CHARACTERIZATION OF ATMOSPHERIC MICROPLASTICS IN A SUB-URBAN AREA AT NORTHWEST SPAIN

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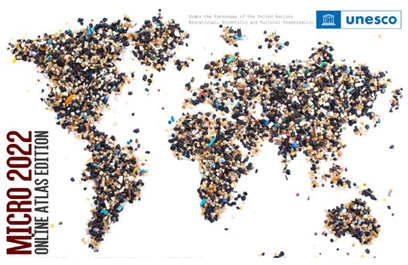
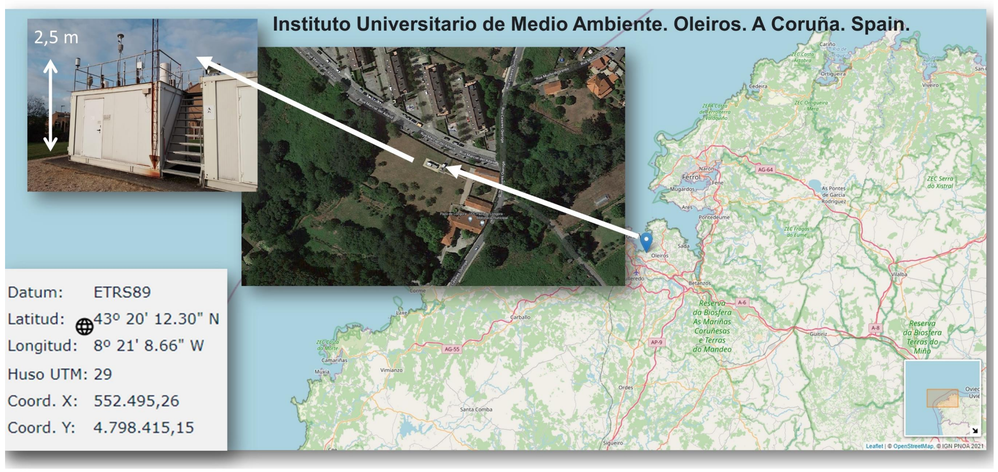


1. INTRODUCTION

The number of studies dealing with microplastics pollution in the atmosphere is increasing. But sampling methods and sample treatment protocols are not standardized yet and, so, comparison of results is hardly possible. On the other hand, a relatively novel instrumental technique based on the use of Quantum Cascade Lasers in the IR spectral region (LDIR) offers nice possibilities to perform monitoring although some parameters need further optimization. We optimized a parameters that yields high-confidence identifications in MP's and its shape (fibre or particle) in the LDIR system. We will compare 3 types of digestions to verify which may be more suitable for airborne samples: two alkaline-oxidative ones (based on KOH plus NaClO, and based on KOH plus H2O2) and one oxidising only. Finally, we studied the atmospheric deposition of MPs (dry and wet) in a sub-urban area at NW Spain, considering different particle size ranges.

2. SAMPLING

2.1 Location of study



2.2 Samplers tested

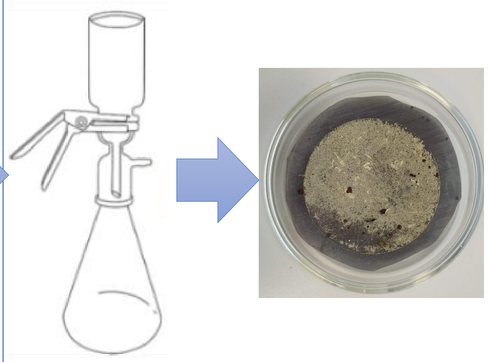
Proposed sampler: "Red" (11 cm) (From EnviroPlanet-Network)

VS

Depolbulk® Sampler (22 cm)

Bulk atmospheric deposition was collected for 1 month (June 2021)

