



Supplement of

Asymptotic behavior of lidar scattering properties of absorbing dust aerosols across Rayleigh and geometrical-optics regimes: theory and implications

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Supplementary Figures

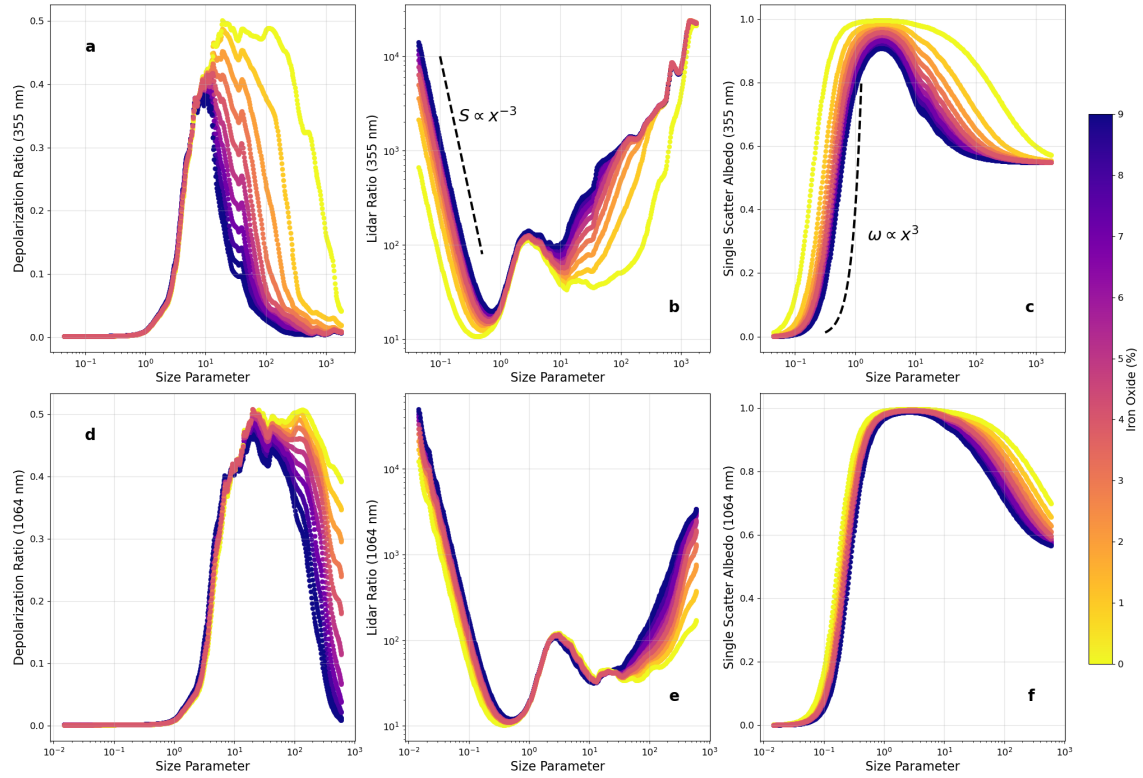


Figure S1. Single-particle backscattering properties for hexahedral dust particles calculated via the TAMUdust2020 database at 355 nm (top row) and 1064 nm (bottom row). Panels show the evolution of depolarization ratio (a, d), lidar ratio (b, e), and single-scattering albedo (c, f) as a function of size parameter.

Table S1. Summary of bulk optical properties (Lidar Ratio S , Depolarization Ratio δ , and Single-Scattering Albedo ω) for selected particle median radii and iron oxide volume fractions across three lidar wavelengths using the TAMUdust2020 hexahedral database.

