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Supplement of

Spectral aerosol extinction (SpEx): a new instrument for in situ ambient aerosol extinction measurements across the UV/visible wavelength range

C. E. Jordan et al.

Correspondence to: C. E. Jordan (carolyn.jordan@nianet.org)

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SUPPLEMENTARY TABLES & FIGURES

Table S1. Minimum standard deviations for select wavelengths from Allan Variance test. Test conducted with filtered air at a flow rate of 90 lpm using 50 ms integration time per spectrum.

<i>Wavelength (nm)</i>	<i># of scans for minimum st. dev.</i>	<i>Time (s) to acquire # of scans</i>	<i>Minimum st. dev. (Mm⁻¹)</i>
300	1379	69	5.7
400	1076	54	3.5
500	946	47	4.2
600	946	47	5.4
700	946	47	3.9

Table S2. Summary of aerosol tests: materials used and generated size distributions. A total of 22 tests were performed generating 87 total spectra.

Material	Size Distributions			
<i>Scatterers</i>	<i>200 nm</i>	<i>600 nm</i>	<i>900 nm</i>	
Polystyrene Latex Spheres	2	1	1	
Ammonium Sulfate	1	1		
Citric Acid	1	1		
<i>Dust</i>	<i>PM₁</i>	<i>PM_{2.5}</i>		
Montmorillonite	1	2		
Blue Ridge Violet	1			
Italian Yellow Earth	1			
Luberon Natural Red	1	1		
Goethite	1			
<i>Smoke & Soot Analogs</i>	<i>40 nm</i>	<i>80 nm</i>	<i>190 nm</i>	<i>Polydisperse</i>
Fullerene Soot				1
Aquadag				1
Smoke		1	1	
Low O:C Smoke	1			
High O:C Smoke	1			

Table S3. Mean single scattering albedo calculated from TSI nephelometer scattering and SpEx extinction for the tests shown in Table S2. Errors propagated based on 10% measurement error for each instrument.

	450nm	550nm	700nm
PSL 200nm Test 1	0.85±0.12	0.76±0.11	0.66±0.09
PSL 200nm Test 2	0.95±0.13	0.88±0.12	0.81±0.11
PSL 600nm	1.12±0.16	0.98±0.14	0.91±0.13
PSL 900nm	1.13±0.16	1.02±0.14	0.98±0.14
AS 200nm	1.00±0.14	0.94±0.13	0.88±0.12
AS 600nm	1.10±0.16	1.01±0.14	0.95±0.13
Citric Acid 200nm	1.11±0.16	1.01±0.14	0.94±0.13
Citric Acid 600nm	1.11±0.16	1.01±0.14	0.95±0.13
Montmorillonite PM1	0.97±0.14	0.94±0.13	0.91±0.13
Montmorillonite PM2.5 Test 1	0.85±0.12	0.81±0.11	0.78±0.11
Montmorillonite PM2.5 Test 2	0.84±0.12	0.80±0.11	0.78±0.11
Italian Yellow Earth PM1	0.85±0.12	1.05±0.15	0.97±0.14
Goethite PM1	0.80±0.11	1.07±0.15	1.02±0.14
Blue Ridge Violet PM1	0.65±0.09	0.71±0.10	1.15±0.16
Luberon Natural Red PM1	0.67±0.09	0.80±0.11	1.25±0.18
Luberon Natural Red PM2.5	0.42±0.06	0.52±0.07	0.93±0.13
Fullerene Soot polydisperse	0.41±0.06	0.38±0.05	0.35±0.05
Aquadag polydisperse	0.45±0.06	0.40±0.06	0.35±0.05
Smoke ~190nm	0.20±0.03	0.17±0.02	0.12±0.02
Smoke ~80nm	0.14±0.02	0.14±0.02	0.12±0.02
Smoke Low O:C ~40nm	0.56±0.08	0.60±0.08	0.57±0.08
Smoke High O:C ~40nm	0.25±0.04	0.26±0.04	0.26±0.04

