

Thesis Abstract

No. _____

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Thesis Title Quantification of Aerosol Wet Scavenging Using Observational data and Meteorology-Chemistry Simulation			
Thesis Summary Aerosols affect the Earth's radiation budget by altering cloud optical properties and cloud lifetime. Since the degree of global warming is determined by the breakdown of solar and earth radiation, accurate aerosol number estimates are required. However, the most significant source of uncertainty in global warming projections is the aerosol-cloud interaction. Therefore, the extent to which aerosols are removed by wet convection needs to be clarified, but the "wet scavenging process" associated with rainfall and snowfall is unresolved. In this study, first, we analyzed the relationship between rainfall and snowfall and PM_{2.5} concentrations at ground surface observation data to clarify the quantitative wet scavenging process. It was quantitatively revealed the PM_{2.5} concentrations decreased from one hour before to one hour after the onset of rainfall and snowfall. In the case of rainfall, the PM_{2.5} scavenging rate increased as rainfall intensity increased. In the case of snowfall, the PM_{2.5} scavenging rate tended to decrease up to 90% relative humidity (RH) and increase above 90%. These results are valuable findings that demonstrate, based on actual measurements, that the wet scavenging process is effective in reducing PM_{2.5} concentrations on the ground surface. Second, we conducted meteorology-chemistry simulation to clarify the details of the wet scavenging process when PM_{2.5} concentrations decrease due to rainfall. As a result, we quantitatively clarified the amount of reduction in PM_{2.5} concentrations due to the below-cloud scavenging and the contribution of the below-cloud scavenging to the total wet scavenging process for sulfate and nitrate. Keywords Aerosols, wet scavenging, below-cloud scavenging, observation, meteorology-chemistry simulation			