

BUNIAACIC meeting, University of Manchester

Details of Room and Building Location...

2nd - 3rd July 2012,

Draft agenda v2

Monday 2nd July		
11:00 – 11:30	Welcome and Coffee	
	Introduction to BUNIAACIC	Gordon McFiggans (Manchester)
11:30 – 17:00	Update on Programmes and Activities Associated with BUNIAACIC	
	with lunch	
12:30 – 13:30	Perspectives from FAPESP	Paulo Artaxo (USP)
	Perspectives from NCAS and NERC	Gordon McFiggans (Manchester) on behalf of Ally Lewis (NCAS)
	Projects with funded UK involvement:	
	SAMBBA, UK perspectives	Will Morgan (Manchester)
	SAMBBA, Brazilian perspectives	Karla Longo (INPE)
	BUNIAACIC field deployment	James Allan (Manchester)
	CLAIRE-UK	Nick Hewitt (Lancaster), Eiko Nemitz (CEH, Edinburgh)
	Ongoing Brazilian research	
	AEROCLIMA and GoAmazon2014.	Paulo Artaxo (USP)
	INPE Activities & Initiatives	Karla Longo (INPE)
	INPA Activities & Initiatives	Laszlo Nagy (INPA)
	Other potential UK interests	
	Leicester PTR-MS OVOC measurements	Iain White (Leicester)
	Leeds FAGE LIF measurements.	Lisa Whalley (Leeds)
	Remote sensing	Michael Barkley (Leicester)
	Large-scale modelling	Alex Archibald (Cambridge)
19:30 –	Dinner and discussion	

Tuesday 3rd July

09:00 – 09:30	Coffee & Reintroduction for the Benefit of New Arrivals	Whole team
09:30 – 14:00 with lunch	BUNIAACIC Response to the Biodiversity and Ecosystem Processes in Human Modified Tropical Forests, NERC - FAPESP Announcement of Opportunity	
12:30 – 13:30	INPA biodiversity perspectives and possible atmospheric linkages	Laszlo Nagy
	Lancaster biodiversity perspectives and possible atmospheric linkages	Jos Barlow
	Edinburgh biodiversity perspectives and possible atmospheric linkages	Patrick Meir
	Atmospheric aspects of biogeochemical cycling and ecosystem processes in HMTF	Whole team
14:00 – 16:00	White Paper Preparation - next steps for UK Atmospheric Research in Amazonia Possibly including: A. The ACPC angle: Amazonia as a pristine, high sensitivity, laboratory for the hydrological cycle through aerosol-cloud interactions and will provide a strong contributor to global cloud-precip-climate impacts. The FAAM BAe146 can serve as a key high impact platform post-SAMBBA. B. The biogeochemical cycling and biodiversity angle: i) Pollution impacts on biodiversity and biogeochemical cycling (e.g. O ₃ and nitrate deposition) - the other direction to the US approach (forests impacts on pollution). ii) Impacts of pristine Amazonia on the global VOC, oxidant and SOA budgets. Projected impacts of land-use change. Excellent experimental capability from OP3 and model capability from Hadley Centre & others. C. The technology angle: producing new capability to measure forest functioning and biogeochemical cycling - an economic opportunity for business to create new products. D. The OH / CH₄ story: that models cannot in any way correctly predict OH over the tropical forests compared to measurements - the UK has some of the most internationally leading capability associated with radical measurements and measurement of organic radical sinks, coupled to excellent explicit and global modelling capabilities. E. Non CO₂ GHG emissions from the seasonally-changing Amazonian wetlands: the UK GHG flux capability is exceptional and could make a substantial contribution here.	
16:00	Meeting Close	

