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Using ombrotrophic peat archives to determine the evolution of atmospheric microplastic deposition patterns

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Ombrotrophic peatlands are fed uniquely by atmospheric inputs and therefore have much potential as temporal archives of atmospheric microplastic (MP) deposition. We investigate by automated Raman microspectroscopy, the MP content ≥2 µm in sphagnum moss peat cores collected in a wide range of sites, spread across the globe. The study is still ongoing but the applied protocol has been validated (Hagelskjaer et al. 2022, in review) and three study sites have been investigated. Fig. 1 presents preliminary results from (top to bottom) Mouriscot, Biarritz, France (MOU), La Réunion, France (REU4) and Matsuyama, Northern Hokkaido, Japan (MYS), with future addition of more sites.

Figure 1 - From left to right, the diagrams plot (i) n MPs per cm^3 wet peat, (ii) a step diagram displaying atmospheric MP deposition (n/day/m^2) and (iii) a smoothed plot with the same information.

Although, the plots all demonstrate a similar trend of increasing atmospheric MP deposition at the beginning of the new millennium, the number of MPs may vary with up to two orders of magnitude. This major difference in quantity may be linked to site proximity to major oceanic garbage patches (Kaiser, 2010). By investigating the MP content in pristine as well as anthropogenically influenced peatlands, this study aims to broaden our understanding of long-range MP deposition patterns, and further to learn more about the oceans' role (Allen et al., 2020) on atmospheric MP transport. Fig. 2 displays the absolute quantity and distribution of MPs across size and polymer type, identified in all samples from each study site. Across all sites we observe a relatively similar size and polymer type distribution, largely dominated by polyethylene (PE) succeeded by polyamide (PA), polyurethane (PUR) and many other, less common plastics.

Figure 2 - The histograms display size and polymer distribution of the total sum of MPs identified within all investigated samples from cores collected on the respective study sites.

We expect to present a final manuscript on the findings before July 2023.