Iron Oxide	Radius	355 nm			532 nm			1064 nm		
		S	δ	ω	S	δ	ω	S	δ	ω
0%	1 μm	46	0.38	0.98	54	0.32	0.99	76	0.21	1.00
0%	3 μm	40	0.47	0.94	39	0.45	0.98	50	0.38	0.99
0%	5 μm	43	0.48	0.90	37	0.48	0.96	43	0.44	0.98
3%	1 μm	71	0.35	0.87	55	0.32	0.96	71	0.21	0.99
3%	3 μm	115	0.33	0.75	52	0.43	0.90	47	0.38	0.97
3%	5 μm	188	0.27	0.69	64	0.43	0.85	43	0.44	0.95
5%	1 μm	90	0.32	0.83	57	0.32	0.94	68	0.22	0.99
5%	3 μm	177	0.25	0.70	62	0.40	0.86	46	0.38	0.96
5%	5 μm	309	0.18	0.65	86	0.39	0.80	43	0.43	0.94

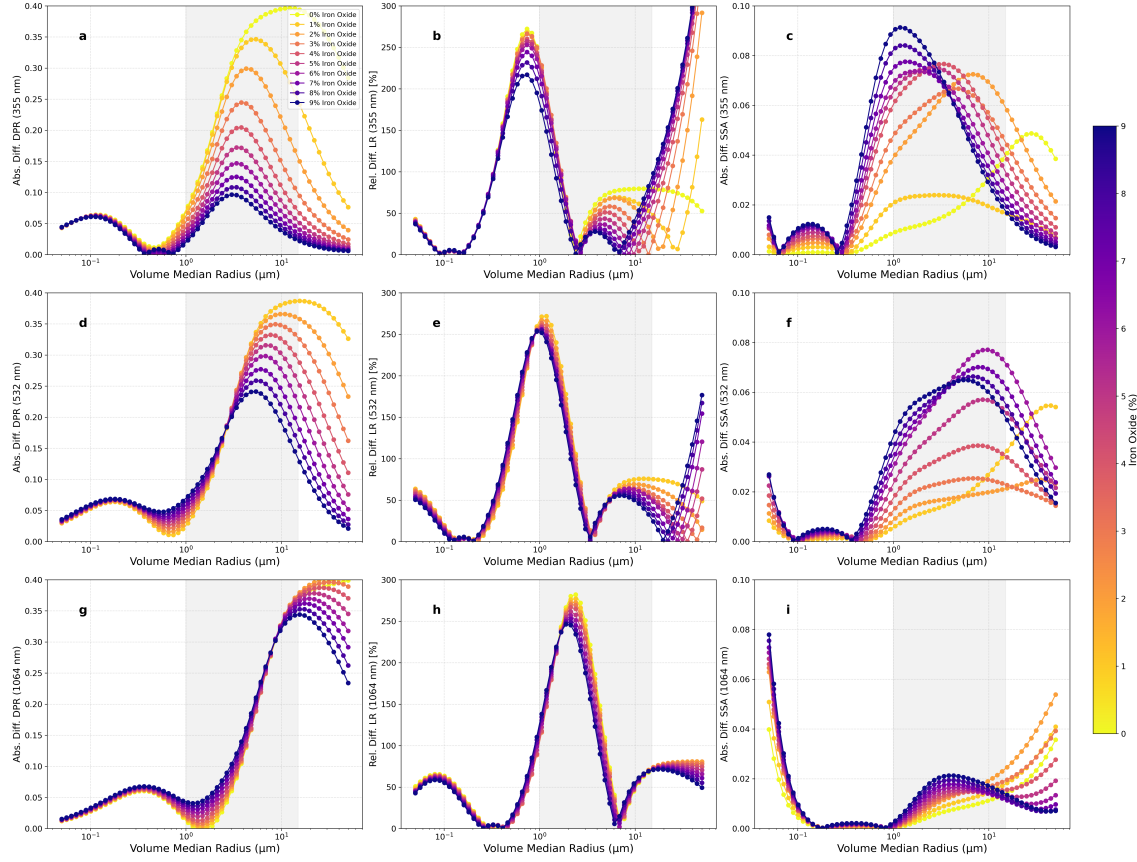


Figure S2. Comparison of backscattering properties for hexahedral dust particles calculated via the TAMUdust2020 database and spheroidal particles at 355 nm (top row) and 1064 nm (bottom row). Panels show the absolute difference of depolarization ratio (a, d), relative difference of lidar ratio (b, e), and absolute difference of single-scattering albedo (c, f) as a function of volume median radius. Grayed regions show range of r_m from $1\ \mu\text{m}$ to $15\ \mu\text{m}$.