We thank Referee #1 for the review and suggestions. We have addressed the comments line-by-line below and updated the manuscript as needed, and feel this has improved the paper.

Anonymous Referee #1:

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.

Thank you for the useful feedback. We respond inline below.

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.

We address the water vapor correction in response to Dr. Pitt's review, so please refer to that above for more detail. We have tested the wet-dry correction and included information on the setup in Section 2.4. We have added new text and figures, regarding both the uncertainties due to water and any altitude-dependent sensitivity. This is an important issue so we have expanded our manuscript accordingly.

The 1σ difference of 340 ppm in water vapor between the two instruments would indeed cause a dilution uncertainty larger than the 1s precision of the instrument. We note that the precision is not where such an uncertainty should be described; instead potential water vapor correction errors impact the accuracy of the instrument and traceability to a known scale. Using the traceability standard we find an empirical check gas instrument accuracy of 0.30 ppm for CO_2 (in Table 1). The comparison with the Picarro shows variance of differences between the analyzers of 0.45 ppm for 1 s data. This slightly elevated value compared to the check gas approach may be related to the dilution, but may simply be variance in the Picarro. We have added this information to the manuscript in the Table to help clarify, and now have a total uncertainty value that accounts for the various sources of uncertainty, including the water vapor uncertainty impact.

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.

Thank you for catching the omission, we have updated Figure 1.

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,

There is no excess flow, the calibration does indeed switch directly from the inlet to the tanks with the solenoid valves to preventing potential contamination of other inlets and also not consume excess calibration gas. We have added a figure in Section 2.2 that shows the pressure variation when switching to a calibration gas in our system and clarified the text to explain our setup (replacement, no excess flow).