

Microplastic distribution in the Arno River deposits (central Italy): from depositional processes to the Anthropocene stratigraphic record

(Proposer: Prof. Massimiliano Ghinassi)

Unique properties of plastics made them extraordinarily diffused in daily life products causing the global production of plastics to increase so dramatically since the 1940s that they are included in the so-called Anthropocene technofossils. Following this blooming of plastic production, large amounts of plastic wastes were injected in the environment, where they were fragmented into smaller and smaller pieces, promoting their dispersion from mountains to the deep sea. Once microplastics (MPs) are spread in the environment can be easily ingested by organisms and may act as a vector of chemical contaminants and pathogens. Nowadays, MPs have been included among emerging contaminants and clearly have become an issue worldwide. Rivers are known to be the major conveyers of MPs to the sea, nevertheless our knowledge about how MPs are transported and accumulated in riverine deposits is still limited.



The project focuses on the Arno River (Italy) and aims to: i) understand how MPs are transported, and to ii) define time and modes of their spreading over the past 70 years.

Towards this goal the PhD candidate will integrate an experimental approach with field data by means of the application of modern analytical procedures. During the first phase of the project, mechanisms of MPs transport under tractional-flow conditions will be investigated using an especially-designed apparatus, which will allow to monitor and quantify MPs mobility under specific flow conditions. Different approaches will be tested to optimize separation of MPs from sediments, and to allow their quantification and classification. Data from laboratory experiments will be compared with those obtained from sediments retrieved in the Arno River, in order to develop sedimentological models aimed at predicting diffusion of MPs in different sub-environments of the riverine system. During the second phase of the project, cores will be recovered from selected sites along the Arno River, where expanded sedimentary successions have been accumulated over the past 70 years. Sedimentological principles and analytical methods developed in the early phase of the project will be integrated with an ultra-refined age model in order to investigate the appearance of different types of plastics in the study area, aiming to model the tempo and mode of MPs spreading in riverine environments.

Expected Results

The results of this project will allow the PhD candidate to:

- i) establish how MPs are transported in rivers under different physical conditions and define models to predict their distribution in riverine sediments
- ii) define innovative analytical approaches to quantify MPs in sediments
- iii) reconstruct mechanisms controlling spreading of different types of plastics in riverine deposits over the past 70 years

Funding: Enel Green Power S.p.A.

Additional info: massimiliano.ghinassi@unipd.it