Supplementary Information

Impact of various air mass types on cloud condensation nuclei concentrations along coastal southeast Florida

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Section S1. CCN Counter Calibration

The CCN counter was calibrated by DMT in 2013 just before the start of this study, once in May of 2017, and again in May of 2018. The supersaturations (SSs) generated in the CCN counter are a result of the column temperature gradient (dT). The SS-dT relationship was calibrated by atomizing a dilute ammonium sulfate (Aldrich, 99.999% purity) solution with pure nitrogen and then drying it with a silica gel drier. The dried, polydispersed aerosol passed through a ^{210}Po neutralizer, followed by a differential mobility analyzer (DMA, Model 3080, TSI Inc.) selecting particles with mobility diameters between 12 and 594 nm to obtain a monodisperse aerosol flow. The flow was split to measure the total particle concentration (CN) with a condensation particle counter (CPC, model 3010, TSI Inc.) and CCN concentrations with the CCN counter for SSs between 0.1 and 1.0%. Activation curves of CCN/CN ratios were made for each particle size selected by the DMA at a constant dT. This was then repeated at 6 dTs. Additionally, the influence of multiply charged particles was corrected using the method found in Rose et al. (2008).

Section S2. Method to Determine the Ratio of $CCN_{0.2\%}$:$CCN_{1.0\%}$

The one Hz data for CCN concentrations at 0.2 and 1.0% SS within each category were reorganized using the MATLAB function "retime" and synchronized as hourly averages. The "retime" function took all measurements for a single SS within an hour's time span and produced a single average to reflect the behavior of CCN at that SS for that particular hour. Since the CCN counter only measured one SS at a time, and spent a designated period of time (5 minutes for the 2013 dataset; 10 minutes for both the 2017 and 2018 datasets) on each SS, this was a way to compare CCN concentrations at different SSs with as much temporal proximity as possible. After obtaining a single average for both $CCN_{0.2\%}$ and $CCN_{1.0\%}$ in each hour, the ratio of the two values was calculated. In the calculations involving smoke, dust, background, and "other" days, all calculated ratios falling within a type of day were used to determine the total average for that particular category.

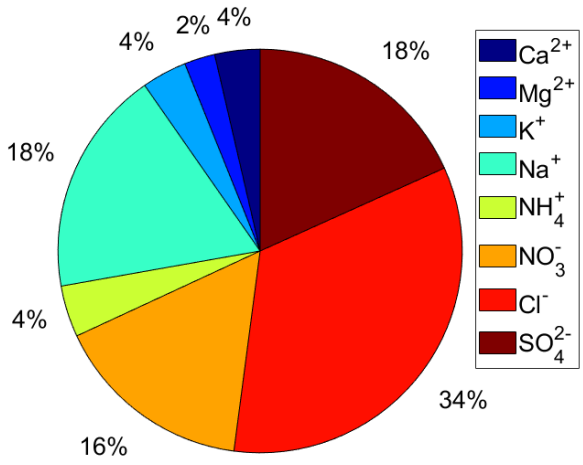

Figure S1. Average mass fraction of ions based on volume-weighted concentrations for weekly wet deposition samples collected by NADP at Everglades NP for June-July-August (JJA) of 2017.

Reference

Rose, D., Gunthe, S. S., Mikhailov, E., Frank, G. P., Dusek, U., Andreae, M. O., and Pöschl, U. (2008). Calibration and measurement uncertainties of a continuous-flow cloud condensation nuclei counter (DMT-CCNC): CCN activation of ammonium sulfate and sodium chloride aerosol particles in theory and experiment. *Atmos. Chem. Phys., 8*(5), 1153-1179. doi:10.5194/acp-8-1153-2008