NANO HIGHLIGHT
Clusters to Nanoparticles: Implications for Atmospheric Nucleation

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Condensation particle counters (CPC) are used to detect particles too small to be detected by light scattering. Nanoparticles are grown by vapor condensation to sizes in the 1-10 nm range, which are easy to detect. The minimum detectable size for commercially available CPCs (the TSI 3025) is about 3 nm [1]. Using an idea de la Mora and coworkers [2, 3], Doctoral student Kenjiro Iida has developed a new CPC that operates stably, and that can detect particles as small as 1.4 nm mobility size (1.0 nm geometric size) [4], as shown in Figure 1. This CPC involves two stages of condensation, first by ethylene glycol and then butanol.We plan to use this CPC as the detector in a new nano-scanning mobility spectrometer (Nano-SMPS) [5] that we are building as a part of this project. The Nano-SMPS will extend measurements of aerosol size distributions down to about 1 nm. When used in parallel with the Cluster Chemical Ionization Mass Spectrometer that we are building to detect neutral molecular clusters, we hope to be able to measure the entire spectrum of sizes during atmospheric nucleation, from molecules to nanoparticles and beyond. These distribution measurements will be used to study processes responsible for the growth of molecular clusters into new particles (i.e., the *nucleation* of new particles in the atmosphere.) Our previous research has shown that nucleation is an important process that occurs frequently, affects concentrations of cloud condensation nuclei, and likely affects the earth's radiation balance. Therefore, new particle formation is a process that must be included in global climate models. Our work is aimed at developing microphysical models for atmospheric nucleation that can be included in global climate models.

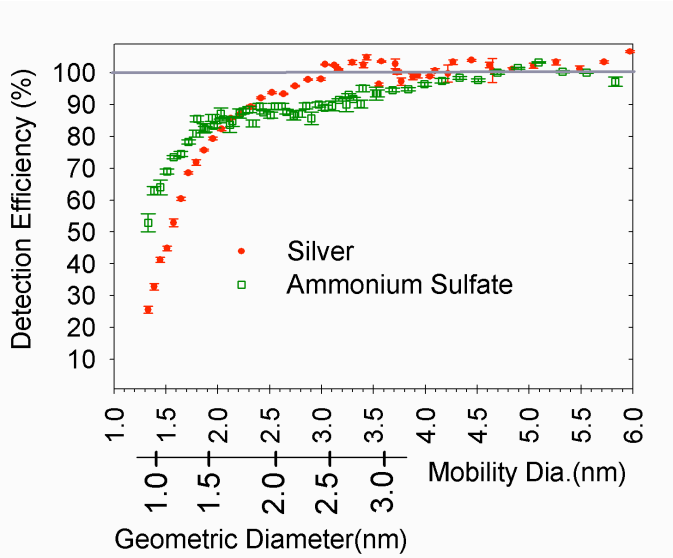

Figure 1: the detection efficiency of the CPC using ammoniumsulfate and silver as test aerosols

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