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Long term aerosol and trace gas measurements in Central Amazonia

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The central region of the Amazonian forest is a pristine region in terms of aerosol and trace gases concentrations. In the wet season, Amazonia is actually one of the cleanest continental region we can observe on Earth. A long term observational program started 20 years ago, and show important features of this pristine region. Several sites were used, between then ATTO (Amazon Tall Tower Observatory) and ZF2 ecological research site, both 70-150 Km North of Manaus, receiving air masses that traveled over 1500 km of pristine tropical forests. The sites are GAW regional monitoring stations. Aerosol chemical composition (OC/EC and trace elements) is being analysed using filters for fine (PM2.5) and coarse mode aerosol as well as Aerodyne ACSM (Aerosol Chemical Speciation Monitors). VOCs are measured using PTR-MS, while CO, O_3 and CO_2 are routinely measured. Aerosol absorption is being studied with AE33 aethalometers and MAAP (Multi Angle Absorption Photometers). Aerosol light scattering are being measured at several wavelengths using TSI and Ecotech nephelometers. Aerosol size distribution is determined using scanning mobility particle sizer at each site. Lidars measure the aerosol column up to 12 Km providing the vertical profile of aerosol extinction. The aerosol column is measures using AERONET sun photometers.

In the wet season, organic aerosol comprises 75-85% of fine aerosol, and sulfate and nitrate concentrations are very low (1-3 percent). Aerosols are dominated by biogenic primary particles as well as SOA from biogenic precursors. Black carbon in the wet season accounts for 5-9% of fine mode aerosol. Ozone in the wet season peaks at 10-12 ppb at the middle of the day, while carbon monoxide averages at 50-80 ppb. Aerosol optical thickness (AOT) is a low 0.05 to 0.1 at 550 nm in the wet season. Sahara dust transport events sporadically enhance the concentration of soil dust aerosols and black carbon. In the dry season (August-December), long range transported biomass burning alters atmospheric composition very significantly. AOT can reach values as high as 2-3 at 550 nm, and concentrations of aerosol species and trace gases are strongly enriched.