4.022 Investigation of the below-cloud scavenging of the soluble inorganic aerosols by the rainfall during summer in Beijing.

Early Career Scientist

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Abstract:

In order to determine the relationship between the below-cloud scavenging and the precipitation intensity, high resolution of the aerosol concentration and the evolution of the chemical composition in precipitation through the each event were observed in Beijing during 3^{th} Jun and 4^{th} Jul 2014. It is the first field measurement study which focus on the below-cloud scavenging coefficients of the soluble inorganic aerosols based on the sequential sampling method in Beijing. Averaged concentration of NO_3^-, SO_4^{2-}, NH_4^+ in the precipitation were 158.3, 205.7, 338.6 μeq/L respectively, while the below cloud scavenging is much more significant than that in cloud process with about 2/3 fractions to 1/3. Eliminated the cleaning up effect of the north wind, the below cloud scavenging is calculated by the below-cloud scavenging ratio multiplied by the precipitation intensity and divided by the cloud-base height. The relationship between the below-cloud scavenging efficiency and the precipitation intensity is determined by the exponent function $K=aP^b$. For NO_3^-, SO_4^{2-} and NH_4^+ the relationship is $K=4.79\times10^{-3}P^{0.75}$, $K=1.28\times10^{-3}P^{1.20}$ and $K=8.45\times10^{-4}P^{1.20}$, respectively. Compared to the literature reported over the world, the parameter a, which depends on the precipitation type and the aerosol particle size, is at the same order of magnitude. Due to the high aerosol concentration in the air mass and short-time rainstorm events frequently occurred in summer of Beijing the parameter b obtained in this study is a little higher than the others, which indicated the soluble inorganic aerosols were more convenient to be scavenged from the atmosphere. Therefore, this study offered a new opportunity to improve the wet scavenging procedure in the 3-D numerical model and hence the simulation of the wet deposition in Beijing.