Vertical profile analysis of wind flow to obtain optimal eddy covariance parameters

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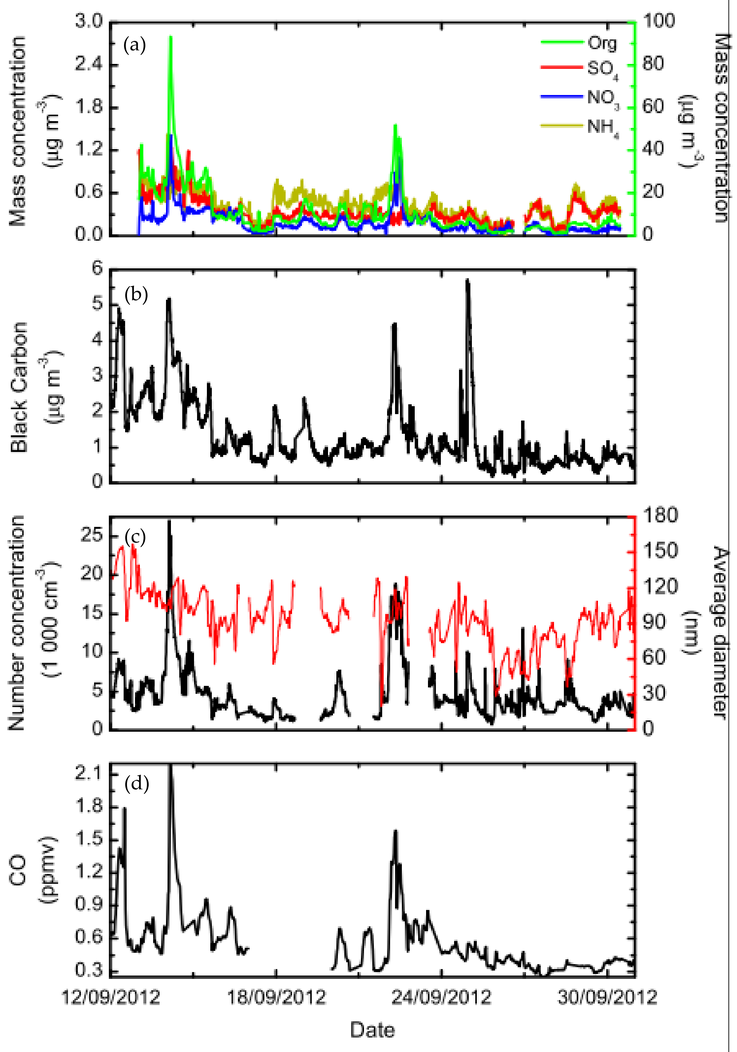
Introduction

Energy is the main variable that is intended to be obtained when the eddy is studied. This variable participates in a thermal balance defined by the equation:

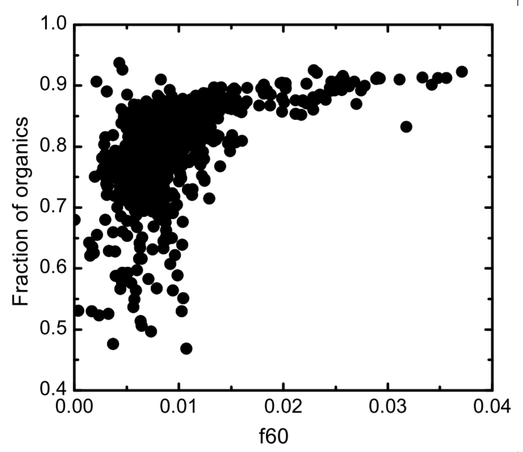
Results and discussion

Several instruments were deployed at the sampling site, near Porto Velho, Rondônia. Here, results from an Aethalometer (Magge), SMPS (TSI), CO monitor (Picarro) and an ACSM (Aerodyne) are analyzed. The ACSM is a compact version of the widely used Aerosol Mass Spectrometer (AMS, Aerodyne). Concentration time series of: Organics, SO4, NO3 and NH4 (a), Black Carbon (b), particle number concentration and average diameter (c) and CO mixing ratio (d).