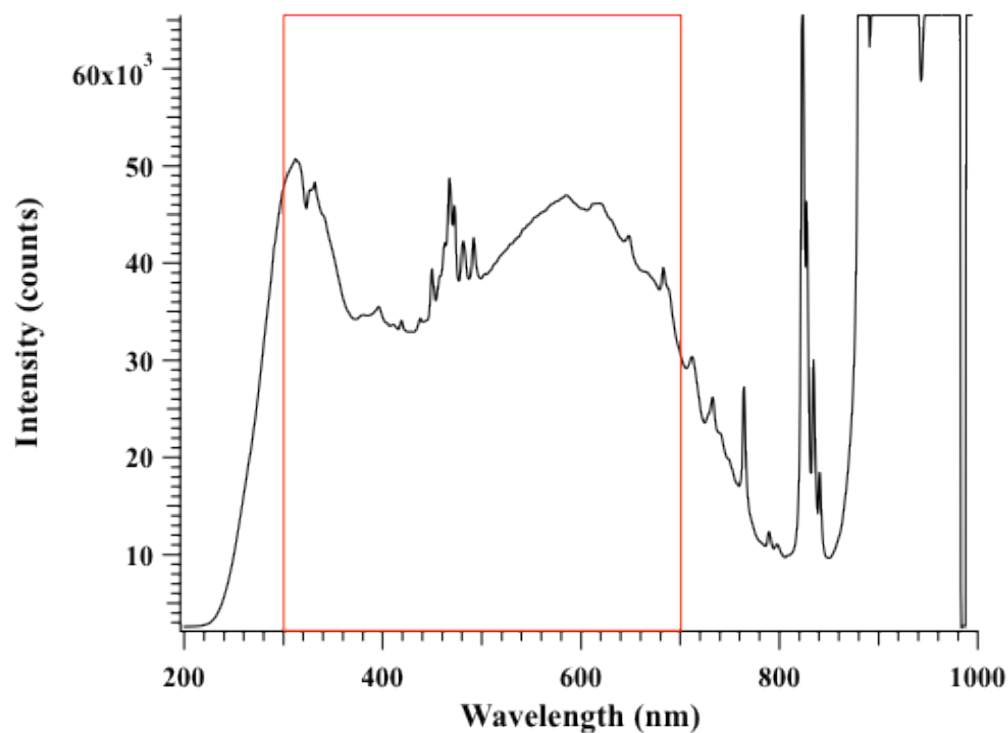


Figure S1. Intensity spectrum of the xenon lamp over the full wavelength range of the spectrometer for a filtered air sample. The measurement range is highlighted by the red box.

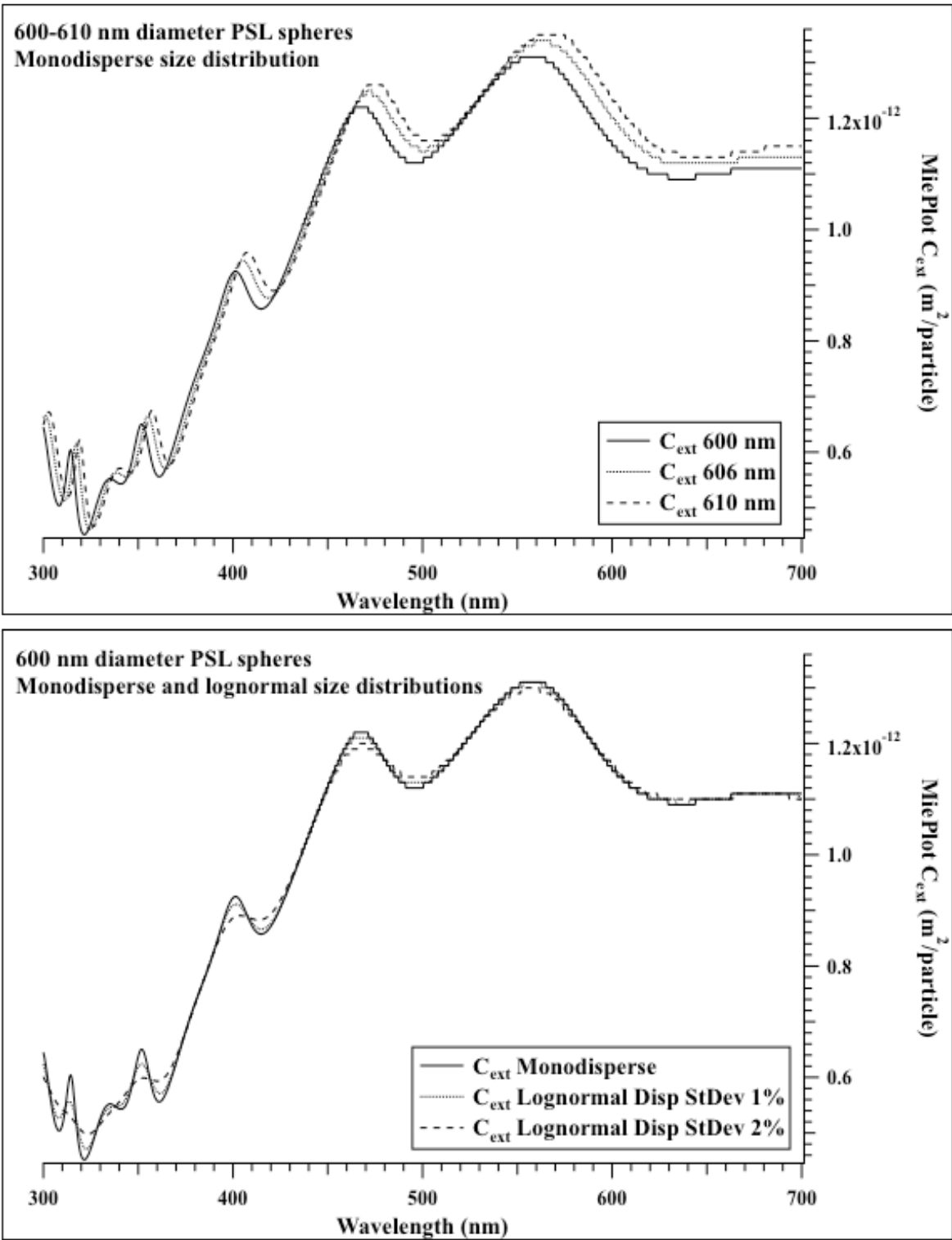


Figure S2. Sensitivity of MiePlot C_{ext} calculations to particle diameter for monodisperse PSL spheres (top panel) and to lognormally distributed PSL spheres with standard deviations of 1% and 2% (bottom panel).