Attendees

James Allan, University of Manchester, james.allan@manchester.ac.uk

Alex Archibald, University of Cambridge, alex.archibald@atm.ch.cam.ac.uk

Paulo Artaxo, University of Sao Paulo, artaxo@if.usp.br

Michael Barkley, University of Leicester, mpb14@leicester.ac.uk

Jos Barlow, Lancaster University, jos.barlow@lancaster.ac.uk

Hugh Coe, University of Manchester, hugh.coe@manchester.ac.uk

Jim Haywood, Met Office / University of Exeter, jim.haywood@metoffice.gov.uk

Nick Hewitt, Lancaster University, n.hewitt@lancaster.ac.uk

Karla Longo, INPE, karla.longo@inpe.br

Gordon McFiggans, University of Manchester, g.mcfiggans@manchester.ac.uk

Patrick Meir, University of Edinburgh, pmeir@ed.ac.uk

Laszlo Nagy, INPA, laszlo.nagy@inpa.gov.br

Eiko Nemitz, CEH Edinburgh, en@ceh.ac.uk

Lisa Whalley, University of Leeds, L.K.Whalley@leeds.ac.uk

Iain White, University of Leicester, irw7@leicester.ac.uk

Jamie Whitehead, University of Manchester, james.whitehead@manchester.ac.uk

Unable to Attend, but providing input or requesting contact about subsequent activities

Gilberto Fisch, INPE, fisch.gilberto@gmail.com

Dwayne Heard, University of Leeds, d.e.heard@leeds.ac.uk

Ally Lewis, University of York, altl@nerc.ac.uk

Paul Monks, University of Leicester, p.s.monks@leicester.ac.uk

Toby Pennington, Royal Botanical Garden, Edinburgh, t.pennington@rbge.ac.uk

John Pyle, University of Cambridge, john.pyle@atm.ch.cam.ac.uk

Meeting minutes:**Monday****My Introduction...**

Paulo's perspective

NERC pressing for more joint calls - main NERC focus on the HMTF aspects

FAPESP very hard pushed for Internationalisation - cannot do everything that is requested!!!

FAPESP pushed for Amazonia inclusion, NERC wanted only to work on Atlantic forests (BIOTA projects in global climate change in Atlantic only) - FAPESP will fund 4 or 5 thematics in this call and will include Amazonia.

NB the 4 or 5 thematics will be real money (excluding staff, students, overhead etc...), but must be coordinated by very senior researchers. NERC only interested in 4 to 5 year projects.

NB therefore need 4 to 5 year (long-term experiments)

Explicitly looking at transferal of technology from Malaysia to Amazonia from the NERC perspective (but no such requirement from the Brazilian perspective).

However, since NERC budget must include all staff - it will contribute a much smaller part of the programme and will need supplementary funding applications.

NB Contrasting degrees of fragmentation between Sabah and Amazonia, with the LBA advantage of the larger fragments being more suitable for atmospheric studies

Will Morgan - UK SAMBBA

NB N of Cruzeiro do Sul is pristine & clean - useful for HMTF background if 146 used

Overview of progress following last week's meeting, NB contrast BB w W. Africa,

WP6: BB FX on diffuse radiation & GPP - dependence on biodiversity, enhancement of 30-40% GPP from AOD 0.1 to 1.5 increase due to BB. What is the dependence on where the AOD is? Less convinced that it is possible to empirically assess ozone sensitivity when there are 10000 species per hectare! Use in HMTF?

Karla Longo - Brazil perspectives on SAMBBA

Overview after last week's meeting - based on last week's presentation

NB Madeleine Gacita PhD student looking at organic N in S. America

James Allan - BUNIAACIC intensive

Timing: June-July 2013 if Spring ACCACIA goes ahead, March if it doesn't

Possible science:

NB Manaus, Porto Velho & Sao Paulo for ACSM

General aerosol characterization: already done by AMAZE & being done as part of long-term meas.

BB - better done by SAMBBA & wrong time of year

Biological particles - done by AMAZE, plenty of scope for more work

Pollution & natural interactions - synergy w GO-AMAZON, reliant on seeing plumes

Aerosol chem expt (as OP3) - needs much more instrumentation

Links CLAIRE;UK

Instruments: AMS, WIBS, SP2, HTDMA, CCNc, ESEM

Locations:

Remote sensing station in agricultural college, too close to road, good facilities

TT34, good lab space for additional instruments, possibly take container, on-site accommodation

K34, taller tower, lacking infrastructure

Shipping & customs:

Sao Paulo or Rio entry, container or non-container

Linkages & Timing - to be discussed

Eiko Nemitz - CLAIRE-UK update

Originally planned for MPI-run CLAIRE/ATTO tower, but site not ready

3 year programme, 8 yr FTE + 3 yr student

Collaborators moved from MPI CLAIRE deployment to GO-AMAZON because of delays

12 m PTR-MS at K34 from Jan 2013 + Sao Paulo PhD student, intensives otherwise measured in 2013 at CLAIRE/ATTO (but no commitment as yet) or at TT34 / K34

Possibly collaborate between BUNIAACIC / CLAIRE / MPI in a TT34 / K34

Use of CCNc/HTDMA to calibrate flux corrections as part of WP2 would be useful

Now we need to work out optimal timings to see if this is a runner...

