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Atmospheric Measurement Techniques Discussions

Interactive comment on "Testing and evaluation of a new airborne system for continuous N_2O, CO_2, CO, and H_2O measurements: the Frequent Calibration High-performance Airborne Observation System (FCHAOS)" *by* Alexander Gvakharia et al.

Anonymous Referee #1

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The paper describes an airborne Tunable Infrared Laser Direct Absorption Spectroscopy (TILDAS) system for airborne atmospheric trace gas measurements. The focus is on a novel method to address cabin pressure induced changes in the measured mole fraction. The paper is well written, and fits well within the scope of AMT. However, a few issues listed below should be addressed before the paper can be recommended for publication.

General comments:

The potential impact of water vapour on the derived dry air mole fractions should be more elaborated. E.g. Pitt et al. (2016) mention a lack of long-term stability in the retrieval of H2O mole fractions using a similar instrument. Has the wet-dry correction been tested, and if so, what was the setup used for this? Also the difference of the Picarro G2301-f and FCHAOS water vapour measurements shows a standard deviation of 0.034%, which would correspond to uncertainties of 0.136 ppm CO2 (at 400 ppm) just due to dilution by H2O alone, more than the claimed precision of 0.1 ppm.

Specific comments:

Fig. 1: In addition to the calibration tanks, there should also be a symbol for e.g. a pressure regulator of valve included.

Pg 4 Line 14: please clarify if there is excess flow escaping backward through the inlet when calibrating, or if calibration is performed by replacing the sample gas (solenoid valve closed to ambient, only open to filter/MFC). In the latter case I would expect slightly larger fluctuations in pressure within the inlet and filter,

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