Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

AAS21-P19 Room:Convention Hall Time:May 19 18:15-19:30

Vertical profiles of aerosol size distributions near the surface boundary layer

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Knowledge of the properties of the atmospheric minor constituents is essential in studies on climate change and its effects on human health. The concentrations of ambient trace gases and aerosols, which are emitted by both natural and anthropogenic sources, are influenced by diffusion due to the thermodynamic processes during the air-mass transportation along the prevailing wind flow. Their chemical and physical properties vary both temporally and spatially as a result of various atmospheric processes such as scavenging, nucleation, evaporation, and condensation. Therefore, a comprehensive approach that takes into consideration atmospheric chemistry as well as dynamics and thermodynamics is required for a thorough understanding of air quality.

For elucidating the properties of the minor constituents in the surface boundary layer, we have carried out AERObol and GAses Profiling (AEROGAP) experiments using a combination of in situ and remote sensing measurements at the Kyoto University Middle and Upper Radar site (34.9 N, 136.1 E) in Shiga Prefecture, Japan, during the summers of 2011 and 2012. In this study, we focus on the temporal variations in the vertical profile of nano- and submicron particles observed by a condensation particle counter and an optical particle counter fixed to tethered balloon platforms. We also discuss the properties derived from aerosol lidar observations compared with those observed using in situ instruments.

Keywords: Aerosol, Size distribution, Tethered balloon, Lidar