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Night-time aircraft measurements of OH and HO2 using the FAGE technique

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The hydroxyl radical, OH, is the dominant tropospheric oxidant of trace gases during the day, however, night-time oxidation is thought to be driven by the nitrate radical, NO_3. During the night, the reactions of ozone and NO_3 with alkenes can lead to night-time production of HO_x (OH + HO_2) radicals which can contribute to night-time oxidation.

This night time chemistry was investigated during the Role of Night-time Chemistry in Controlling the Oxidising Capacity of the Atmosphere (RONOCO) project during a series of night-time flights over the UK made with the UK BAe146 research aircraft. The RONOCO campaign included the first aircraft-based night-time measurements of OH and HO_2, made alongside measurements of the sum of RO_2 radicals and the NO_3 radical.

During the summer field campaign (16^{th} to 30^{th} July 2010) a comprehensive suite of measurements was made over a period of eight flights, including the measurement of the concentrations of OH and HO_2 by the Leeds Aircraft FAGE instrument. Examples of these measurements are presented here to illustrate aspects of night-time oxidative chemistry and to demonstrate the capabilities of the aircraft FAGE instrument.

Preliminary data analysis indicates that the average HO_2 concentration over the summer field campaign was 3.7×10^7 molecule cm^{-3} (1.58 pptv), with concentrations of around 9 pptv observed during one flight.

Model calculations of OH and HO_2, made using an observationally constrained zero dimensional box model based on the Master Chemical Mechanism (MCM), are compared to measurements and used to determine the processes controlling the concentrations of OH and HO_2, and to investigate night-time oxidation chemistry.