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INVERSION OF UCNC PULSE HEIGHT DISTRIBUTIONS TO OBTAIN ULTRAFINE (~3 TO 10 NM) PARTICLE SIZE DISTRIBUTIONS

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Previous work (Brockmann, 1981; Stolzenburg, 1988; Ahn and Liu, 1990) has shown that for particles smaller than about 15 nm pulse heights produced by the optical detector in a white-light ultrafine condensation nucleus counter (UCNC; Stolzenburg and McMurry, 1991) decrease with initial particle size. We have previously reported on the use of pulse heights from this instrument to determine the concentrations of freshly nucleated ultrafine (3 to 4 nm) atmospheric particles (Weber et al., 1995; Weber et al., 1995). In this paper we report on the inversion of measured pulse height distributions to obtain ultrafine aerosol size distributions.

Using methods developed by Stolzenburg (1988), the effect of diffusional broadening is taken into account so as to obtain monodisperse kernel functions from measured pulse height distributions produced by DMA-generated calibration aerosols in the 3 to 15 nm diameter range. These kernel functions are then used with the MICRON algorithm described by Wolfenbarger and Seinfeld (1990) to obtain size distributions of ultrafine aerosols from measured pulse height distributions.

Calculations were done to ensure that simulated pulse height data generated from selected known size distributions can be inverted to recover the original size distribution. Results from these validation studies will be discussed. Applications of the inversion algorithm to data acquired in studies of homogeneous nucleation in the atmosphere will also be presented.

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