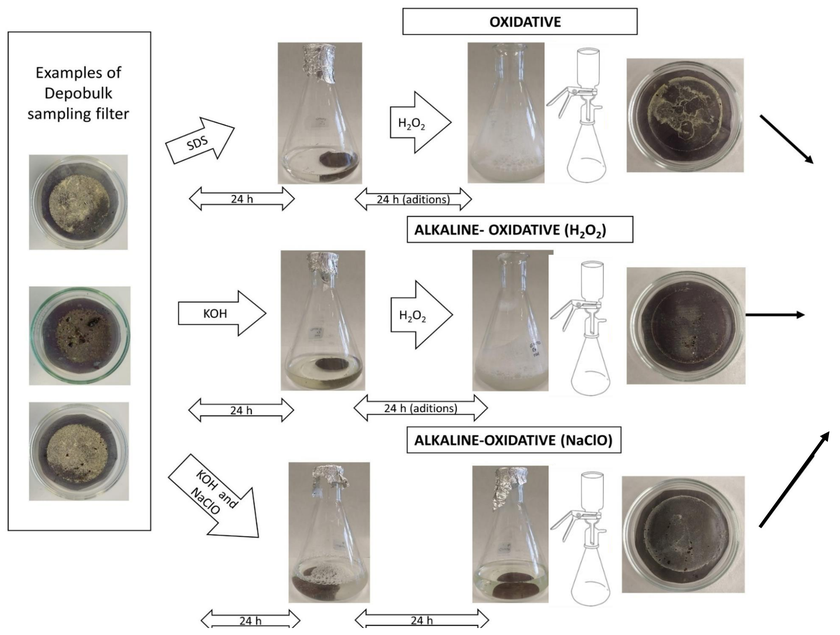
2.3 Sample filter



High organic matter in filters

3. SAMPLE PROCESSING

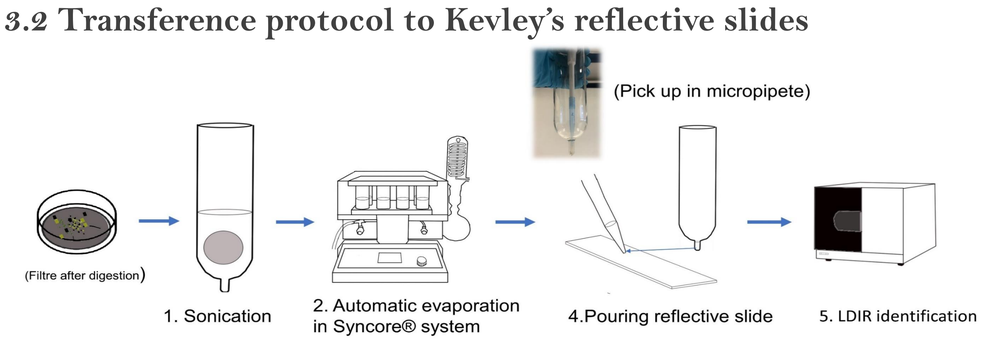
3.1 Digestion



Protocols.
- 2 % SDS and 30 % H2O2 in small volumes to reach 15%.
- 10 % KOH and 30% H2O2 in small volumes to reach 15%.
- 10% KOH and 15% NaClO (6-14% active chloride).

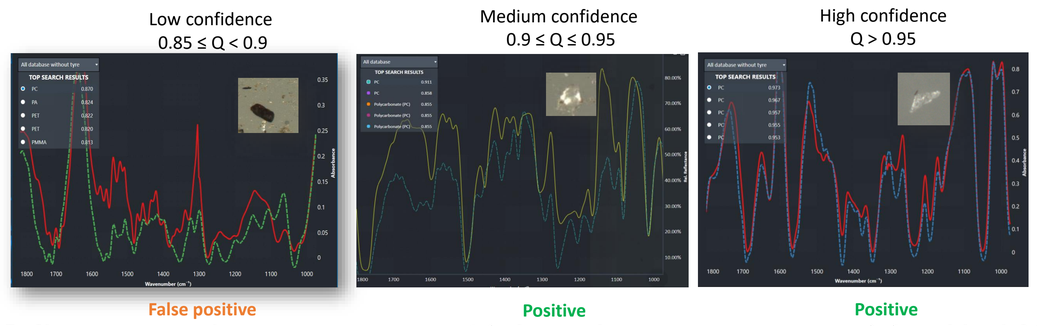
Results
- Digestion and recoveries was satisfactory in protocols (85-95% particles, 70-80% fibres).
- KOH + NaClO method is very simple. Avoids foam formation problems.

