

2.020 Simulation on the similarities and differences of particle formation in winter and summer period in Beijing by NAQPMS+APM.

Early Career Scientist

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Abstract:

The NAQPMS+APM model was applied to simulating particle number size distribution evolution in two periods in summer and winter in Beijing. Both in summer and in winter, the new particle formation events usually occurred in relative clean atmosphere or followed a pollution scavenging process by strong north winds. The number concentration of nucleation-mode particles explosively increased in new particle formation events. In polluted periods, number concentration of accumulation-mode particles increased significantly while number concentration of nucleation-mode particles was at a low value. The diurnal variation of nucleation-mode secondary particles was opposite to the primary

particles while the accumulation-mode secondary particles diurnal pattern was in line with primary particles, which showed local features of nucleation-mode secondary particles and regional features of accumulation particles. The high concentration of condensable gas led to high frequency of new particles formation events in Beijing. Nucleation rates can be higher than $10 \text{ cm}^{-3}\text{s}^{-1}$. Nucleation events usually occurred before noon when pollutants concentration was low. In pollution episodes, the primary particles can grow rapidly due to coating secondary species through microphysics processes. Nucleation rates in winter was obviously higher than that in summer due to the higher temperature in summer was not favorable to nucleation despite the higher concentration of sulfuric acid and organic vapors. However, in summer the secondary particles can grow to a larger size as a result of the higher concentration of condensable gases produced by intense photochemistry.