

Characterization of (micro-)plastics in groundwater bodies : insights from Italian aquifers



Laura Sforzi¹, Agostina Tabilio^{2,3}, Tiziana Di Lorenzo^{3,4,5,6}, Valentina Balestra⁷, David Chelazzi^{1,8}, Samuele Ciattini⁹, Tania Martellini^{1,8}, Alessandra Cincinelli^{1,8}

¹DICUS, Via della Lastruccia 3, 50019 Sesto Fiorentino, Firenze, Italy; ²Department of Life, Health and Environmental Sciences, UNIVAQ, Via Vetoio, 67100, L'Aquila, Italy; ³IRET CNR, Florence, Italy; ⁴NBFC, Palermo 90133, Italy; ⁵Emil Racovita Institute of Speleology, Cluj-Napoca, Romania; ⁶3cE3c & CHANGE, Departamento de Biología Animal, Faculdade de Ciências, ULisboa, Campo Grande 1749-016, Lisbon, Portugal; ⁷CSGI, UNIFI, Via della Lastruccia 3, Sesto Fiorentino, 50019, Firenze, Italy; ⁸DIATI, PoliTo, Corso Duca degli Abruzzi 24, 10129 Torino, Italy; ⁹CRIST, UNIFI, Via della Lastruccia 3, 50019 Sesto Fiorentino, Firenze, Italy

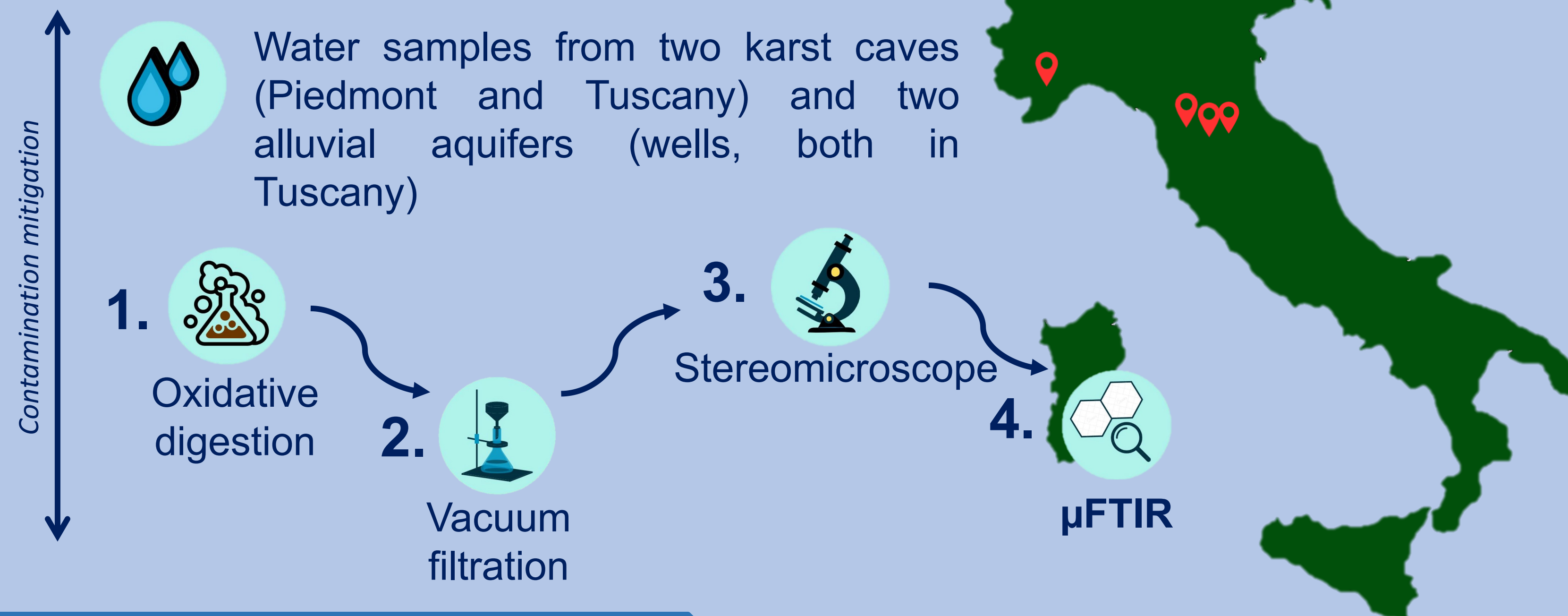
laura.sforzi@unifi.it

INTRODUCTION

Microplastics (MPs) are plastic particles smaller than 5 mm, which are mainly present in terrestrial and aquatic ecosystems. **Groundwater** is a sensitive environment; its close connection to the surface makes it susceptible to MPs pollution and this type of contamination could be detrimental to both groundwater quality and biodiversity conservation.

Today, there is still no sampling and analysis protocol to detect MPs in environmental matrices. Here, we analyze the concentration and composition of MPs in four Italian groundwater bodies to assess the level of contamination in different aquifer types, and follow best practices to minimize the occurrence of contamination.

