

4.001 The properties and effects of new particle formation events on polluted days in the PRD region, China.

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Abstract:

New particle formation (NPF) events on polluted days at a regional supersite in the Pearl River Delta (PRD) region and its impact on the abundance and properties of cloud condensation nuclei (CCN) were investigated. Nucleation and subsequently significant growth of nanoparticles on a regional scale was observed and representative events on 2 and 6 October 2013 were chosen in this study. The measurements showed that the primary components of the particles were sulfate, ammonium, and organics as they were added continuously to secondary aerosol mass and that particles show inversion from growth to shrink if the particles comprise primarily of organics due to evaporation of semi-volatile species under favorable meteorological conditions. The effective hygroscopicity parameter κ of fine particles on 2 October composed of sulfate, nitrate and ammonium ($\kappa=0.26-0.42$) was larger than that of fine particles on 6 October containing more organics ($\kappa=0.19-0.36$). Particles in the nucleation mode were observed to grow rapidly to the CCN sizes and dominate the CCN number concentrations at a water vapor supersaturation (S) over 0.46%. At an S range of 0.26-0.86%, the CCN number concentrations reached maximum values of $(1.3-2.6)\times 10^4 \text{ cm}^{-3}$ after the NPF event on 2 October. The sulfate component in the particles was found to increase significantly, about 50% higher than that before NPF. Results from events on 6 October showed a significant increase of the organic component and the CCN number concentrations after the NPF event were comparable or slightly lower than those before the event. Nevertheless, the

average CCN number concentrations scaled with EC mass concentration with S over 0.46% in the daytime of 2 and 6 October were significantly higher than those on a non-NPF event day.