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Classification of aerosol properties derived from AERONET direct sun data

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Abstract. Aerosol spectral measurements by sunphotometers can be characterized by three independent pieces of information: 1) the optical thickness (AOT), a measure of the column aerosol concentration, 2) the optical thickness average spectral dependence, given by the Angstrom exponent (α), and 3) the spectral curvature of α (δα). We propose a simple graphical method to visually convert (α, δα) to the contribution of fine aerosol to the AOT and the size of the fine aerosols. This information can be used to track mixtures of pollution aerosol with dust, to distinguish aerosol growth from cloud contamination and to observe aerosol humidification. The graphical method is applied to the analysis of yearly records at 8 sites in 3 continents, characterized by different levels of pollution, biomass burning and mineral dust concentrations. Results depict the dominance of fine mode aerosols in driving the AOT at polluted sites. In stable meteorological conditions, we see an increase in the size of the fine aerosol as the pollution stagnates and increases in optical thickness. Coexistence of coarse and fine particles is evidenced at the polluted sites downwind of arid regions.

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