User Guide
Database of Scattering and Radiative Properties of Morphologically Complex Carbonaceous Aerosols

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Recently, we have published a paper entitled "Scattering and radiative properties of morphologically complex carbonaceous aerosols: a systematic modeling study" [1]. In this publication we used the numerically exact superposition *T*-matrix method to compute and analyze scattering and radiative properties of carbonaceous aerosols with 11 different model morphologies, as shown in Fig. 1 of the paper, ranging from bare soot to completely embedded soot-sulfate/brown-carbon internal mixtures. Calculations have been performed at three wavelengths: λ = 355, 532, and 1064 nm, representing the spectral channels of the NASA Langley High Spectral Resolution Lidar-2 (HSRL-2). As the coating material, we have mostly assumed sulfate, but weakly absorbing brown carbon has also been considered. Ensemble averaging has been performed by assuming that the carbonaceous particles are polydisperse and obey the standard power-law size distribution.

The entire dataset is now available online at

https://www.giss.nasa.gov/staff/mmishchenko/related.html.

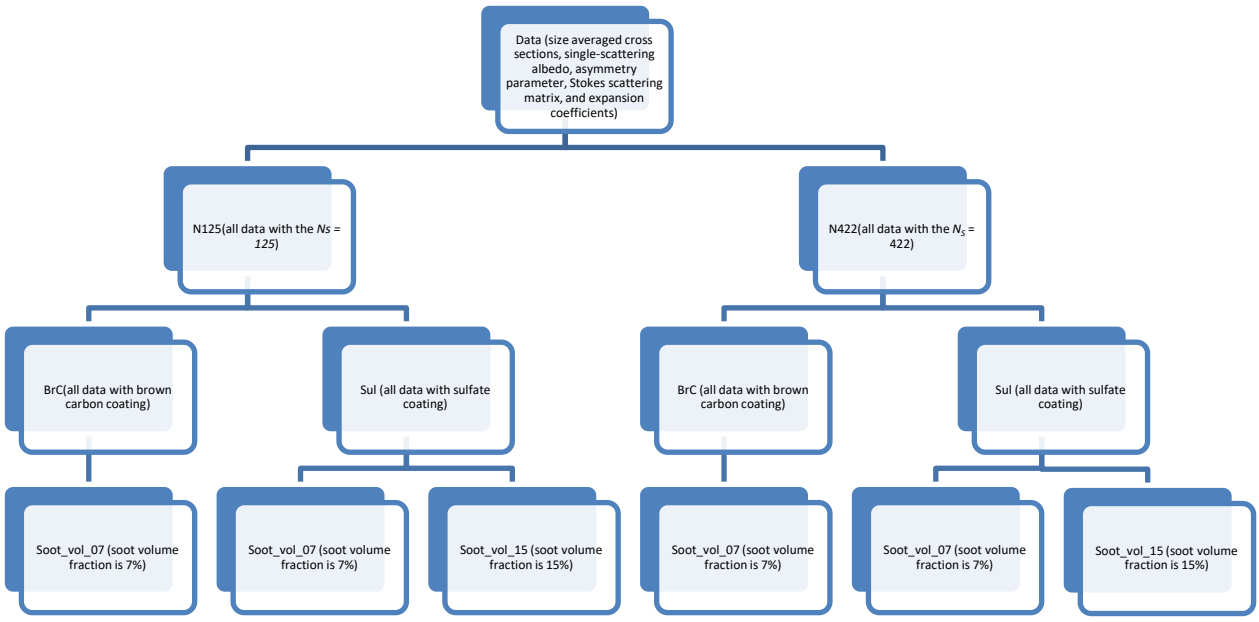
The data structure is outlined in the chart below, and the data are stored in the subdirectories shown in the bottom row. In each of the subdirectories,

AVG.SECTIONS_xxxx_yyyy_zzzz contains from left to right the extinction, scattering, and absorption cross sections in μm^2, single-scattering albedo, and asymmetry parameter for the 11 different models (top to bottom). The xxxx in the file name means the number of monomers, yyyy means the soot volume fraction, and zzzz indicates the wavelength.

matr_xxxx_yyyy_zzzz_wwww contains the normalized Stokes scattering matrix elements from left to right scattering angle, F11, F22, F33, F44, F12, F34 at 361 scattering angles with an angular resolution of 0.5 degree. xxxx in the file name represents the model number, yyyy is the number of monomers, zzzz shows the soot volume fraction, and finally wwww means the wavelength.

coeff_xxxx_yyyy_zzzz_wwww contains the expansion coefficients from left to right, alfa1, alfa2, alfa3, alfa4, beta1, beta2. xxxx in the file name represents the model number, yyyy is the number of monomers, zzzz shows the soot volume fraction, and finally wwww means the wavelength.

The normalized scattering matrix and the expansion coefficients are defined in Sections 4.10 and 4.11 of Ref. [2].



References

[1] Liu, L., and M. I. Mishchenko, 2018: Scattering and radiative properties of morphologically complex carbonaceous aerosols: a systematic modeling study. *Remote Sens*. **10**, 1634. https://www.giss.nasa.gov/staff/mmishchenko/publications/2018_Remote_Sens_10_1634.pdf

[2] Mishchenko, M. I., L. D. Travis, and A. A. Lacis, 2002: *Scattering, Absorption, and Emission of Light by Small Particles*, Cambridge University Press, Cambridge, UK. https://www.giss.nasa.gov/staff/mmishchenko/publications/book_2.pdf