Jamie will set up a coordination conference call & Google doc to try to coordinate.

Ron MacKenzie to carry out CiTTYCat modeling, but will need ancillary measurements.

ATTO workshop end of November (road plus plans for 2013 activities) - too late to wait until then for decision on BUNIAACIC project.

Alex Gunther & Jonathan Williams possibly participate @ some point

HMTF focus on surface - atmos fluxes -should be discussed

Paulo Artaxo, GO-AMAZON 2014, AMAZE & FAPESP Global Change programme update:

NB TT34 RH 30% to 40% @ ambient T, keeping container @ roughly ambient T (27-28 C) so no rehumidification

Very infrequent receipt of Manaus plume at TT34 (N_{tot} background = c.400/cc, jumps to 4000 when in-plume.

NB no correl of absorption w AMS BB fraction

K found in 30 nm particles - possibly nucleating??? KCl in the gas phase???

Kuhn et al., ACP 2010 for an overview of Manaus pollution

GO-AMAZON, AMF operations (ground based), Dates Jan 1 - Dec 31 2014, proposal to extend for 1 more year to get variability, plus airborne AAF, ARM facility

AEROCLIMA - long-term programme. Porto Velho looks like a prime altered forest location (HMTF).

Manaus: PM₁₀ + PM_{2.5} mass over 4 years 2008,9,10 & 11 PM₁₀ 10ug/m³, PM_{2.5} 2ug to 4 in dry season, BC annual cycle peaking about 400 ng/m³, driving all the absorption variability. Cl and P all in coarse mode. However single-scattering albedo is the same (0.88) in dry and wet season.

K34 CO shows clear departures sporadically corresponding to Manaus plume

Porto Velho: very variable aerosol mass and BC mass in dry season (2010 >>2009 and 2011)

Laszlo Nagy - INPA interests

INPA mostly focused on Manaus. Biodiversity vaster than all atmos interests by a long way

LBA focus has 25 official (50 total) affiliated projects

Database in progress...

Iain White - Leicester interests

PTR-MS OVOC Measurements - RF funnel increased sensitivity instrument, field deployable, currently 2 orders of magnitude improvement, aiming at 3

Lisa Whalley - Leeds interests

LIF OH measurements. OP3 meas etc...

Still missing 90% of OH source plus a large sink (though if you reduce the deposition - have enough carbon to provide the loss if depos lifetime is 5 days).

Michael Barkley - Leicester EO interests

Adv of spatial scale for the obs. Use HCHO as a proxy for isoprene (NB annual minimum in MJJ - same as AOD minimum)

Prior isoprene emissions from model are too high compared w retrievals, though OMI and SCIAMACHY disagree by factor of 2. Insensitive to BL mixing, rate of dry dep, hydroperoxy-aldehydes etc... much more sensitive to chem solver, cloud fraction and the input emissions guess...

Alex Archibald - Cambridge interests

Large-scale modeling in the tropics - UM-UKCA, based on HadGEM-3ES, coarse scale.

BB O3 high only in tropics (up to 14 ppb). Lightning O3 high in a band around the equator (up to 7 ppb)

DeltaOH highest change since pre-industrial in the Amazon (up by 400%), DeltaCH4 lifetime 30% down in pre-industrial

Future land-use change in Amazon using Sheffield DGVM, MEGAN, UKCA to get changes in isoprene emissions - greatest change in SA by deforesting and cropping. Large change in surface O3

Long-term measurements of halocarbons - Barbados gets NH baseline and SH baseline - get spikes in timeseries when the trajectories skirt SH coastlines.

Impacts of Land-Use Change on Tropical Atmospheric Chemistry - what about the biodiversity angle

Tuesday

Me - brief re-intro

Laszlo Nago - Biodiversity and biogeochemical cycling linkages to the atmosphere

Are all species equal? - in some aspects yes, in some no - structural diversity, functional diversity

i) Huge variety in natural forest types - assess the difference on atmos impacts??? terra firme, campinara, campina (lowland evergreen, tall heath, low stature heath) all diff. growth rates w diff biochem. & diff. fluxes

ii) Anthropogenic vegetation types - secondary forest (hugely changed speciation etc. e.g. Dipterocarp to Euphorbia), crop, plantation - changes in impacts??? Lots of parts of the canopy from soil→litter→leaf, all w different biochem. in terms of C, N and P

iii) Need to establish the change in rate and magnitude of ecosystem biogeochem & service provision associated w changing land-use. Are the linkages broken when changes induced.