3.2 Transference protocol to Kevley's reflective slides



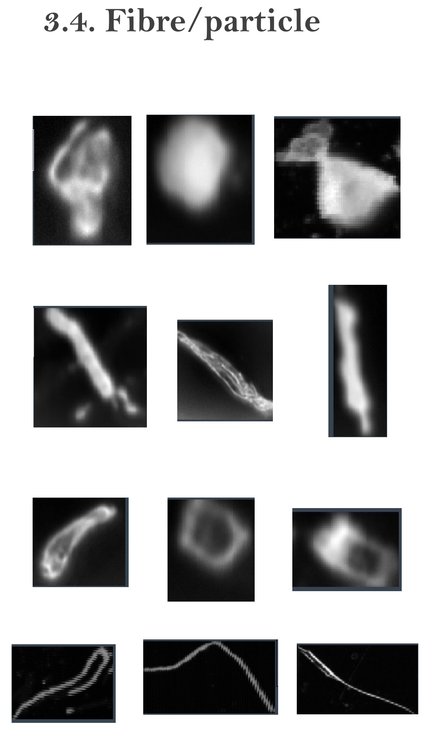
See more details in Marine Pollution Bulletin 178 (2022) 113591

3.3. Identification criteria (example in PC particles)



In literature, matches > 0.65 are accepted (other authors suggest >0.70-0.80), but this yields too many false positives. In our experience, spectral matches should be >0.90 for all polymers, except for tyre, wich really needs > 0.95. We built an in-house spectral library.

3.4. Fibre/particle



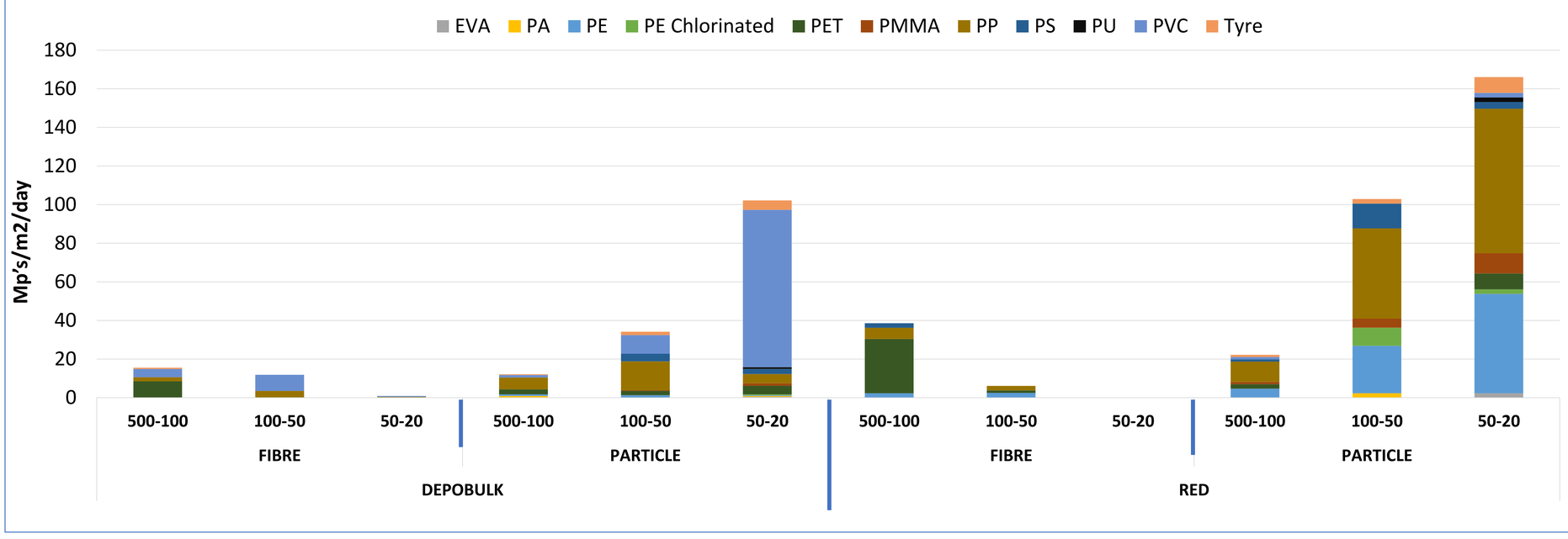
A lot of variety of shapes.

4. RESULTS

4.1. Total MP's/m2/day sampled

Sampler	Average	SD
Red	335,7	55,1
Depobulk	180,2	197,8

4.2. Results differentiated by fibres and particles (length and diameter, respectively), by size (µm) and by polymers.



5. CONCLUSIONS

- **The most frequent particles are those <50 µm.**
- **PE, PET, PP and PVC predominate.**
- **Due to the high variability of the natural samples, no significative differences in the two sampling systems (p> 0.05, t-Student's test).**
- **The alkaline-oxidative method was the most suitable one for organic matrix digestion.**
- **A reliable criteria was established to determine MP's automatically in LDIR avoiding high overestimations.**

6 ACKNOWLEDGEMENTS

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