Cooperative LBA Atmospheric Regional Experiment (CLAIRE-UK)
Large-Scale Biosphere-Atmosphere Experiment in Amazonia

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AIMS: TO IMPROVE OUR UNDERSTANDING OF THE INFLUENCE THAT BIOGENIC VOLATILE ORGANIC COMPOUNDS (BVOCs) EMITTED FROM THE AMAZON RAINFOREST HAVE ON ATMOSPHERIC COMPOSITION AND CLIMATE; AND TO EXPLORE HOW THIS MIGHT CHANGE IN RESPONSE TO FUTURE CHANGES IN CLIMATE AND LAND USE

BACKGROUND: ROLE OF ATMOSPHERIC CHEMISTRY IN BIOSPHERE-ATMOSPHERE INTERACTIONS

Intense emissions of **BVOCs from the rainforest** (e.g. isoprene; the most abundant globally) influence the abundance of the **hydroxyl radical (OH)**—responsible for removing atmospheric pollutants, including
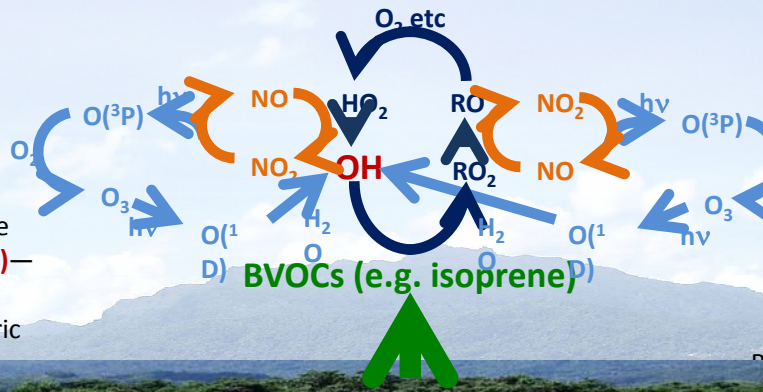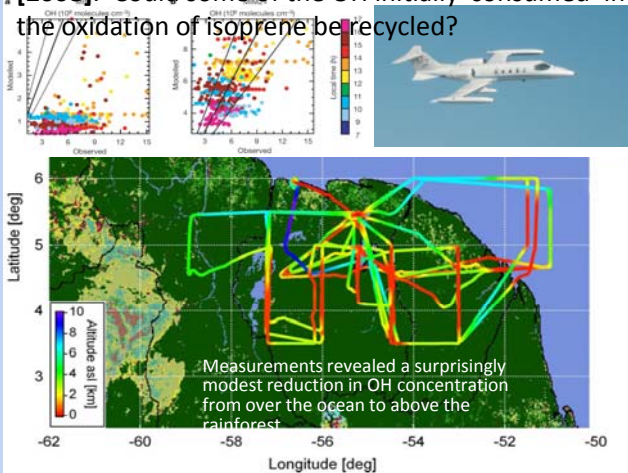

Two-way biosphere-atmosphere interactions: BVOC emissions affect both air quality and climate; and the climate affects the intensity of BVOC emissions and their subsequent effects. BVOC emissions are al
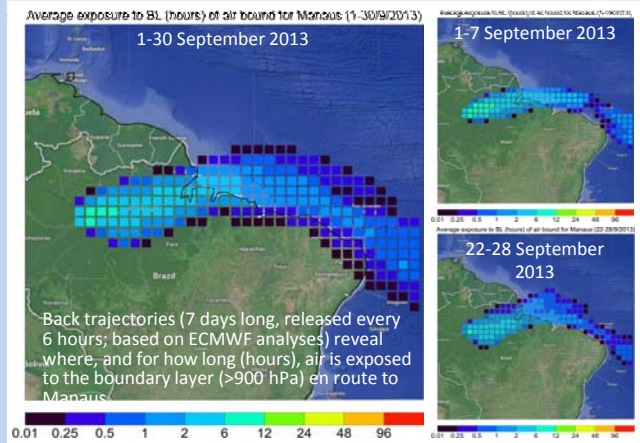
UNCERTAINTY: POSSIBLE RECYCLING OF OH

Airborne measurements during the Guyanas Atmosphere-Biosphere exchange and Radicals Intensive Experiment campaign in 2005 revealed much higher concentrations of OH above regions of intense isoprene emissions than simulated with an atmospheric chemistry-transport model employing the Mainz Isoprene Mechanism (MIM); see **Lelieveld et al. [2008]**. Could some of the OH initially 'consumed' in the oxidation of isoprene be recycled?

Measurements revealed a surprisingly modest reduction in OH concentration from over the ocean to above the rainforest

MODELLING: FROM LOCAL TO GLOBAL

Average exposure to BL (hours) of air bound for Manaus (1-30/9/2013)

1-30 September 2013

1-7 September 2013

22-28 September 2013

Back trajectories (7 days long, released every 6 hours; based on ECMWF analyses) reveal where, and for how long (hours), air is exposed to the boundary layer (>900 hPa) en route to Manaus

0.01 0.25 0.5 1 2 6 12 24 48 96

We plan to first carry out **process-scale studies** using a Lagrangian model (the Cambridge Tropospheric Trajectory model of Chemistry And Transport; CiTTyCAT), exploring a range of chemical mechanisms of differing complexities. Then, implementing any insights gained from the modelling in conjunction with **field measurements**, we intend to use an Eulerian model to explore their **regional and/or global effects**—subject to both present- and future climate/land-use scenarios.