Penuelas & Staudt (2012) Trends in Plant Science, 15, 133-144, 2012 - get paper from Laszlo - discussing how changes in VOC emissions from plants result from different stressors

Secondary forest & work around Manaus: about 40000 Ha of secondary forest about 1.5 times the distance North of Manaus as TT34: lots of variety, from pasture through heathland to full regrowth (all with enough fetch for flux work?).

Lots of work showing how loss of forest leads to loss of ecosystem services - on many different plots. Possible to get back up to 200t C/ha (from basal area measurements) in 20 years regrowth (as high as low productivity primary forest

Summary: a) biodiversity linked to biogeochem cycling (within natural forest types & between primary and human modified).

b) include extreme types of natural forest for scaling i) the degree of natural variation and ii) estimate the impact of conversion

Jos Barlow - Biodiversity in Human-Modified Projects

Linkages @ different scales - i) basin-wide (network of degraded plots), ii) landscape scale (1M ha plots in E. Amazonia), iii) local scale manipulation

Lots of early work on wildfires. Up to 40% of trees die immediately, the rest die slowly after initial resilience. Fires likely to be more important in future - increase in amplitude and extent of fires in a single 2M ha principality. Looked @ long-term consequences on biodiversity of wildfire. Fire reduction can be win-win, Barlow et al., 2012 - biological conservation, REDD+

Landscape scale - 2 different 1 to 2M ha landscapes looking at regeneration, intensification and degradation cycling. Gradient of deforestation and degradation across plots (from 12% to 100% forest cover) - lots of ecosystem services sampling, landuse data, time since deforestation, age of regeneration, frequency of degradation & frequency of regeneration, topography, distance to river, to road etc...

Continuous decline in biodiversity (bird types, total C etc...) from pristine → degraded → secondary
→ agric → soy monoculture

Experimental manipulation - links between biodiversity loss and ecosystem resilience, how it changes w degradation, how this matches to biogeochem atmos consequences

Note not LBA sites...

Patrick Meir - Bios - Atmos Exchange w a plant focus

1. NERC/LBA projects - drought expt. - Para & Malaysia FX on C cycle, limited non-CO₂, physiology, mortality, species, ecosystem model (DGVM and fine scale) - Museu Goeldi, UFPa and Embrapa

2. NERC/Moore Foundation, Andes-Amazon - soil microbial biodiversity/soil processes (Andes), nutrient (N, P) constraints on C cycle (Peru-French Guiana)

3. EU/LBA "Amazalert" - INPE lead in Brazil

4. Amazonian forest plots, intensive C cycle, range of land use: terra preta

5. Atlantic forest gradient & fragmentation project

6. Plant traits - scaling laws for upscaling

1. Forest initially resistant to drought, but after 3 years, big trees most vulnerable (highest mortality), species vary in vulnerability. Could do CH₄, VOC fluxes at this site??? Huge impact on above ground biomass with 7 years of drought. Lots of physiological responses on GPP & leaf respiration (dark respiration goes up, counterintuitively - i.e. increased flux, but light, unknown). NPP is reduced and respiration increased, esp. autotrophic.

2. Soil translocation experiment, measuring fluxes in CO₂ when moving soil to diff. T regimes and altitudes - biological differences in samples very great (bacterial & fungal content, subject to DNA analysis currently) - CH₄ fluxes to be measured. Interest in NO_x emissions.

So far as the call is concerned:

i) biodiversity / biogeochem. cycles - fine scale, stress response, N&P cycling, species roles

ii) spatial correlations

iii) REDD+, forest manag. species (conservation), focal species

iv) new technology - new DNA testing, non-CO₂ trace gases, new biological-atmos connections (fungal spores) through clouds, few sites or low cost sensors

v) application to Brazil - Atlantic forests, Amazonia, combine new flux techniques w existing datasets, linking w policy goals???

I Address Biological-Ecosystem Function (BEF) appropriately, from a scientifically practical standpoint (also, services vs function)

II Scaling from process to region - experimental, not just model

III Site-landscape, natural variation in veg

IV Methods i) common standards, ii) new technology

V Linking tropical regions??? Probably not needed.

