



Continuous spectroscopic measurement of methane isotopes and ethane made on board an aircraft: instrument configuration and characterisation

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We describe the configuration of two commercially available absorption spectrometers for use on board the UK Facility for Airborne Atmospheric Research (FAAM) aircraft. A dual laser instrument has been used to make continuous measurements of the atmospheric $^{13}\text{CH}_4$: $^{12}\text{CH}_4$ ratio and ethane mole fraction, using an interband cascade laser (ICL) and a recently developed type of diode laser respectively. Simultaneous measurements of atmospheric ethane have also been made using a single laser instrument employing an ICL, enabling instrument inter-comparison.

Instrument performance is evaluated over a series of test flights, and initial results from the MOYA (Methane Observations and Yearly Assessments) campaign, targeting biomass burning plumes in west Africa, are also presented. We describe the calibration procedure and data analysis approaches for methane isotope measurement, involving calibration over a range of methane isotopic composition and methane mole fraction. We assess the effectiveness of this calibration technique during the first MOYA campaign period using measurements of a target cylinder of known composition.