REAL TIME IN FLIGHT DETECTION OF METHANE, NITROUS OXIDE, CARBON DIOXIDE AND NITRIC OXIDE USING A CHIRPED QC LASER SPECTROMETER

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Frequency down-chirped long pulse quantum cascade laser spectrometers have proved to be useful tools for measuring trace levels of atmospheric gases. In this contribution we show that a resolution of ca. 0.005 cm^{-1} may be achieved using a pulsed laser. We also demonstrate the sensitivity of these instruments via two examples of the use of these spectrometers for in flight measurements of trace concentrations. These comprise two series of low level flights in the small NERC Dornier aircraft over the South Wales peninsula in the UK. The recent results obtained in February 2009 using a three channel instrument designed by Cascade Technologies are compared with those made using our single channel instrument in 2007.[a] One of the main changes made in the current instrument is the replacement of the fast liquid nitrogen cooled MCT detector used in the earlier flights by an even greater bandwidth, Peltier cooled, MCT detector, which has proved to give better detectivity as well as better resolution. It also eliminates the reliance on liquid nitrogen.The altitudes of the flights ranged from about 500 to 800 m. The gases detected in the original flights were methane, nitrous oxide and water.The wavelength micro-windows chosen for the flight in February 2009 were set to detect nitrous oxide, nitric oxide and carbon dioxide.

[a] K. G. Hay, S. Wright, G. Duxbury and N. Langford *App. Phys. B* **90**, 329 2008.