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Utilizing an electrical low-pressure impactor to indirectly probe water uptake via particle bounce measurements

Kevin B. Fischer and Giuseppe A. Petrucci

Correspondence to: Giuseppe A. Petrucci (giuseppe.petrucci@uvm.edu)

Supplemental Information:

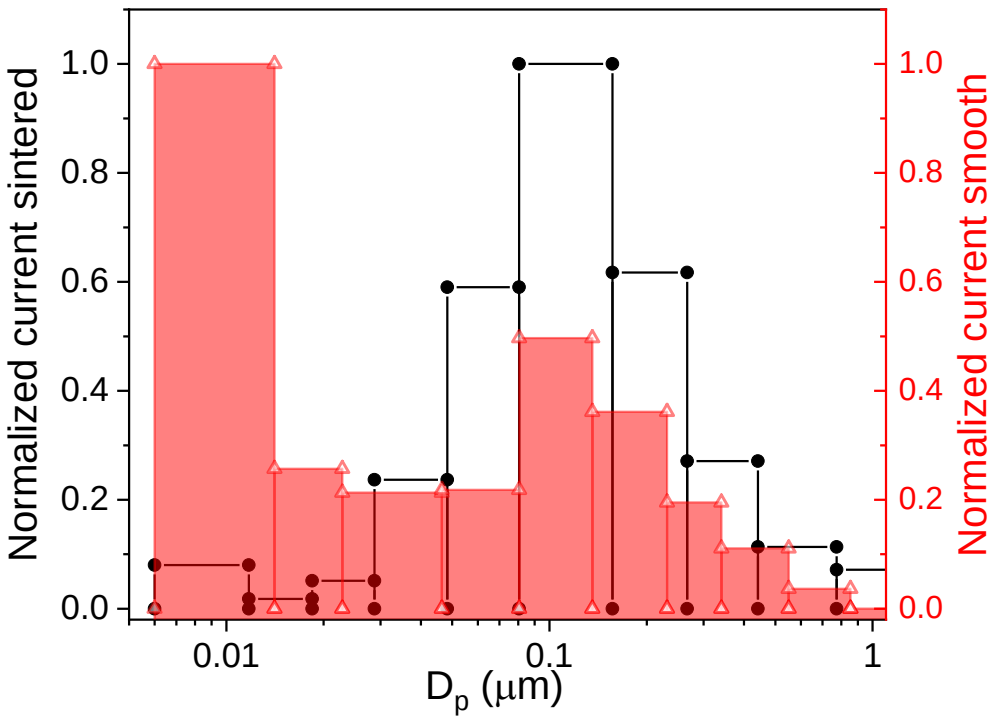

Figure S1. Normalized current distributions measured with the ELPI+ using smooth (filled bars) and sintered (empty bars) impaction plates, where all bounce is eliminated. The distribution measured with the sintered plates reflects the true current distribution in the absence of bounce. As can be seen, when using the smooth impaction plates that favor bounce, a majority of the current has shifted from higher stages (Stage >4) to the filter stage (Stage 1). It should be noted that the current on stages 2 and 3 also increases due to bounce. Therefore, our reported estimates of bounce factor should be considered a lower limit.

Electrical Low Pressure Impactor Relative Humidity

The lower stages of the electrical low-pressure impactor (ELPI+, Dekati, Kangasala, Finland) utilized here experience a RH decrease proportional to the pressure drop. Note also that stage 15 is not active and does not report any current values.

Stage	**D_{50} (µm)**	**t_{res} (ms)**	**P_n (kPa)**	**RH_n (%)**
Chamber			101.33	100
15	9.87	0	101.32	99.9901
14	5.36	102.9	101.3	99.9704
13	3.65	73.6	101.25	99.9211
12	2.47	57.8	101.19	99.8618
11	1.63	57.1	101.01	99.6842
10	0.947	62.2	100.5	99.1809
9	0.602	58.5	99.59	98.2828
8	0.381	55.2	97.21	95.9341
7	0.255	50.5	88.8	87.6345
6	0.155	39.1	68.86	67.9562
5	0.0941	22.2	38.44	37.9355
4	0.0528	12.7	21.86	21.5731
3	0.0296	5.6	9.73	9.60229
2	0.0161	2.4	4.48	4.4212
1	0.006	1	4	3.9475

Table S1. ELPI cut point diameter (µm), residence time (ms), pressure (kPa), and relative humidity (%) for each stage, assuming 100% RH and 101.33 kPa in chamber.

