

Supplement of Atmos. Chem. Phys., 19, 11985–12006, 2019  
<https://doi.org/10.5194/acp-19-11985-2019-supplement>  
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*Supplement of*

## **Quantifying aerosol size distributions and their temporal variability in the Southern Great Plains, USA**

**Peter J. Marinescu et al.**

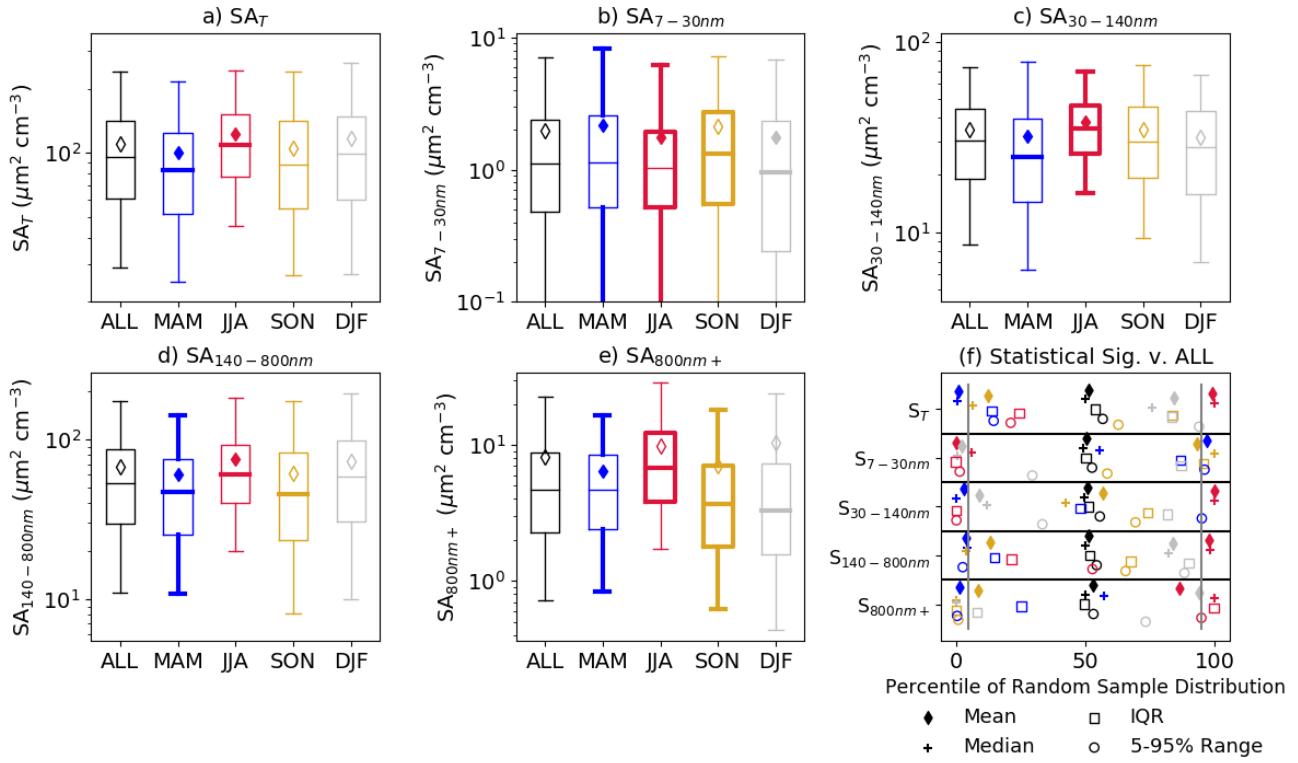
*Correspondence to:* Peter J. Marinescu (peter.marinescu@colostate.edu)

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## Supplement

While the focus of this manuscript was on aerosol number size distributions, for completeness, we converted the number size distribution data to surface area (SA) and volume size (V) distributions and performed the same analyses on the total surface

