1. Introduction

- OH is the dominant daytime oxidant in the troposphere.
- OH dependence on sunlight and water vapor results in the largest contribution to the global oxidation capacity being from the tropics, with around 80% of the global CH4 removal occurring in the tropical troposphere.
- In order to understand variations in OH radical concentrations both source and sink terms must be understood.
- The overall sink of OH is currently poorly constrained.
- Tropical forests are responsible for almost half of all biogenic VOC emissions into the atmosphere.
- OH reactivity observations were made in a tropical forest as part of the Oxidant and Particle Photochemical Processes (OP3) field study to Borneo during 2008.

2. OH reactivity measurements during OP3

- OH reactivity ($k_{OH}$) is the pseudo 1st order rate coefficient of OH in ambient air - a direct measurement of the total OH sinks in an air sample.
  \[ k_{OH} = \sum k_{OH,VOC} + k_{OH,CO} + \ldots \]
- The University of Leeds OH reactivity instrument:
  - OH is made in the centre of a turbulent flow of ambient air
  - The movable OH injector allows the residence time to be changed
  - OH is detected via Fluorescence Assay by Gas Expansion (FAGE)
  - A plot of OH signal against residence time yields $k_{OH}$
- OH reactivity was measured over a period of 14 days during OP3.

3. Can we explain the observed reactivity?

- An observationally constrained box model, using the full MCM chemistry scheme, has been used to interpret the observations of OH reactivity made during OP3.

4. Conclusions

- OH reactivity was measured over 2 weeks during OP3, with average daily reactivity peakng at ~26.7 ± 7.7 s⁻¹.
- Base model underpredicts day time reactivity by ~47%, consistent with other studies in low NOx, high reactivity environments.
- Increasing [OH] to observed levels improves calculated reactivity, highlighting importance of isoprene oxidation products, but still underpredicting by 29%.
- Reducing the lifetime with respect to physical loss of intermediates from 24 hrs to 5 days results in the observed OH reactivity being reproduced.
- Missing OH sink may be from poorly constrained isoprene oxidation products or unmeasured primary emitted species.
- Unmeasured / poorly understood oxidation products of isoprene chemistry (such as hydroperoxides, epoxides and carbonyls) may provide a significant sink for OH.

7. Acknowledgements

- The University of Leeds OH reactivity instrument
- Sample OP3 OH decay.
- Field site within the tropical rainforest during the OP3 campaign, Sabah, Borneo.

8. References