Ammonium Sulfate Method Validation

The modified, abridged approach used in this study was also validated for use with α-pinene-derived secondary organic aerosol against the complete method described by Jain and Petrucci (2015) where bounce factor (BF) was determined (Figure S3). Good agreement was observed between the methods, especially when one considers that the complete method requires two separate experiments where the same nominal conditions are established for two consecutive experiments, one of which uses sintered impaction plates to shut down bounce and the other smooth plates to favor bounce.

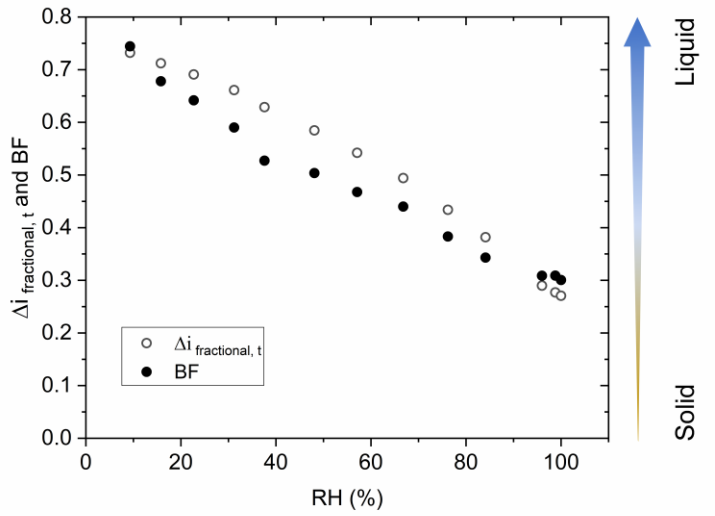

Figure S2. Comparison of particle phase as measured by bounce method of Jain and Petrucci (2015) and modified method used in this work. α-pinene-derived SOA was generated via ozonolysis in a 750 L Teflon environmental chamber. Maximum C_{SOA} observed was 48-52 μg m^{-3}.

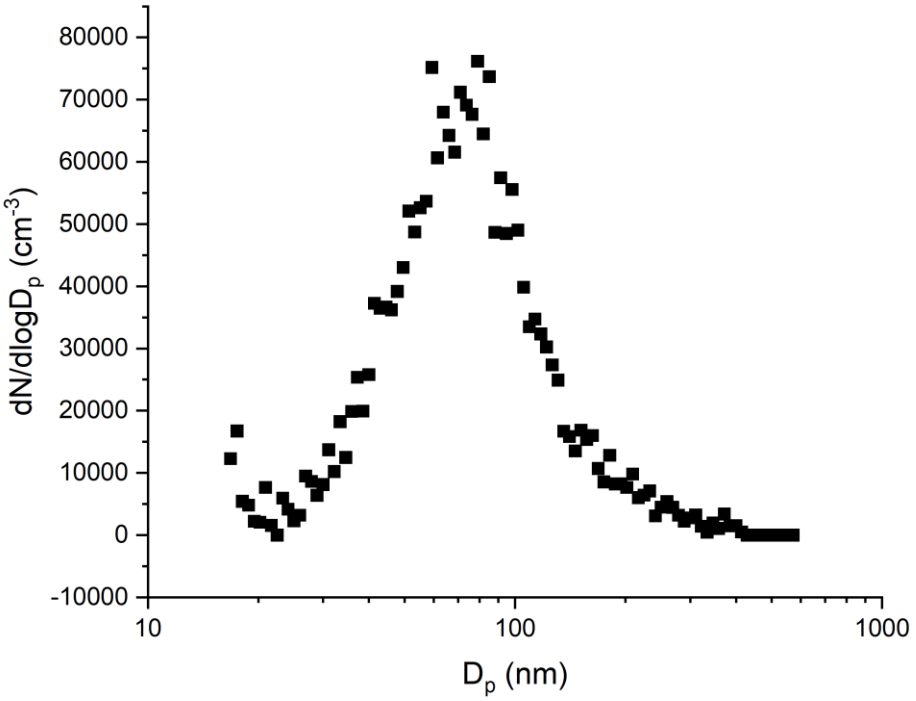

Figure S3. Typical number size distribution for ammonium sulfate generated by pneumatic nebulization of an aqueous solution into a dry chamber. GMD = 90 nm, geometric standard deviation = 1.7.