5 area and volume concentrations, as well as the integrated surface area and volume for the specified size ranges (7-30nm, 30-140nm, 140-800nm, and 800nm+) as in the main text. In general, the results for the integrated surface area and volume concentrations were similar to those for the integrated number concentrations. These supplemental figures are shown in Figures S1-S8. Figures S1 and S2 correspond to Figure 4 in the main text regarding the seasonal boxplot distributions of aerosol concentrations, but for surface area and volume size distribution data, respectively. Figures S3 and S5 represent 10 power spectra for periods from 4 hours to 2 days for the total surface area ( $SA_T$ ) and volume ( $V_T$ ) concentrations, respectively and correspond to Figure 5 in the main text. Figures S4 and S6 represent the timing of peak concentrations associated with the diurnal cycle of  $SA_T$  and  $V_T$  and correspond to Figure 6 in the main text. Figure S7 represents the power spectra of the 4 aerosol modes for the surface area size distribution, while Figure S8 represents the timing of the peak concentrations associated with the diurnal cycle in surface area concentrations associated with the 4 aerosol modes. The 15 power spectra and timing of the diurnal cycle for the 4 aerosol modes within the volume size distribution was included in the main text.



**Figure S1: Distributions of integrated surface area for the entire size distribution (a) and for the 4 size ranges (b-e,  $SA_{7-30nm}$ ,  $SA_{30-140nm}$ ,  $SA_{140-800nm}$ , and  $SA_{800nm+}$ ), shown as box-plot diagrams. Data is shown for the entire time period (ALL) and by season. The boxes represent the interquartile ranges separated into two boxes by the median values, the diamonds represent the mean values, the lines extending from the boxes represent the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Bolded lines and solid symbols in panels (a) through (e) represent differences between the seasonal and ALL variables that are statistically significant at the 95% level, as described in the text and shown in panel (f). The vertical grey lines in (f) are the 5<sup>th</sup> and 95<sup>th</sup> percentiles.**

