Geophysical Research Abstracts, Vol. 7, 04998, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04998

Diffusion and electric charge contributions to below-cloud wet removal of atmospheric ultra-fine aerosol particles

C. Andronache

Boston College, Gasson Hall 012, 140 Commonwealth Ave., Chestnut Hill, MA 02467 USA (andronac@bc.edu/Fax: 1-617-552-2836)

Ultra-fine particles (UFP) or aerosols with diameter d $<$ 100 nm are produced in the atmospheric boundary layer (BL) by nucleation or by direct emission from various sources. This study describes a method to calculate the UFP below-cloud scavenging coefficient (L), applicable in numerical modeling of environmental aerosols under rainy conditions. Results illustrate the UFP scavenging dependence on aerosol diameter, rainfall intensity and average electric charge. The electric charge effect on UFP scavenging is treated for strongly electrified clouds. The Brownian diffusion contribution to BL UFP scavenging can be applied to any type of precipitation, while the electric contribution to scavenging as treated here is appropriate for precipitation events associated with thunderstorms, or mesoscale convective systems. It is shown that for the UFP diameter range, L decreases with aerosol diameter, increases with the rainfall rate R, and increases with the average raindrop and aerosol electric charge. Model estimations of the UFP 0.5- folding time and the aerosol mass scavenged fraction under a wide range of conditions are presented and discussed.