

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

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, NO₂ (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

Current Status

- Long-term measurements
 - 12 months PTR-MS flux measurement during 2013
 - Cabin at bottom of walk-up tower at K34
 - Supported by PhD student (Anna Maria)
 - Shipment of PTR-MS being prepared
 - Longish-term AMS?
 - Instrument availability
 - Duplication of Manchester effort?
- Campaign measurements
 - Either: CLAIRE/ATTO
 - MPI still keen for us to come to CLAIRE/ATTO site
 - Road hopefully built by then
 - No firm MPI plans for 2013 campaigns
 - Or: K34 site
 - Need to cost carefully
 - Need to add measurements that would otherwise be provided by MPI

Beyond CLAIRE-UK

Human Modified Tropical Forests call

Goal 4: “Develop and test **new technological capability for sustainable long-term observations of biogeochemical cycling** that may be deployed as a legacy of the programme across a range of tropical environments”

Goal 4 will be met using ambitious new approaches to **low-intensity** (electrical, manpower, cost etc.) **biogeochemical exchange measurements** (e.g. CO₂, H₂O, isoprene, aerosol fluxes, N and O₃ deposition). The concept is for the development of new technology to be embedded within the programme so that it is tightly coupled to research drivers and may be tested against current state of the art. This goal will create a long-term technological legacy for the programme.

Suitable Brazilian FAPESP Flux Sites (primary vs disturbed)