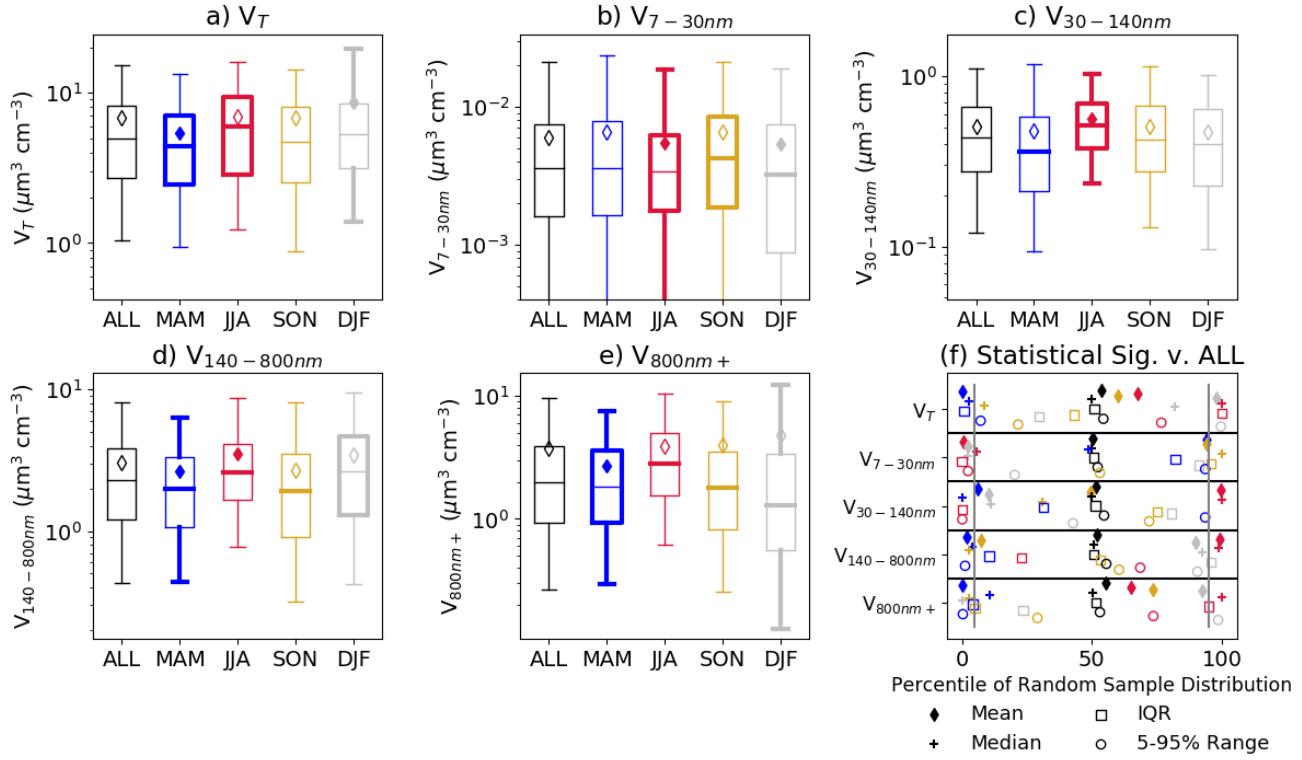
