The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC2
https://doi.org/10.5194/tc-2021-385-RC2, 2022

Comment on tc-2021-385

Anonymous Referee #2

Referee comment on "First evidence of microplastics in Antarctic snow" by Alex R. Aves et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-385-RC2, 2022

Overall this is a well written manuscript. However, there are some places where the results and methods can be more clearly presented. Additionally the authors should more clearly state the limitations of their approach. Lastly, I cannot find any data availability statement. I recommend major revisions.

One aspect of the methods that was not clear to me is the calculation of microplastic count per liter. Was this from the total liquid volume? If so, the authors must provide that information and this should be stated in the methods (line 60). Additionally, I suggest the authors add a summary table summarizing how many plastic particles per sample were identified and the volume of water in the main text.

Blank corrections are really important here. On average, it appears that 6 particles were identified in the blanks. This seems to be greater than number of plastic particles measured in some samples (E.g. S2, S9). This should be clearly stated and this highlights the importance of the approach used for blank corrections. There are many different approaches in the microplastics literature for handling blanks and for handling low sample counts (e.g., Bender et al., 2020 Applied Spectroscopy; Miller et al., 2021 Journal of Hazardous Material; Standard Operating Procedures for Extraction and Measurement by Infrared Spectroscopy of Microplastic Particles in Drinking Water by the California Water Board) including the method used here and using FTIR spectral matches. I suggest the authors include a citation for how they chose their approach. Additionally, the authors should provide some additional information such as how many particles from field and laboratory procedures were identified per sample and what the blank particles look like (color, size, morphology, spectra, etc). Additionally line 140 to 141 should include standard deviations of the blanks and the authors should include a table like A2 for the particles identified in the blanks which will also help the reader to understand lines 144 to 145. It appears that sample volume is a limitation here, as a greater sample volume would have resulted in particle counts that were greater than the blank values. This should be clearly stated and perhaps samples with low microplastic counts should be clearly identified. I suggest the authors clearly state this limitation of the data set in the text and in the conclusion and make recommendations for future studies to collect a

greater sample volume. For example, I suggest lines 213 to 215 should state "our work provides the first evidence of microplastics in Antarctic snow. limitations of this dataset include low sample volume and therefore should be replicated, however, our preliminary results suggest…" This low sample volume also explain why particles are higher than prior work.

While picking putative plastic particles is a good approach, it is important that the authors note that there is a limitation to this method. Specifically that it is really hard to detect translucent or transparent microplastics, and that it is really hard to pick small particles (which the authors noted), and many particles become brittle and difficult to transfer. I think it's important to note these limitation, specifically in the discussion about the color.

Lastly, there is no data availability statement. Please see Cowger et al., 2020 Critical Review of Processing and Classification Techniques for Images and Spectra in Microplastic Research, Applied spectroscopy for a discussion on data sharing practices for microplastic data.

Minor comments:

Line 30: There is evidence that anthropogenic pollutants in ice core records from 1889 (e.g. McConnell et al., 2014, Scientific reports)

Line 52: was the funnel also stainless steel? And is there an approximate area of the surface snow that was sampled?

Section 2.2: Were the reagents used pre-filtered?

Line 56: were they kept covered during thawing?

Line 68: Was the magnetic stir bar coated in plastic?

Line 70: Glass Fiber?

Line 76: I would rewrite to say "Suspected microplastics were characterized…"

Line 85: What is the minimum size that the authors were able to pick?

Line 88 to 89: This is unclear to the reader. I suggest defining the acronyms.

Line 90 to 91: Was there any smoothing, baseline correction, atmospheric suppression, etc conducted on the spectra?

Line 90 to 91: For the spectra that did not match the library, can the authors provide some additional detail about the matching approach? Perhaps an example spectra and subsequent match would be helpful here.

Line 96 to 97: What was the lid of the sample bottle made of?

Line 156 to 157: Does this include the plastics with matches <70%?

Figure 4: I think the abbreviations used in the figure should be defined in the figure caption.

Figure 5: I suggest combine with figure 4.

Line 255 to 256: I suggest reminding the reader the minimum and max distances to these stations.

Section 4.3.1: Are tumble dryers used at the stations? If so, perhaps considering them as a potential source (see Tao et al., 2022, Microfibers Released into the Air from a Household Tumble Dryer, ES&T).

Line 281 to 282: what are the WWT processes for the bases nearby the sampling sites?