

Height-resolved measurements of the aerosol size distributions in a temperate forest by tower observation system

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Dry and wet depositions are quite important for aerosol particles to be removed from the atmosphere. Also deposition of ammonium, sulfate, and nitrate contained in aerosol particles may contribute to potential acidification and eutrophication of the ecosystems. Both deposition processes are size specific, in particular, dry deposition of aerosol particles depends principally on particle size, atmospheric turbulence and stability and the collecting properties of the surface.

We conducted observational studies measuring the number size distributions of ambient submicron and ultrafine aerosol particles in a deciduous forest, during the summers of 2013 and 2014. The deciduous forest is located in suburban Tokyo, as a part of the experimental forest at the Tokyo University of Agriculture and Technology (Field Museum Tamakyuryo (FM Tama)). The observation site has a 30-m tall tower where we installed aerosol measurement instruments of the Scanning Mobility Particle Sizer and the Optical Particle Counter to explore the vertical profiles of the aerosol size distributions within and above the forest canopy. We report that the size distribution for submicron particles varied significantly with both temporally and vertically, depending on the wind field as well as the relative humidity related to the hygroscopic properties of aerosol particles.

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