

Particulate Oxalate-to-Sulfate Ratio as an Aqueous Processing Marker: Similarity Across Field Campaigns and Limitations

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Abstract

Leveraging aerosol data from multiple airborne and surface-based field campaigns encompassing diverse environmental conditions, we calculate statistics of the oxalate-sulfate mass ratio (median: 0.0217; 95% confidence interval: 0.0154 – 0.0296; $R = 0.76$; $N = 2948$). Ground-based measurements of the oxalate-sulfate ratio fall within our 95% confidence interval, suggesting the range is robust within the mixed layer for the submicrometer particle size range. We demonstrate that dust and biomass burning emissions can separately bias this ratio towards higher values by at least one order of magnitude. In the absence of these confounding factors, the 95% confidence interval of the ratio may be used to estimate the relative extent of aqueous processing by comparing inferred oxalate concentrations between air masses, with the assumption that sulfate primarily originates from aqueous processing.