Nick Hewitt's ideas (Lancaster, CEH and York)

Does increased biodiversity lead to increased complexity in atmospheric composition?

Role of biodiversity in biogeochemical cycling of C and N?

Based on OP3 oil palm vs forest in Borneo - increased isoprene, plus other PTRMS fragments over oil palm

Measure fluxes of reactive and radiatively active gases over diff landscapes @ diff scales, linked to quantitative metrics of biodiversity (Jos: would need to be modelled on scales of interest; fly over study areas; transect across gradient of land use)

Impacts on AQ and climate

Aircraft based EC fluxes of bVOCs, NO_x, N₂O. ARSF – Dornier aircraft flies slow enough for fluxes @ 3km res, building on proof of concept, w hyperspectral data (canopy structure). Canopy lidar available, but payload may be limited. Chemistry a challenge (flux divergence; also storage effect) – question of interpretation. Some VOC lifetimes not long enough to reach height of aircraft.

Limited tower based EC BVOC, NO_x, O₃ intensives. Dornier flyby for comparison. Portable tower?

Tower based long-term low cost REA cartridge flux sensor network.

Flux measurements across scales in Malaysia and Brazil to meet 1, 4, 5 of HMTF Would be atmos comp vs land use study – not process study

Hi-res modeling component

Remote sensing component - w height resolution

Aerosol - Cloud Radiation business

Bioaerosol - WBS should be relatively easy to add - ask Martin

Biodiversity elements - what is the *a priori* expectation on e.g. soy vs. millet vs secondary vs. primary wrt VOC fluxes? Need lidar to penetrate canopy (Michael Keller has done this - his data will be available, and the BDFR region has also been studied).

Response of the biodiversity people to this response to the call - link to biodiversity is necessarily coarse (not species derived), but will emerge from consortium. Linking changes in composition to land use changes.

No real interest in considering the impacts of pollution (incl O₃ and diffuse radiation inducing aerosol) on ecosystems, changing NPP.

Discussion of White Paper preparation

White Paper Preparation - next steps for UK Atmospheric Research in Amazonia

Possibly including:

A. The ACPC angle: Amazonia as a pristine, high sensitivity, laboratory for the hydrological cycle through aerosol-cloud interactions and will provide a strong contributor to global cloud-precip-climate impacts. The FAAM BAe146 can serve as a key high impact platform post-SAMBBA.

More fundamental process based work on a number of scales building on the ACID-PRUF structure, but focused on Amazonia (e.g. in terms of PBOA, BSOA as well as BB aerosol – i.e. seasonality). Focus on precipitation feedbacks thru clouds that will not be the focus of SAMBBA, nor the changes in the hydrological cycle and impacts on biosphere (and in turn influences on aerosol types). High altitude platform involvement – multi-agency programme. Funding Ops: Coupled feedbacks to the HMTF (piggy backing???)

2017 horizon, after GoAmazon, HMTF etc...

B. The biogeochemical cycling and biodiversity angle:

i) Pollution exposure so far as it may impact on biodiversity and biogeochemical cycling (e.g. O₃, N & P deposition) - the other direction to the US approach (forests impacts on pollution) – note GoAmazon contribution to this goal (Laszlo will send documentation).

ii) Impacts of (pristine & perturbed) Amazonia on the regional & global VOC (/oVOC), oxidant and SOA budgets. Projected impacts of land-use change. Excellent experimental capability from OP3 and model capability from NCAS, Hadley Centre & other Universities (process level to climate scenario & ESM).

C. The technology angle: producing new capability to measure forest functioning and biogeochemical cycling - an economic opportunity for business to create new products.

D. The OH /HO₂/RO₂/ CH₄ story: that models cannot in any way correctly predict OH over the tropical forests compared to measurements - the UK has some of the most internationally leading capability associated with radical

measurements and measurement of organic radical sinks, coupled to excellent explicit and global modelling capabilities.

E. Non CO₂ GHG emissions from the seasonally-changing Amazonian wetlands: the UK GHG flux capability is exceptional and could make a substantial contribution here.

F. Vulnerability (& uncertainties) of Amazonian ecosystems (& hence atmospheric sensitivities) in terms of climate change scenarios (cf Hadley Centre sims).