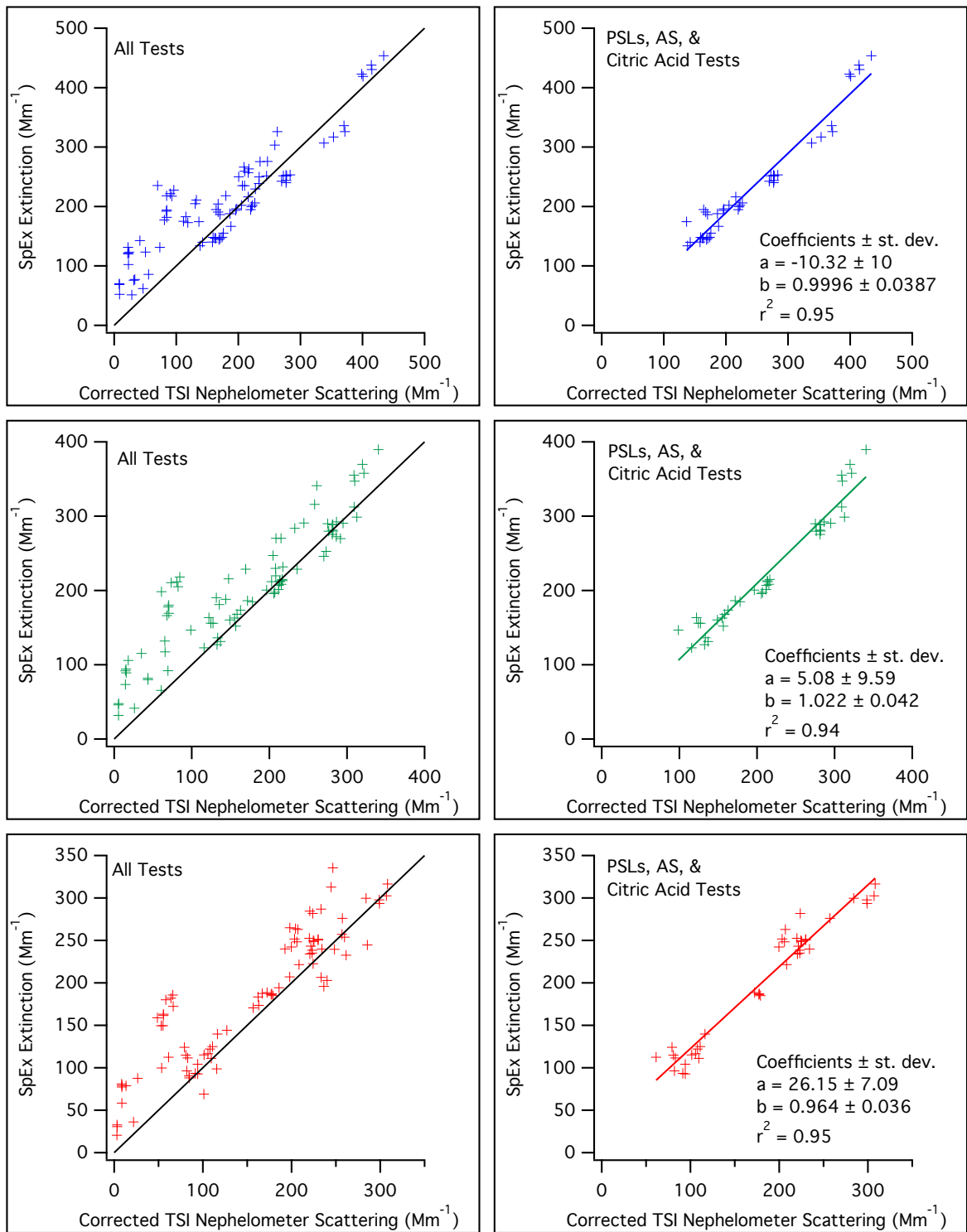


Figure S3. Extinctions measured at 450 (top panels), 550 (middle panels), and 700 (bottom panels) nm by SpEx versus by scattering measured by TSI nephelometer (as shown in Fig. 5) for all aerosol tests (left panels) listed in Table S2. Black lines in left panels show 1:1 line. Right panels show subset of tests for scattering aerosols (PSLs, AS, and citric acid) with linear fits that show the slope (b) and the intercept (a) in each case, along with r^2 values.