Supplementary material

For manuscript “Look−up tables of complex refractive index corrections of particle size measured by common research−grade optical particle counters”

Representation of model size distribution according to Seinfeld and Pandis (2006)

lognormal three−modal number size distribution, where each mode is represented as

$$\frac{dN}{dlogD_p} = \frac{N_{tot}}{\sqrt{2\pi}log\sigma_g} exp\left[-\frac{(logD_p - logD_{p,g})^2}{2(log\sigma_g)^2}\right] \quad (2)$$

where N_{tot} is the integrated number concentration, $D_{p,g}$ the median diameter and σ_g the geometric standard deviation.

Parameters are listed in Table S1.

	N_{tot}	$D_{p,g}$	$log\sigma_g$
Mode 1	726	2	0.247
Mode 2	114	37	0.777
Mode 2	0.178	21.6	0.438

Table S2. Second−degree polynomial function (generic form y=a0+a1*x+a2*x²) used to fit the CDP−representation of the nominal dust size distribution from Seinfeld and Pandis (2006)

Diameter range	Polynomial function	R^2
>16.85 μm	$y = 0.06x^2 + 3.8793x + 12.593$	0.99
2.43−16.85 μm	$y = -0.0521x^2 + 2.2899x - 0.202$	0.96
< 2.43 μm	$y = 0.0436x^2 + 0.1779x + 9.2514$	0.85

Formulae

- Particle extinction, scattering and absorption coefficient (σ_{ext}, σ_{sca} and σ_{abs}; units Mm^{-1}; 1 Mm^{-1} = 10^{-6} m^{-1})

$$\sigma_{ext}(\lambda) = \int \left(\frac{\pi D^2}{4}\right) Q_{ext}(\lambda, D, CRI) \frac{dN}{dlogD} dlogD \quad (1.a)$$

$$\sigma_{sca}(\lambda) = \int \left(\frac{\pi D^2}{4}\right) Q_{sca}(\lambda, D, CRI) \frac{dN}{dlogD} dlogD \quad (1.b)$$

$$\sigma_{abs}(\lambda) = \int \left(\frac{\pi D^2}{4}\right) Q_{abs}(\lambda, D, CRI) \frac{dN}{dlogD} dlogD \quad (1.c)$$

where

D is the diameter (μm)

Qext, Qsca, Qabs are the single particle extinction, scattering and absorption efficiencies (unitless) as functions of wavelength (l), diameter, and complex refractive index (CRI)

dN/dlogD is the particle number size distribution (cm^{-3})

- Mass concentration

$$M = \rho_p \int \left(\frac{\pi D^3}{6}\right) \frac{dN}{dlogD} dlogD \quad (2)$$

where

ρ_p is the particle density (g cm^{-3}), set equal to 2.65 for mineral dust

- Mass extinction and absorption efficiency (MEE and MAE, units m^2/g)

$$MEE(\lambda) = \frac{\sigma_{ext(\lambda)}}{M} \quad (3.a)$$

$$MAE(\lambda) = \frac{\sigma_{abs(\lambda)}}{M} \quad (3.b)$$

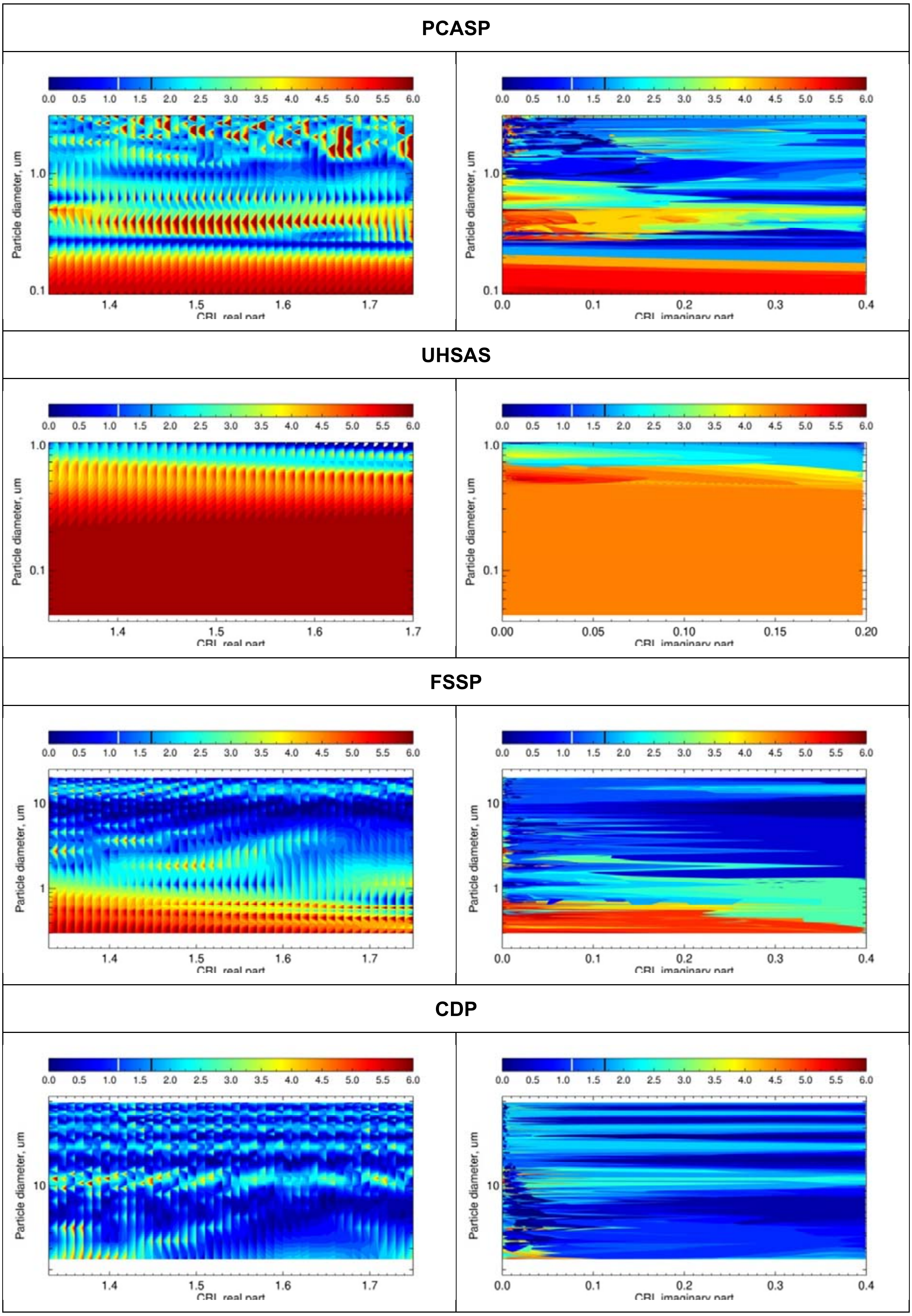
- Angstrom extinction and absorption exponent (AEE and AAE, unitless)

$$AEE(\lambda) = -\frac{log\left(\sigma_{ext(\lambda)}/\sigma_{ext(\lambda_0)}\right)}{log(\lambda/\lambda_0)} \quad (4.a)$$

$$AAE(\lambda) = -\frac{log\left(\sigma_{abs(\lambda)}/\sigma_{abs(\lambda_0)}\right)}{log(\lambda/\lambda_0)} \quad (4.b)$$

In this paper λ = 870 nm and λ_0 = 440 nm

Figure S1. Contour plots of $d\log C_{sca}/d\log D$ as functions of the bin midpoint diameters and the real and imaginary parts of *CRI*.



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