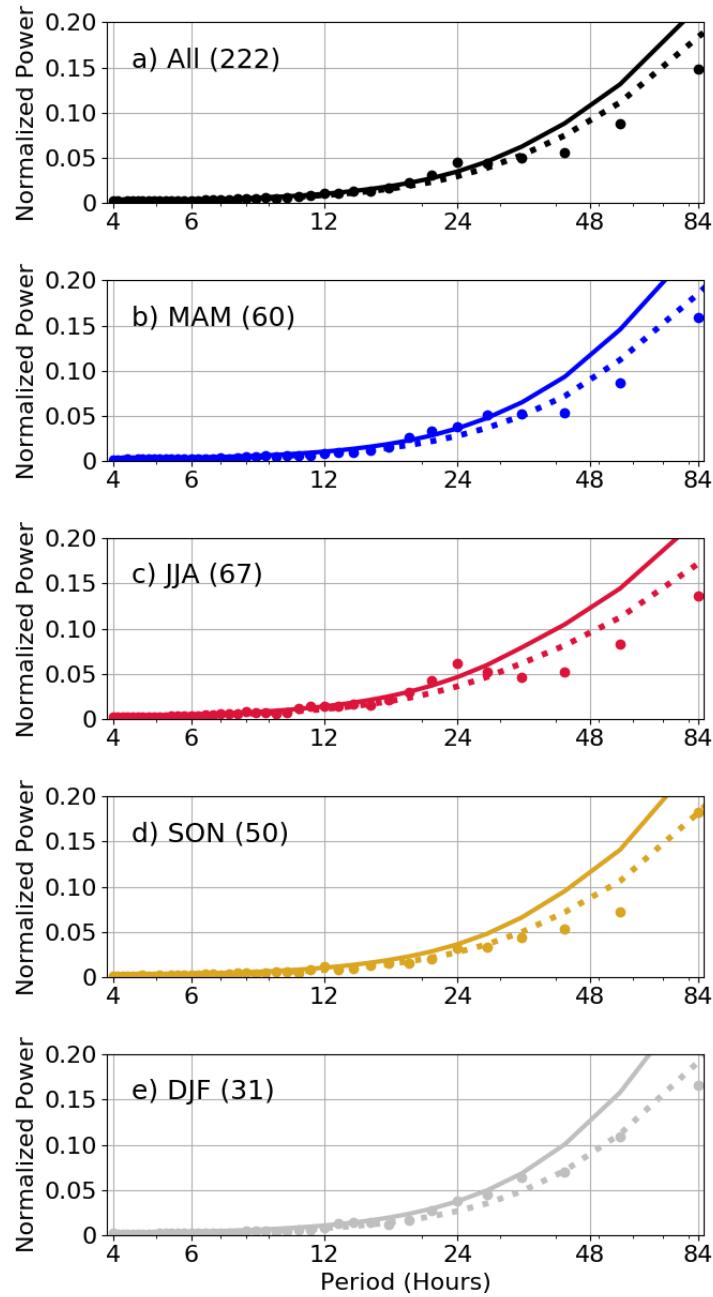


