**Introduction**

Gas phase oxidation processes are responsible for the removal of many species emitted into the atmosphere. Oxidation processes control atmospheric lifetimes of pollutants and radiatively active gases such as CO, CH₄, and O₃ and influence air quality and climate. The hydroxyl radical (OH) dominates daytime oxidation chemistry in the troposphere. OH is primarily produced by the short wavelength (λ < 320 nm) solar photolysis of ozone, followed by reaction of O(1D) with water vapour. OH interconverts rapidly with the hydroperoxy radical (HO₂) through reactions involving CO₂, O₂, and NO/NO₂.

Tropospheric concentrations of OH and HO₂ (collectively termed HO) determine the atmospheric oxidising capacity. Knowledge of OH and HO₂ concentrations in the atmosphere is essential to understanding atmospheric oxidation. HO₂ measurements are used to test chemical schemes used in atmospheric models. Validated chemical models can be used to predict air quality and climate change and influence policy decisions.

**Atmospheric oxidation processes influence air quality and climate.**

**FAGE Detection of OH and HO₂**

OH and HO₂ concentrations in the troposphere are very low. Highly sensitive and selective techniques are required for atmospheric detection. The hydroxyl radical (OH) dominates daytime oxidation chemistry in the troposphere in the presence of reactive NO and O₃. OH is primarily produced by the short wavelength (λ < 320 nm) solar photolysis of ozone, followed by reaction of O(1D) with water vapour. OH interconverts rapidly with the hydroperoxy radical (HO₂) through reactions involving CO₂, O₂, and NO/NO₂. Tropospheric concentrations of OH and HO₂ (collectively termed HO) determine the atmospheric oxidising capacity. Knowledge of OH and HO₂ concentrations in the atmosphere is essential to understanding atmospheric oxidation. HO₂ measurements are used to test chemical schemes used in atmospheric models. Validated chemical models can be used to predict air quality and climate change and influence policy decisions.

**OP3 Campaign, Borneo 2008**

Oxidant and Particle Photochemical Processes campaign

Ground based measurements of OH, HO₂, and OH lifetime within rainforest - Allows determination of magnitude of NO sources and sinks
- Aircraft measurements of OH and HO₂ over rainforest, oil palm and oil - Provides information regarding vertical distribution and effects of land use
- Ozoné and HO₂ ground based measurements
- HO₂ tendency to decrease with increasing altitude
- Large discrepancy between measured and modelled OH for ground and aircraft
- Significant missing NO sources, additional evidence from OH lifetime data
- Missing ground based OH in early morning attributed to HONO photolysis
- Model failure for aircraft and ground based OH corollates with isoprene
- Similar results obtained in other low NO, high isoprene environments

**Seasonal Oxidant Study, Cape Verde 2009**

Long-term measurements at Cape Verde Observatory in tropical Atlantic Relative consistent mean diurnals between seasons

- Both OH and HO₂ tend to zero at night
- Provisional results lower than observations

- Model replicates trends in OH and HO₂ but currently underpredicts both species
- Additional loss processes due to gas phase halogen chemistry and heterogeneous HO₂ uptake required in the model