

Interactive comment on “Development of a cavity enhanced absorption spectrometer for airborne measurements of CH₄ and CO₂” by S. J. O’Shea et al.

Anonymous Referee #1

Received and published: 31 January 2013

Note that the gas pressure in the measurement cell for LGR’s commercial Greenhouse Gas Analyzer (CH₄, CO₂, H₂O) is generally controlled at 142 torr. However, to allow for measurements on-board aircraft flying up to 9150 meters, as investigated in this paper, the set-point gas pressure in the cell was reduced to 50 torr to allow for measurements over the entire flight trajectory. As a result, for this particular instrument, the change in gas pressure in the measurement cell decreased the measurement precision by about a factor of two compared with the standard commercial instrument.

Also, unlike the older instrument described in the present paper, commercial instruments now available from LGR include, as standard, data analysis software that pro-

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vides accurate reporting of methane and carbon dioxide on dry (and wet) mol basis continuously and directly (without post processing). These gas concentrations are obtained from the fully resolved absorption (methane, carbon dioxide and water vapor) lineshapes measured by the instrument and accurate water vapor pressure broadening information.

Finally, a more reliable and accurate method of generating known gas concentrations at different humidity values involves using a Nafion dryer (in reverse) and a Dewpoint Generator. In this scheme, dry gas of known concentration is directed through the center bore of the Nafion tube while wet “zero” air at different humidity values from a Dewpoint Generator is directed through the outer sheath of the Nafion. This method allows the control of both the dry gas concentration as well as the water vapor concentration and, most importantly, avoids solubility effects (particularly for CO₂) that can occur when flowing dry gas through the Dewpoint Generator, that can occur using the method described in the paper.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 1, 2013.

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