Figure S2: Distributions of integrated volume concentrations for the entire size distribution (a) and for the 4 size ranges (b-e,  $V_{7-30\text{nm}}$ ,  $V_{30-140\text{nm}}$ ,  $V_{140-800\text{nm}}$ , and  $V_{800\text{nm}+}$ ), shown as box-plot diagrams. Data is shown for the entire time period (ALL) and by season. The boxes represent the interquartile ranges separated into two boxes by the median values, the diamonds represent the mean values, the lines extending from the boxes represent the 5<sup>th</sup> and 95<sup>th</sup> percentiles. Bolded lines and solid symbols in panels (a) through (e) represent differences between the seasonal and ALL variables that are statistically significant at the 95% level, as described in the text and shown in panel (f). The vertical grey lines in (f) are the 5<sup>th</sup> and 95<sup>th</sup> percentiles.



**Figure S3:** Normalized power spectra for  $SA_T$  for the entire period (a) and by season (b-e). The dots represent power associated with the data. The dashed lines represent an estimate of the red noise power spectrum for each data set, and the solid lines represent the 99% significance testing level, as described in the main text. The values in the parentheses are the number of weekly data chunks used in this analysis.

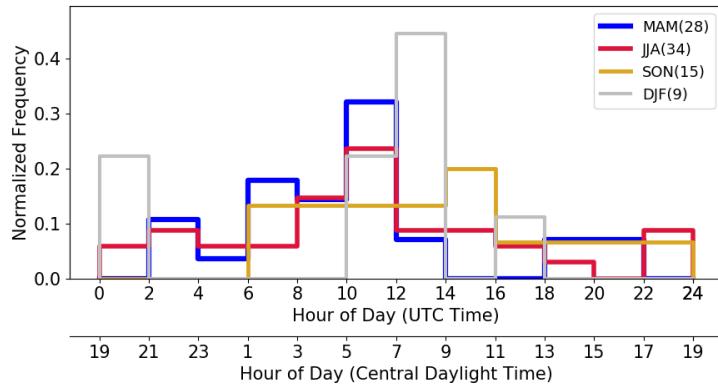
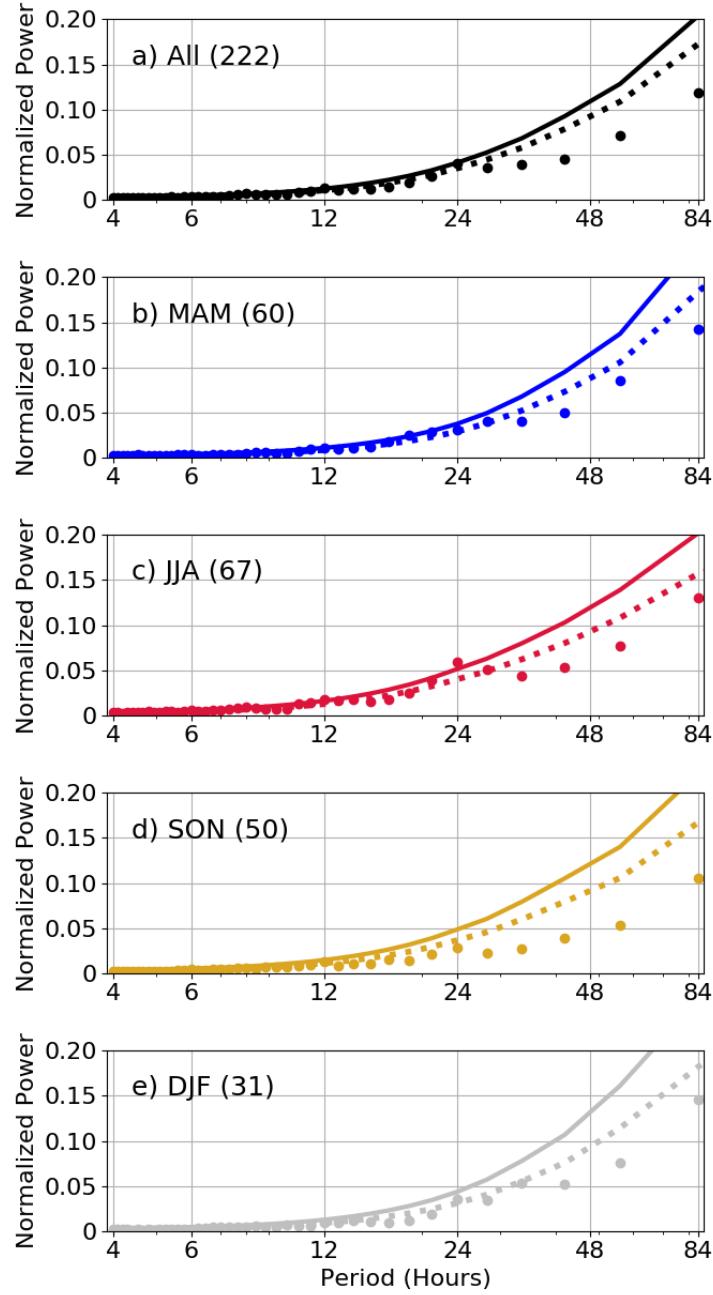


