3™ spectrometers in the world, which have the same instrument specifications for reflectance measurements. We use the same protocols described in Schodlock et al., (2016). We have appended this information about the instrument in the methods section to clarify this point.	*(See Section 2.2 Directional hemispherical reflectance measurements Page 4 Line 8 of the revised manuscript).* HyLogger-3™ spectrometer has 341 wavebands and a peak signal-to-noise ratio (≥2000 at 8μm) for a Lambertian surface with 100 % directional hemispherical spectral reflectance. Detailed specifications of the instrument have been reported in a prior study and we conducted our experiments following the proposed operating protocol of the instrument (Schodlok et al., 2016).
C3. Section 4: Not sure if Figure 10 is really necessary at this point.	**R3.** We agree with the reviewer.	Figure 10 has been removed.

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C4. However, I think it would be very interesting to discuss the limitation of current EO sensors for detection of plastics. The authors identified characteristic peaks of each reflectance spectra, so it would be interesting to discuss if these characteristic peaks can be "captured" by current EO sensors. This is probably more difficult with current TIR sensors, with limitations on the number of spectral bands.	**R4.** This is a good point. The current TIR missions have moderate geo-spatial and limited spectral resolutions but this can be resolved by utilizing airborne or shipborne platforms. We have added text to discuss more on this.	*(See Section 4. Discussion Paragraph 4, Line 27 of the revised manuscript).* In spite of the challenges associated with varying geo-spatial resolution of remotely sensed imagery, including decreased chances to detect plastic litter in the visible spectrum (Acuña-Ruz et al., 2018), satellites provide essential information about the environment. Satellite missions with TIR sensors include ASTER from the National Aeronautics and Space Administration/Japanese Ministry of Economy Trade and Industry, ECOSTRESS from National Aeronautics and Space Administration as well as Landsat-8 from the United States Geologic Survey. The capabilities (TIR spectral, geo-spatial, revisit interval) of ASTER, ECOSTRESS and Landsat-8 missions must be assessed with a focus on detecting aggregated litter zones, considering the geo-spatial resolutions of these sensors (38 - 100 m). We need to further emphasize that the atmospheric window in the TIR is relatively wide. This atmospheric window contained a significant number of diagnostic wavebands of anthropogenic materials we studied and it would be vital to explore development of detection algorithms using the limited (2 - 5 wavebands) spectral information available on these current TIR missions.
C5. The ECOSTRESS spectral library includes a number of manmade and natural materials. I don't know if it includes materials similar to the samples collected and measured by the authors. In this case, a rough comparison between these measurements could be an option for a brief test of the data presented by the authors.	**R5.** We checked the ECOSTRESS repository and the similarities are based on the material being anthropogenic or synthetic products. We think it does merit a comprehensive comparison of these datasets but it would fall out of the scope of the current manuscript. We acknowledge this point in the discussion section and highlight the some related libraries/studies.	*(See Section 4. Discussion Paragraph 1, Line 8 of the revised manuscript).* We are convinced our TIR sample subset provide invaluable complementary insights to the interdisciplinary scientific evidence-based knowledge global plastic litter. To this end, it is recommended that within the TIR remote sensing community a comprehensive high quality assured and quality controlled spectral reference library be established to carefully harmonize available TIR measurements from various works e.g. ECOSTRESS (Meerdink et al., 2019), SLUM (Kotthaus et al., 2014) or contaminated anthropogenic surfaces (Kerekes et al., 2008).

References

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