

Accurate measurements of spectroscopic line parameters of atmospheric relevant molecules.

This thesis deals with the development of frequency-stabilized laser absorption spectrometers in the near-infrared to perform precision measurements on molecular spectra of atmospheric interest, such as acetylene and carbon dioxide.

Two novel schemes have been implemented: the former is based on a pair of phase-locked diode lasers, one of them being a reference oscillator at 1.4 micron; the latter makes use of a self-referenced optical frequency comb synthesizer. In the second apparatus, a diode laser at a wavelength of 2 micron is frequency locked to the nearest tooth of the comb.

In both cases, an absolute frequency scale is produced underneath any absorption spectrum.

Line intensity factors and line widths have been determined with unprecedented accuracy.

For carbon dioxide, our measurements give an important experimental test of ab-initio calculations, which have been recently performed at University College London by Jonathan Tennyson and co-workers.