CLAIRE-UK

(Cooperative LBA Atmospheric Regional Experiment)

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CLAIRE-UK

- NERC-funded RM project initiated as UK contribution to MPI led CLAIRE project
- Planned at new CLAIRE/ATTO site over two intensives (wet / dry)
- Infrastructure & logistics provided by MPI
- 3 years; 8 years FTE + 3-year student
- CEH & Univ. Lancaster
- Delayed start date
- May need to re-think in response to delays with MPI infrastructure (location & science)

Scientific Questions

1. Which chemical and physical mechanisms control the oxidizing capacity of the atmosphere in the humid tropics and how will tropospheric chemistry respond to global change?
2. Which gaseous species serve as precursors for aerosols in Amazonia and how are they transformed from the gas phase into the aerosol phase?
3. What controls the climatically relevant properties of Amazonian aerosols at ambient conditions?
4. What are the number and mass fractions of primary compared to secondary organic aerosols?
5. How does forest ecology affect forest-atmosphere interactions?

Objectives

1. Quantifying above-canopy fluxes and within-canopy concentrations of primary bVOCs and selected gas-phase oxidation products
2. To detect and quantify the formation of bSOA and primary biological aerosol through flux measurements at the canopy scale;
3. Studying nitrogen cycling by measuring concentrations and fluxes of inorganic reactive trace gases and aerosols

WP1: Volatile organic compounds

WP1.1 Canopy-scale fluxes of bVOCs

- 12 months ptr-ms
- supporting GC-MS
- local operator?

WP1.2 Isoprene-OH segregation

- 4 weeks
- Concurrent with MPI OH measurements

WP2: Canopy-scale particle fluxes

WP2.1 Particle number fluxes

- CPC, UHSAS, Grimm
- 2 campaigns
- needs CCN and/or HDMA measurements

WP2.2 Fluxes of organic aerosol mass

- ToF-AMS
- Collaboration with Scott Martin, Harvard

WP3: Reactive nitrogen budgets

WP3.1: Fluxes of inorganic N (gas & aerosol)

- NH_4^+, NO_3^- by ToF-AMS
- GRAEGOR gradient
- Needs 90 m tower suitable for gradient
- Soil chamber N_2O
- NO, NO_2 soil flux & gradient from MPI

WP3.2: Annual budgets of N_r & S_r

- 2 years monitoring of gas & aerosol (DELTA); local site operator (monthly visit)
- Wet deposition from Univ. Sao Paulo
- Long-term meteorological data inc. sonic anemometer

WP4: In-canopy processes

- below & in-canopy gradients
- in- and above canopy bVOCs (2nd PTR-MS) & aerosol gradients
- Inverse Lagrangian source/sink analysis

WP5: Modelling & integration

WP5.1: Modelling local air chemistry

- CiTTyCAT with MEGAN input
- Model development (e.g. adding monoterpenes)
- Need OH, NO, NO_2 (from MPI)
- Land-use change scenarios

WP5.2: Modelling regional air chemistry

- WRF-CHEM with MEGAN input
- Based on CRI chemistry
- Anthropogenic emissions from RETRO
- Global UCI model for boundary conditions & upscaling

Moving to a different site

- Tower access
- Accommodation (instruments & people)
- Power availability
- Power & infrastructure cost (provided by MPI at ATTO)
- Long-term measurements (e.g. met data)
- Local site operator (12 months)
- Shipping
- Work permits
- Local transport and costs
- Timing
- Remote web access

ATTO/CLAIRE site

- Labs have been built
- 2 temporary 80 m towers (not walk up)