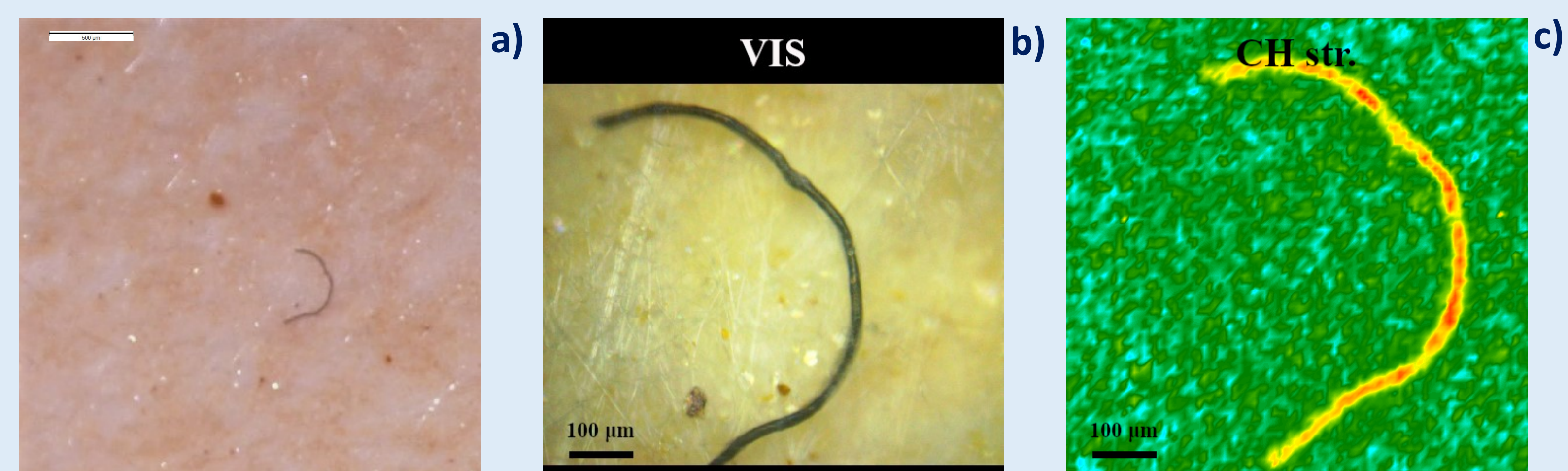
SAMPLING & ANALYSIS



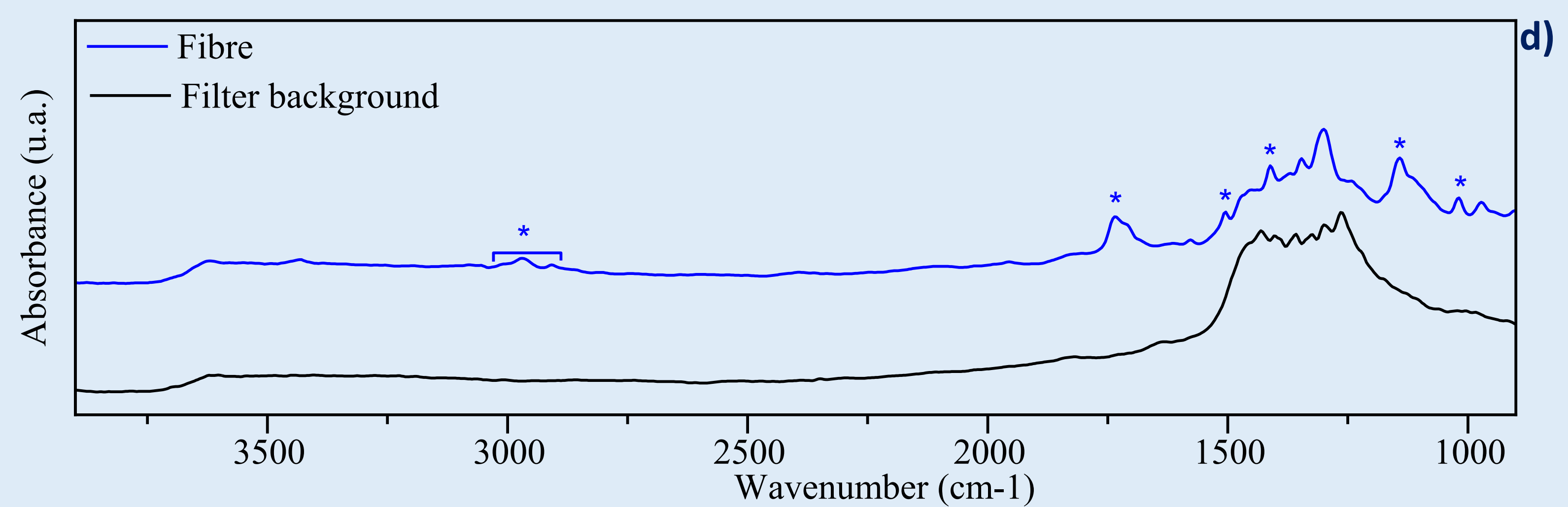
AIMS OF THE STUDY

- Two types of underground aquifers were considered here, which are differently exposed to anthropogenic factors.
- MPs can be dangerous contaminants to water quality and the health of local fauna, and it is increasingly important to assess their presence.
- Importance is placed on the methods used to prevent contamination of samples, given the lack of standardization in MPs analysis protocols.

RESULTS



Example of a) stereomicroscope image, b) visible light FTIR image, c) 2D FTIR Imaging map, d) absorbance spectrum of a PET fibre



CONCLUSIONS

- The Tuscan karst aquifer shows the major MPs concentration (964 ± 131 items/L).
- Predominant size ranges: 1mm-500μm and 500-100μm (both account for 34%).
- Most common color: **black**, **blue** and **red** (25, 18, 37 % respectively).
- Possible sources of contamination related to human activities (i.e. tourism, littering).
- Further **studies** and the adoption of **common protocols** are needed to better determine the level of groundwater MPs pollution and the risks associated with the conservation of the environment, local fauna and human health.

FUTURE

ACKNOWLEDGMENTS

National Recovery and Resilience Plan (PNRR) and the European Union NextGenerationEU are kindly acknowledged for Laura Sforzi Ph.D. scholarship. This study was realised within the research project «PE3-RETURN-Multi-Risk Science for Resilient Communities Under a Changing Climate», VS4 (PE_0000005)