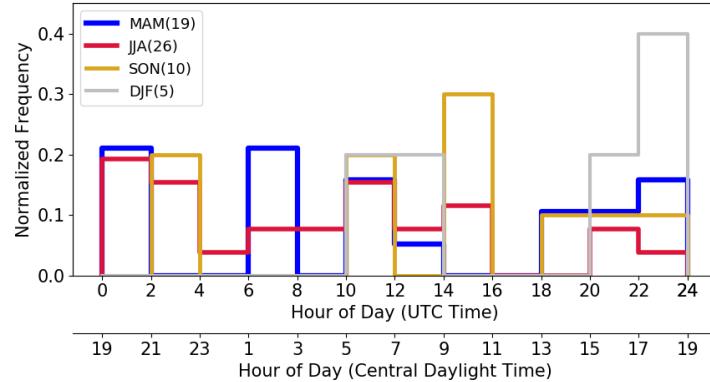
Figure S4: Normalized frequency of the daily time of peak concentrations associated with the 24-hour cycle in  $SA_T$ . This figure only includes weekly data chunks that had normalized power associated with the 24-hour cycle greater than that of the corresponding seasonal estimate of the red noise spectrum power. The numbers in parentheses represent the number of weekly data chunks that met this criterion

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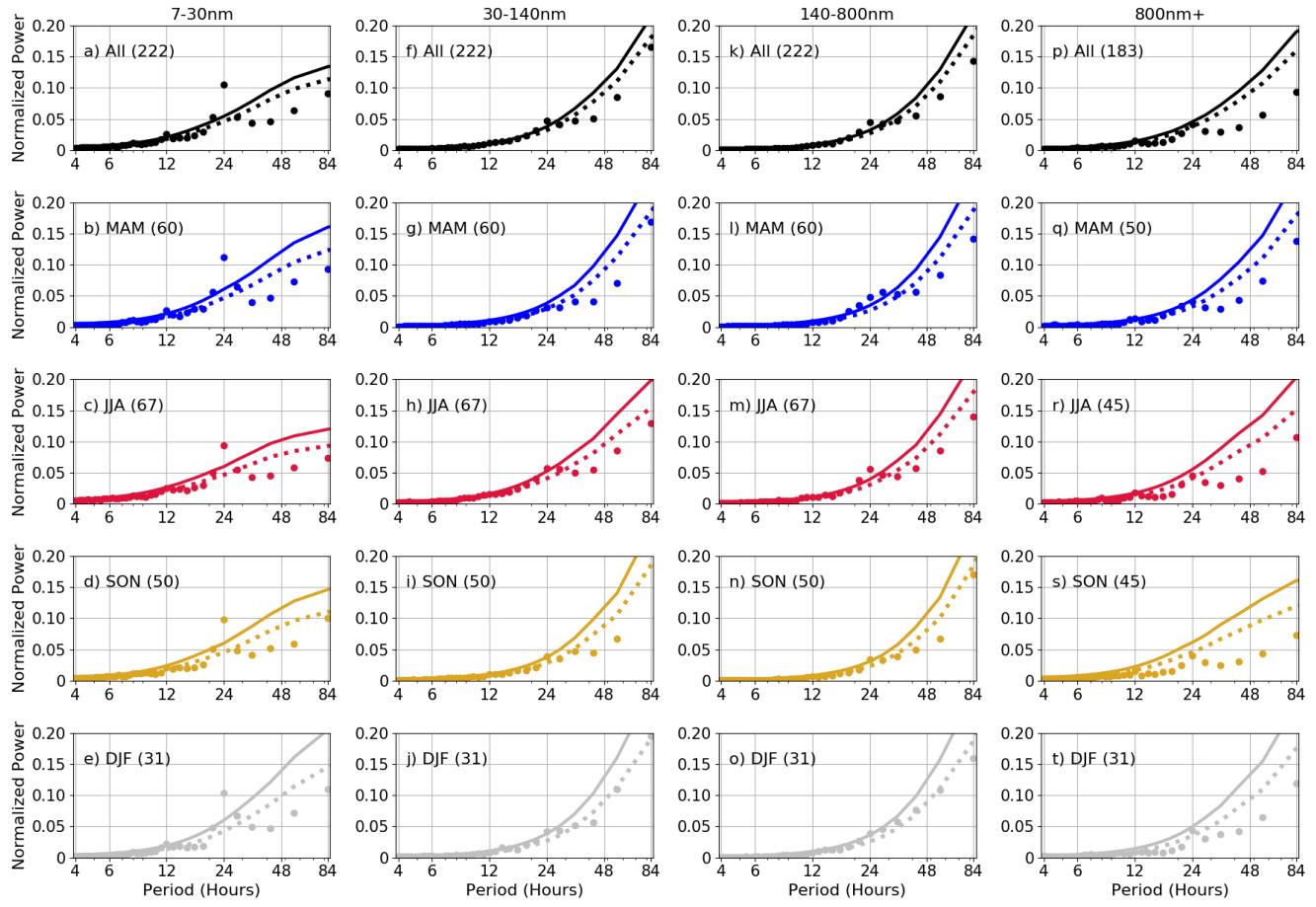
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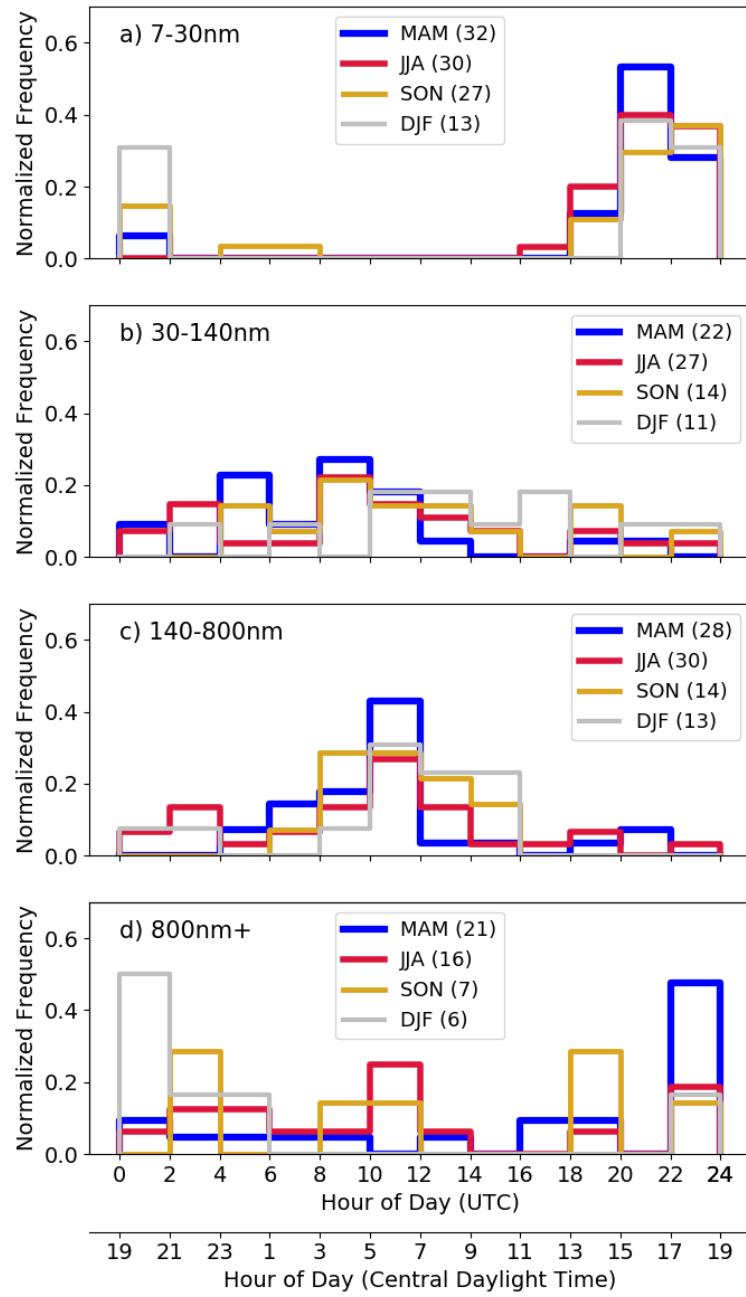
**Figure S5: Normalized power spectra for  $V_T$  for the entire period (a) and by season (b-e). The dots represent power associated with the data. The dashed lines represent an estimate of the red noise power spectrum for each data set, and the solid lines represent the 99% significance testing level, as described in the main text. The values in the parentheses are the number of weekly data chunks used in this analysis.**



**Figure S6: Normalized frequency of the daily time of peak concentrations associated with the 24-hour cycle in  $V_T$ . This figure only includes weekly data chunks that had normalized power associated with the 24-hour cycle greater than that of the corresponding seasonal estimate of the red noise spectrum power. The numbers in parentheses represent the number of weekly data chunks that met this criterion**



**Figure S7: Normalized power spectra for  $SA_{7-30nm}$ ,  $SA_{30-140nm}$ ,  $SA_{140-800nm}$ , and  $SA_{800nm+}$  for the entire period and by season. The descriptions of the symbols used are the same as in Figure S3.**



**Figure S8: Normalized frequency of the daily time of peak concentrations associated with the 24-hour cycle in the different modes of the aerosol surface area size distribution. (a-d) represent  $SA_{7-30nm}$ ,  $SA_{30-140nm}$ ,  $SA_{140-800nm}$ , and  $SA_{800nm+}$ , respectively. The description of the figure is the same as in Figure S4.**