Geophysical Research Abstracts, Vol. 9, 05867, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-05867

Calibration and performance of an FTIR spectrometer for field measurements of D/H ratios in water and water vapour

C. V. Tadros (1), D. W. T. Griffith (2), V. Haverd (2), S. D. Parkes (2), S. R. Wilson (2), A. G. Williams (1)

(1) Australian Nuclear Science and Technology Organisation, Institute for Environmental Research, PMB 1, Menai NSW 2234, Australia (carol.tadros@ansto.gov.au) (2) University of Wollongong, Dept of Chemistry and Centre for Atmospheric Chemistry, Wollongong NSW 2522, Australia

Driven by the need to develop new independent methods for improving and evaluating numerical weather and climate models, there is currently much interest in the use of stable water isotopologues HDO and $H_2^{18}O$ as indicators of complex processes between the atmosphere and the land surface that are not discernible using conventional datasets. Fourier Transform InfraRed (FTIR) spectroscopy is a novel quantitative technique that can be used for ascertaining the deuterium isotopic composition (δD) of atmospheric water vapour in real time continuous mode during field campaigns.

The FTIR trace gas analyser used in this study directly measures the concentration of HDO and H_2O molecules in air in real time. High resolution datasets are collected continuously in the field without the need for manual sample collection, and then further constrained by laboratory processing and analysis.

Accurate calibration of δD in water vapour is a non-trivial procedure for such an instrument. We present a liquid injection calibration system which introduces vaporised liquid water with accurately known δD (V-SMOW) into the measurement cell. The δD of seven liquid water samples ranging from -11 to -256 per mil were analysed by Isotope Ratio Mass Spectrometry (IRMS) traceable to NIST standards. We present results from calibration and sensitivity tests performed before and after a field campaign near Tumbarumba in S.E. Australia in November 2006. Our data reveals an analytical precision for measurements of deuterium in water vapour of around 1 per mil.