



A portable FTIR analyser for field measurements of concentrations and fluxes of CO₂, CH₄, N₂O and CO

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We describe a portable Fourier Transform InfraRed (FTIR) analyser for simultaneous high precision analysis of CO₂, CH₄, N₂O and CO in air. The instrument is based on a commercial 1 cm⁻¹ resolution FTIR spectrometer fitted with a mid-IR globar source, 26 m multipass White cell and thermoelectrically-cooled MCT detector operating between 2000 and 7500 cm⁻¹. Air is passed through the cell and analysed in real time without any pre-treatment except for (optional) drying. An inlet selection manifold allows automated sequential analysis of samples from one or more inlet lines, with typical measurement times of 1-10 minutes per sample. The spectrometer, inlet sampling sequence, real-time quantitative spectrum analysis, data logging and display are all under the control of a single program running on a laptop PC, and can be left unattended for continuous measurements over periods of days to weeks. Selected spectral regions of typically 100-200 cm⁻¹ width are analysed by a least squares fitting technique to retrieve concentrations of trace gases and ¹³CO₂. Typical precision is better than 0.1% without the need for calibration gases. Accuracy is similar if measurements are referenced to calibration standard gases. δ¹³C precision is typically 0.1 – 0.2%.

Applications of the analyser include clean and polluted air monitoring, tower-based flux measurements such as flux gradient or integrated horizontal flux measurements, and automated soil chambers. The simultaneous multi-component advantages can be exploited in tracer-type emission measurements, for example of CH₄ from livestock using a co-released tracer gas and downwind measurement. We have also developed an open path variant especially suited to tracer release studies and measurements of

NH₃ emissions from agricultural sources. An illustrative selection of applications will be presented.