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Organosulfates in aerosols downwind of an urban region in central Amazon†



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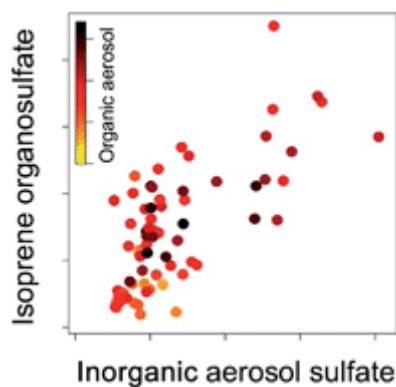
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Abstract

Organosulfates are formed in the atmosphere from reactions between reactive organic compounds (such as oxidation products of isoprene) and acidic sulfate aerosol. Here we investigated speciated organosulfates in an area typically downwind of the city of Manaus situated in the Amazon forest in Brazil during “GoAmazon2014/5” in both the wet season (February–March) and dry season (August–October). We observe products consistent with the reaction of isoprene photooxidation products and sulfate aerosols, leading to formation of several types of isoprene-derived organosulfates, which contribute 3% up to 42% of total sulfate aerosol measured by aerosol mass spectrometry. During the wet season the average contribution of summed organic sulfate concentrations to total sulfate was $19 \pm 10\%$ and similarly during the dry season the contribution was $19 \pm 8\%$. This is the highest fraction of speciated organic sulfate to total sulfate observed at any reported site. Organosulfates appeared to be dominantly formed from isoprene epoxydiols (IEPOX), averaging $104 \pm 73 \text{ ng m}^{-3}$ (range $15\text{--}328 \text{ ng m}^{-3}$) during the wet season, with much higher abundance $610 \pm 400 \text{ ng m}^{-3}$ (range $86\text{--}1962 \text{ ng m}^{-3}$) during the dry season. The concentration of isoprene-derived organic sulfate correlated with total inorganic sulfate ($R^2 = 0.35$ and 0.51 during the wet and dry seasons, respectively), implying the significant

influence of inorganic sulfate aerosol for the heterogeneous reactive uptake of IEPOX. Organosulfates also contributed to organic matter in aerosols ($3.5 \pm 1.9\%$ during the wet season and $5.1 \pm 2.5\%$ during the dry season). The present study shows that an important fraction of sulfate in aerosols in the Amazon downwind of Manaus consists of multifunctional organic chemicals formed in the atmosphere, and that increased SO_2 emissions would substantially increase SOA formation from isoprene.



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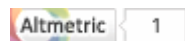
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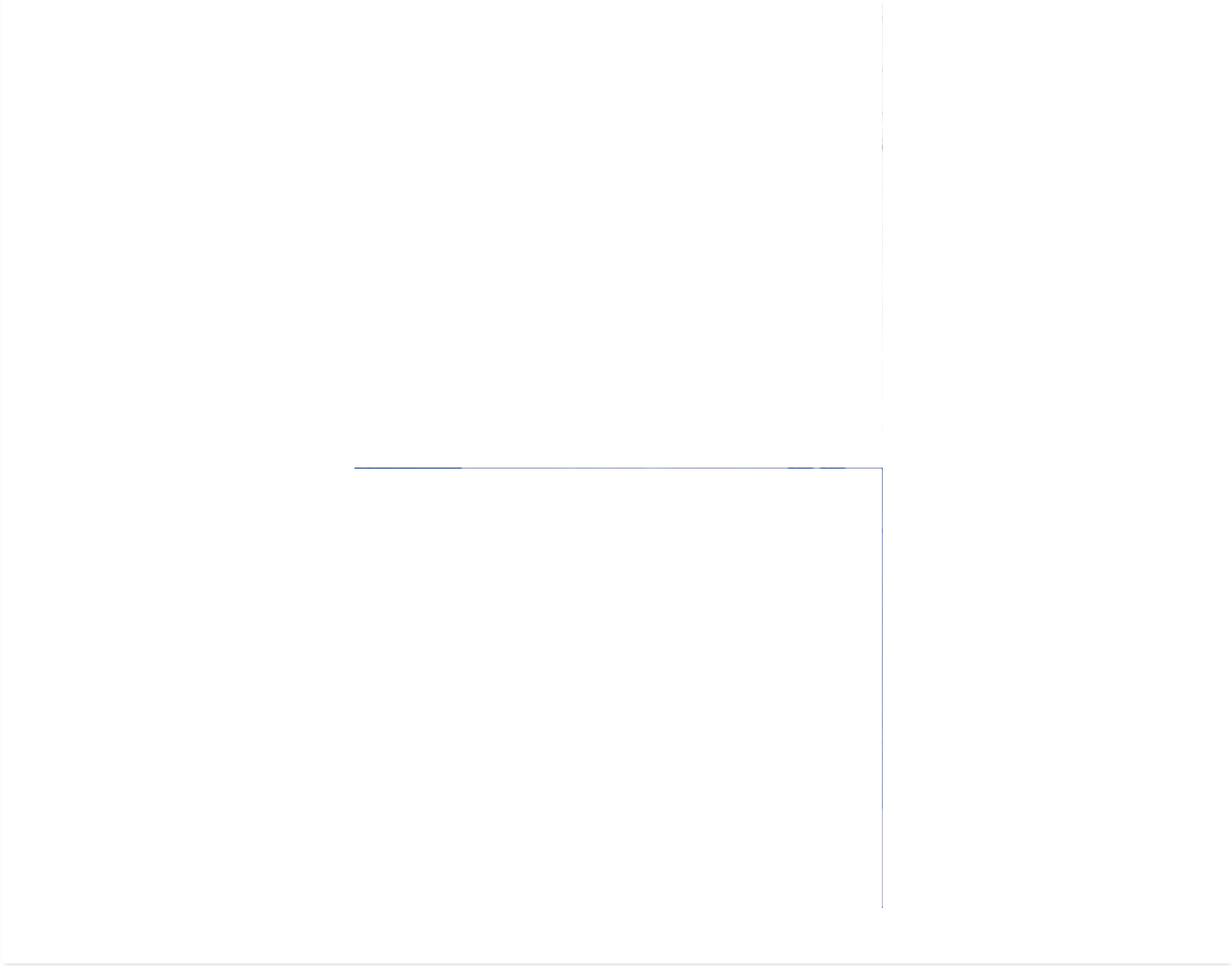
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