Ongoing AMS activities in Manchester

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PRISTINE TROPICAL BIOGENICALLY DOMINATED ENVIRONMENTS

AMMA July 2006, Niamey, Niger

Secondary Organic Aerosol from Biogenic VOCs over West Africa during AMMA
G. Capes, J. G. Murphy, C. E. Reeves, J.B. McQuaid, J.F. Hamilton, J.R. Hopkins, H. Coe
[In submission to ACPD 2008]
Data from Jenny Murphy

Isoprene (ppt)

Flight tracks below 700 m

MODIS 44b

Latitude (°N)

Longitude (°E)

% TREE COVER

Flight tracks below 700 m

Longitude (°E)
Statistics of organic mass loading taken over all low level flights under high and low isoprene conditions

Using Kroll et al, 2006 isoprene yields:

\[ \text{SOA}_{\text{isop}} = 0.114 \pm 0.063 \mu \text{g m}^{-3} \]

Chung and Seinfeld predict 0.3-1 \( \mu \text{g m}^{-3} \) in the region

Using Kroll et al, 2006 isoprene yields:

\[ \text{SOA}_{\text{AP}} = 0.16 \pm 0.10 \mu \text{g m}^{-3} \]
Oxidant and particle photochemical processes above a South-East Asian tropical rain forest (OP3)

The OP3 Team
Globally, very rapid land use change in tropics

Steep W - E knowledge gradient

SE Asian ocean-island mosaic
Eddy flux and gradient instrumentation on the GAW tower

- Ambient concentrations/fluxes
- NO$_x$
- CO
- VOCs
- CO$_2$
- O$_3$
- Particles (size/composition)
- Turbulence
- Latent/sensible heat

Also at other locations:
- VOC profiles
Niall Robinson, James Allan, Paul Williams, Martin Irwin: Manchester
Eiko Nemitz, Gavin Phillips: CEH
Qi Chen: Harvard
Flight B385 – 11/07/08

Profile of Sulphate and Organic Loadings

- Organic
- Sulphate

Average Mass Loading (μg/m³)

Altitude (m)

0 2 4 6 8 10

Mass Concentration (μg/m³)

20 40 60 80 100 120

- Bukit Atri
- Oil Palm Plantation
- Palm Oil Processing Plant Exhaust Plume
Chamber studies of biogenic VOC emissions and SOA formation

This work package is focused on studying the formation of organic aerosol from biogenic organic precursors within the controlled environment of a “smog” chamber.

<table>
<thead>
<tr>
<th>Category</th>
<th>Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicyclic monoterpane – endocyclic double bond</td>
<td>α-pinene</td>
</tr>
<tr>
<td>Monocyclic diene monoterpane</td>
<td>limonene</td>
</tr>
<tr>
<td>Monocyclic conjugated diene monoterpane</td>
<td>α-terpinene</td>
</tr>
<tr>
<td>Acyclic triene monoterpane</td>
<td>myrcene, (ocimene)</td>
</tr>
<tr>
<td>Reactive sesquiterpene</td>
<td>β-caryophyllene</td>
</tr>
<tr>
<td>Reactive C10 oxygenates</td>
<td>linalool</td>
</tr>
</tbody>
</table>
Chamber studies β-caryophyllene SOA formation

- **SOA mass (μg m⁻³)**
  - **(m/z 44 : SOA) %**
  - **(m/z 43 : SOA) %**

- **Time after lights on (hr)**

- **β-Caryophyllene**
  - **50ppb**
  - **250ppb**

- **% total SOA signal**
Using only those days when Harwell (UK EMEP site) >15 µg m\(^{-3}\)
EUCAARI-IMPACT

An aerosol-cloud interaction study

EUCAARI-LONGREx

Particulate transport and evolution across Europe

Will Morgan
Gavin McMeeking
Paul Williams
Megan Northway
16 flights (81 hours of flying) was conducted in 18 days.
Anticyclone dominated Europe and led to clear skies and high pollution load

Mean Sea Level Pressure
VT: Sun, 11 May 2008, 06 UT (+114 h)

UTC 2008/05/11 07:15

EUMETSAT MET-9, DLR Oberpfaffenhofen, IPA
14-May case (Ireland)
FLEXPART - European pollution

Total column of EU-SO$_4$ and 500 hPa geopotential
Analysis @ 20080509.180000
Actual @ 20080509.210000

Total column of EU-BC and 500 hPa geopotential
Analysis @ 20080509.180000
Actual @ 20080509.210000
EUCAARI Flight to Shannon 13th and 14th June 2008
Closing the radiation budget
AMMA – Aerosols in African Sahel during dry and wet seasons
AMMA – Aerosols in African Sahel during dry season
Rationale for AMMA-SOP0 MODIS Image 7th January 2005

Algeria

Niger

Dust

Nigeria

Fires

Smoke

Gulf of Guinea
Aging of biomass burning aerosols over West Africa: Aircraft measurements of chemical composition, microphysical properties and emission ratios

G. Capes¹, B. Johnson², G. McFiggans¹, P. I. Williams¹, J. Haywood², H. Coe¹
¹Centre For Atmospheric Science, University Of Manchester, Manchester, UK
²Met Office, Exeter, UK

Accepted JGR 2008

\[ r = 0.93 \]
\[ \text{Slope} = 0.055 \pm 0.002 \]
\[ \text{Intercept} = 2.3 \pm 0.6 \]