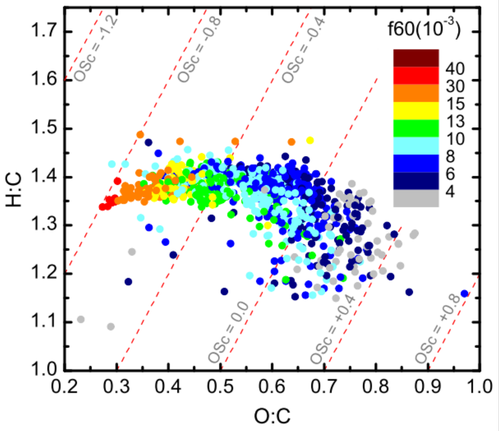


Chemical processing

During intense biomass burning events, the mass contribution of organic matter relative to SO4, NO3, NH4 and Black Carbon has strongly increased. Such organic contribution is the among the highest worldwide. The f60 is a biomass burning marker measured by the ACSM.

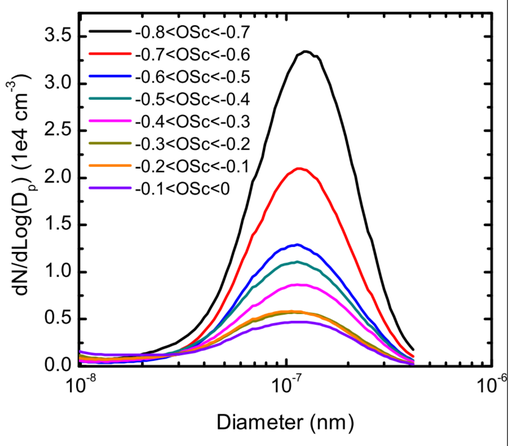


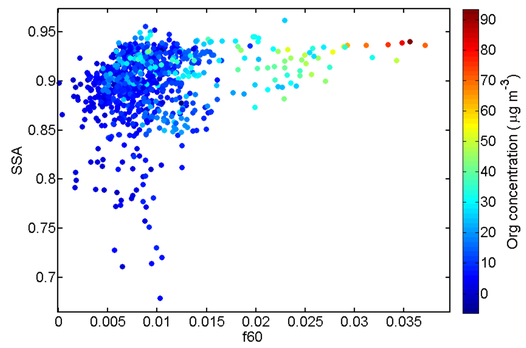
The biomass burning aerosol, studied using a Van Krevelen diagram, was observe to be processed by the change in the O:C ratio only, consistent with the replacement of a hydrogen with an alcohol group (-OH), for example. The parameter f60 is a biomass burning marker.



Physical processing

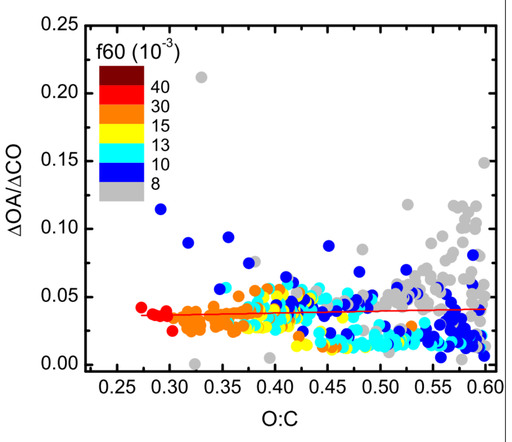
Despite strong chemical changes in the aerosol composition, its size distribution has not been affected during atmospheric processing, except for a scaling factor. The oxidation state (OSc) is defined as 2xO:C-H:C.



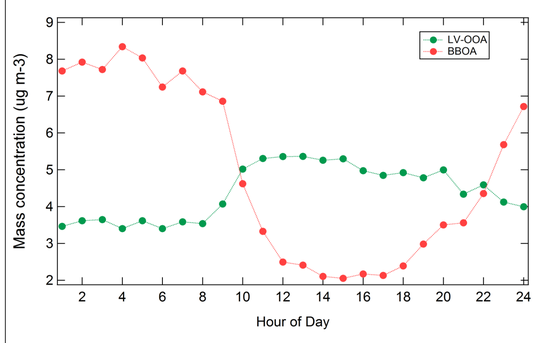


The single scattering albedo (SSA), as well as the fraction of organics, was strongly enhanced during biomass burning events, indicating highly scattering aerosol at the 637nm wavelength.

The mass ratio of Organic Aerosol (OA) relative to CO indicates very little contribution of Secondary Organic Aerosol (SOA) production with processing of the biomass burning plume.



Positive Matrix Factorization analysis



Two dominating factors were obtained, Low Volatility Oxygenated Organic Aerosol (LV-OOA) and Biomass Burning Organic Aerosol (BBOA). Diurnal variation of the BBOA factor indicates regional pollution following boundary layer, whereas LV-OOA (highly processed OA or SOA) seems to be from aloft.

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