Spatial and temporal distribution of soil microplastics in Phoenix, including the surrounding areas of the Sonoran Desert

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Introduction

- The National Oceanic and Atmospheric Administration (NOAA) in 2008 defined microplastics as plastic particles smaller than 5 mm in size.
- Numerous studies have investigated the occurrence and abundance of microplastics in marine and freshwater environments.[1,2] However, microplastics research on terrestrial ecosystems remains unexplored, although a majority of point sources of plastics are terrestrial.
- Microplastics can affect soil structure and act as vectors of other contaminants such as Polycyclic Aromatic Hydrocarbons (PAHs) and metals found in soils.[3]
- We aim to study the spatiotemporal distribution of microplastics in urbanized and agricultural areas of metropolitan Phoenix, including the surroundings areas of the Sonoran desert.
- This study will shed light on the temporal changes of the abundance of microplastics and investigate their spatial distribution, thereby suggesting locations that are possibly prone to microplastics pollution.

Methodology

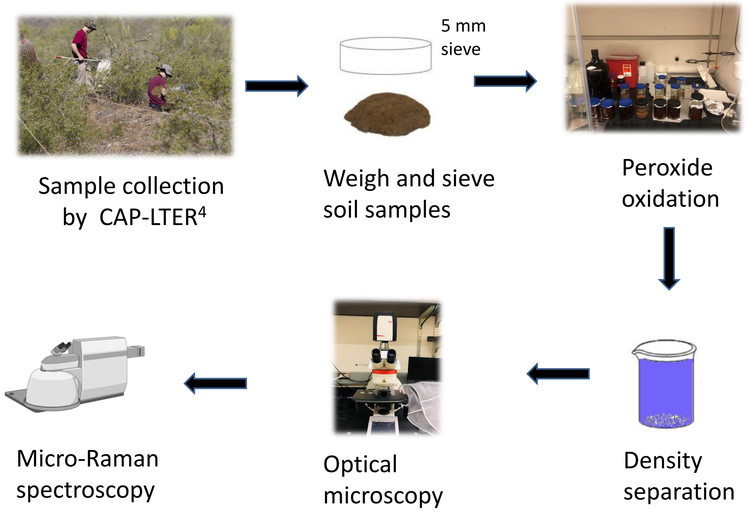

Figure 1: Illustration of the methodology used

Spatial distribution of microplastics in 2015 soil samples

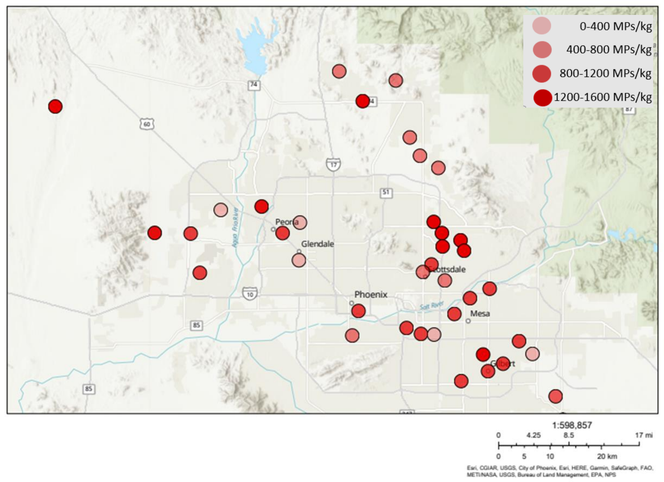

Figure 2: Spatial distribution of microplastics in soil samples from 2015

Temporal variation in microplastics in 2005 and 2015

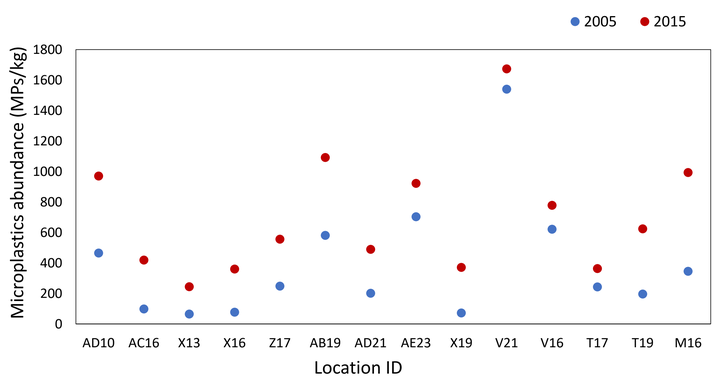

Figure 3: Temporal change in microplastics in soil samples from 2005 and 2015

Raman Characterization of microplastics in 2015 soil samples

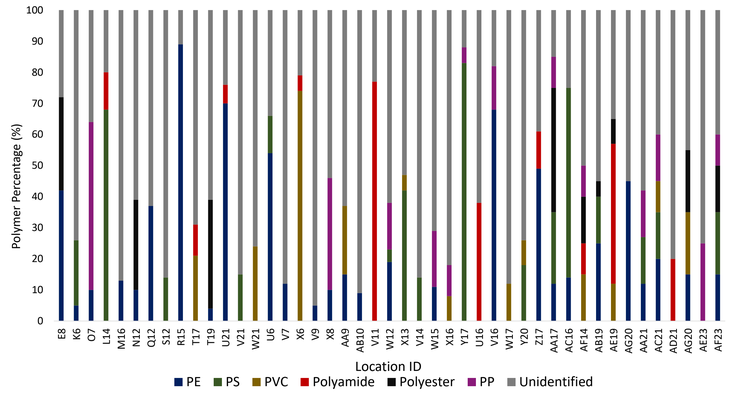

Figure 4: Raman Characterization of microplastics in soil samples from 2015

Summary

- The microplastic abundance in soil samples from 2015 ranged from 122 to 1399 microplastics/kg with a heterogeneous distribution depicting no clear spatial trends.
- Results for the temporal variability indicate a general increase in the abundance of microplastics from 2005 to 2015.
- Raman characterization for microplastics in 2015 soil samples revealed an array of polymers including PE, PS, PVC, PA, Polyester, PP.
- Approximately 75% of the sites contained PE.
- A large majority of the microplastics remain chemically unidentified. Weathering of microplastics over time could potentially change them thereby rendering them unidentifiable using Raman.

Acknowledgement

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References

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