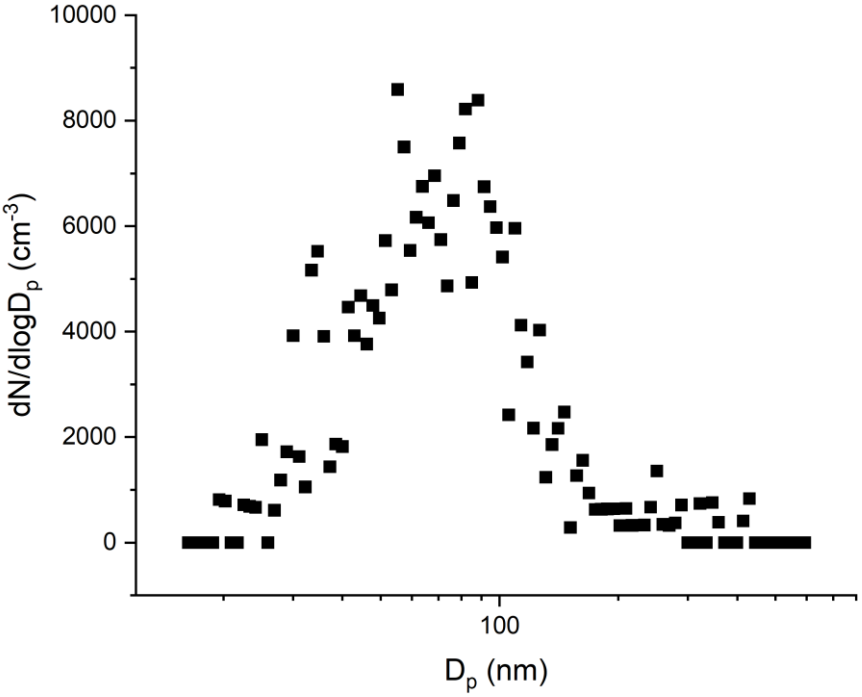

Figure S4. Typical number size distribution for sucrose generated by pneumatic nebulization of an aqueous solution into a dry chamber. GMD = 65 nm, geometric standard deviation = 1.7.

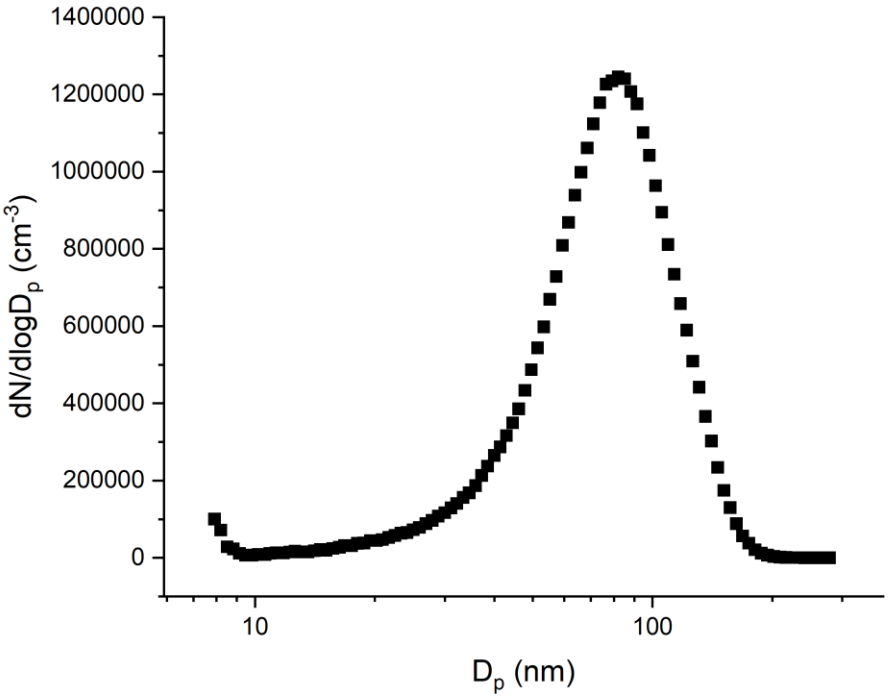

Figure S5. Typical number size distribution for secondary organic aerosol generated by ozonolysis of α-pinene in a dry chamber. α-pinene and ozone mixing ratios were 195 ppb and 650 ppb, respectively. GMD = 95 nm, geometric standard deviation = 1.6.

Jain, S. and Petrucci, G. A.: A New Method to Measure Aerosol Particle Bounce Using a Cascade Electrical Low Pressure Impactor, Aerosol Sci. Technol., 49, 390-399, 10.1080/02786826.2015.1036393, 2015.