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# Detection of Atmospheric Microplastic Fallout in the Southwestern Appalachian Mountain Region in the United States

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## Abstract

Global plastics production was estimated to be 367 million metric tons in 2020. A large portion of these plastic products become waste and are dispersed in the environment. Larger plastic fragments break down into miniscule plastic fragments called microplastics, which are typically less than 5 mm in size. Due to their small size and density, microplastics have been recently detected in urban, suburban, and even remote areas, suggesting the potential for long-distance atmospheric transport. Throughout this study, atmospheric microplastic deposition in Blacksburg, Virginia is investigated to provide insight into the extent of microplastics fallout in the Southwestern Appalachian Mountains in the Eastern United States. A multi-day pilot study is carried out on the Virginia Tech campus to collect field samples using a stainless steel beaker passive sampler. Our sample preparation procedure includes a simple filtering process and organic matter digestion using hydrogen peroxide with heat to remove any contaminants and isolate microplastics in the collected sample. Our investigations show that the digestion step is an essential process because a large amount of organic contaminants were removed as confirmed by microscopy. Raman spectroscopy is carried out to detect/quantify microplastic abundance and composition. To track the origin and distance of the microplastic particles transported in the atmosphere, an air mass back-trajectory analysis using Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model is utilized. These preliminary findings have guided the development of a larger-scale sampling study along the broader Appalachian Mountain region.

**Keywords:** atmospheric microplastics, deposition, atmospheric fallout, Southwestern Appalachian Mountains, United States

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