

1.025 Development of atmospheric particle concentrator with virtual impaction and condensation growth.

Early Career Scientist

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Abstract:

Analysis of PM_{2.5} is carried out with various devices. However, due to the low atmospheric particle concentration, sometimes it is difficult to detect its components correctly and it takes a lot of time to collect samples. Therefore, in this study, we investigated the method of increasing the number concentration of particles with a virtual impactor. The virtual impactor is a device used for the inertial separation in particles. In this impactor a jet of particle-laden air is directed. The large particles cross the air streamlines and enter the straight passage, while the small particles follow the air streamlines into the side passage. To remove the large particles from the side passage, a fraction of the total flow passing through the virtual impactor is allowed to pass through the straight passage. This flow will be referred to as the minor flow, while the flow through the side passage will be referred to as the major flow. As a result, the concentration of the larger particles in the minor flow has increased. However, small particles can't be concentrated well by this method. So in this study, we attempted to enlarge particle diameter by condensation growth. The principle is that when vapor surrounding small particles reaches a certain degree of supersaturation, the vapor begins to condense onto the particles. The vapor can condense onto particles that are larger than a critical size. By combining virtual impactor and condensation growth, both of fine and coarse particles can be concentrated. In this study, we compared the concentration before and after passing through the virtual impactor. It was increased by 4.7 times for particles with diameter of 20 to 400 nm when the particle diameter was enlarged by condensation growth.