Aircraft Observations of Aerosol in the Manaus Urban Plume and Surrounding Tropical Forest during GoAmazon 2014/15

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Overview and Comparison of Wet and Dry Season Aerosol

- Absolute loading of species is significantly higher in dry season.
- Fractional composition is remarkably constant between seasons.
- Organic aerosol chemical composition varies with season.
- Organic H:C is similar between season.
- Organic O:C is significantly higher in dry season, indicating more oxygenated aerosol.

Evolution of the Manaus Plume

- March 13, 2014 is a golden day for studying plume aging.
- G-1 made successive plume crossings downwind of Manaus.
- Flight captures first 4-5 hours of plume aging.
- Sulfate enhanced in plume, particularly the southern edge.
- Aerosol loading is enhanced in the plume, particularly OA.
- Isoprene depleted in the plume, though still present.
- HOA correlates well with CO.
- OOA correlates well with ozone.
- OA becomes more oxidized with aging.
- ΔHOA/ΔCO decreases with aging.
- ΔOOA/ΔCO increases with aging, indicating SOA formation.
- Loss of HOA is balanced by formation of OOA resulting in constant ΔOA/ΔCO.

Motivation

- Modeling studies have suggested biogenic SOA formation is enhanced by anthropogenic emissions.
- Field studies have found evidence for this enhancement.
- GoAmazon 2014/5 campaign is an opportunity to investigate this process.
- Manaus urban plume is transported into the pristine background of the Amazon tropical forest.

GoAmazon G-1 Flight Domain and Strategy

- G-1 characterized the Manaus plume as it was transported downwind and interacted with biogenic emissions.
- IOP1 – Wet Season, February 15th – March 26th 2014
  • 16 Flights
- IOP2 – Dry Season, September 1st – October 10th 2014
  • 19 Flights

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Conclusions

- Aerosol loading much higher in dry season.
- OA was more oxidized in the dry season.
- On March 13, 2014 flight, ΔHOA/ΔCO values decreased from 17.6 to 10.6 μg/m³ ppmv⁻¹ after 4-5 hours of aging.
- ΔOOA/ΔCO increased from 9.2 to 23.1 μg/m³ ppmv⁻¹.
- Loss of HOA is balanced by formation of OOA resulting in constant ΔOA/ΔCO.

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