Supplement of Atmos. Meas. Tech., 17, 3553–3565, 2024
https://doi.org/10.5194/amt-17-3553-2024-supplement


Atmospheric Measurement Techniques
Open Access
EGU

*Supplement of*

# In-flight characterization of a compact airborne quantum cascade laser absorption spectrometer

**Linda Ort et al.**

*Correspondence to:* Linda Ort (linda.ort@mpic.de) and Horst Fischer (horst.fischer@mpic.de)

## Supplemental Materials

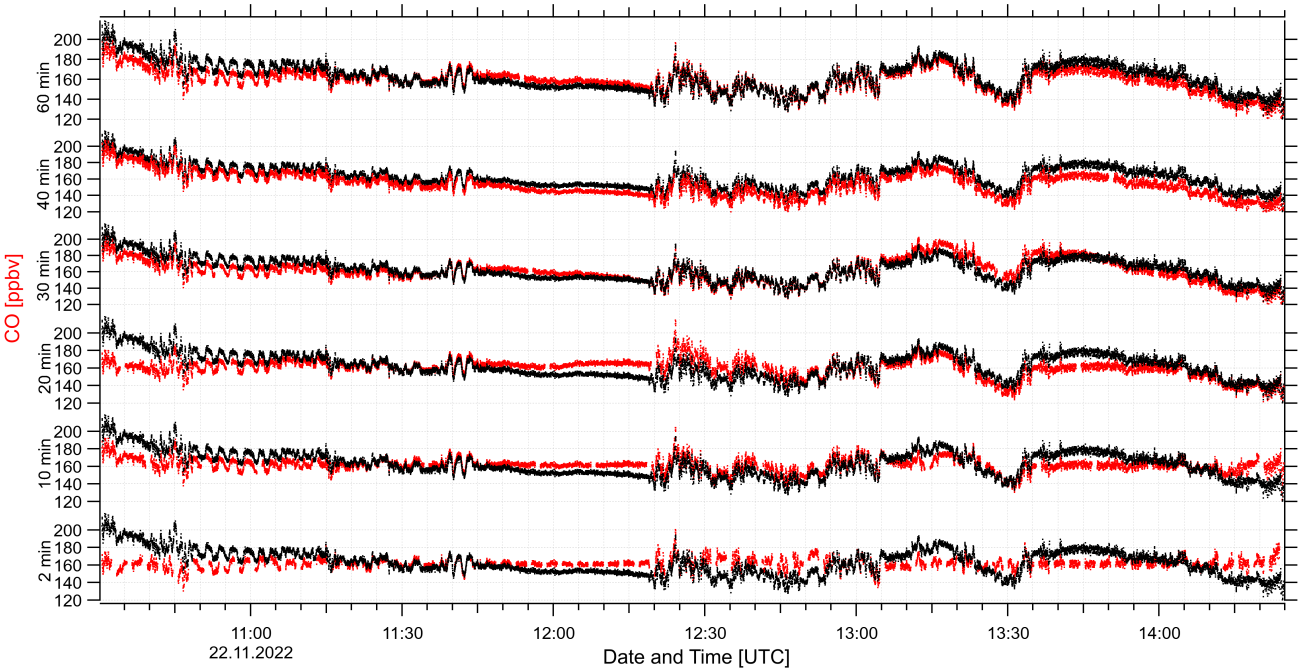


**Figure S1.** Comparison of calibration frequencies of CO with data from the test flight on the 22$^{nd}$ of November 2022. Black lines indicate measurements of constant calibration gas processed with only one virtual calibration before the flight of 60 seconds length. In red the same measurements are shown processed and drift-corrected with virtual calibrations set every 2, 10, 20, 30, 40 and 60 minutes from bottom to top, accordingly. The volume mixing ratio of CO which is supposed to be measured is 161 ppbv.

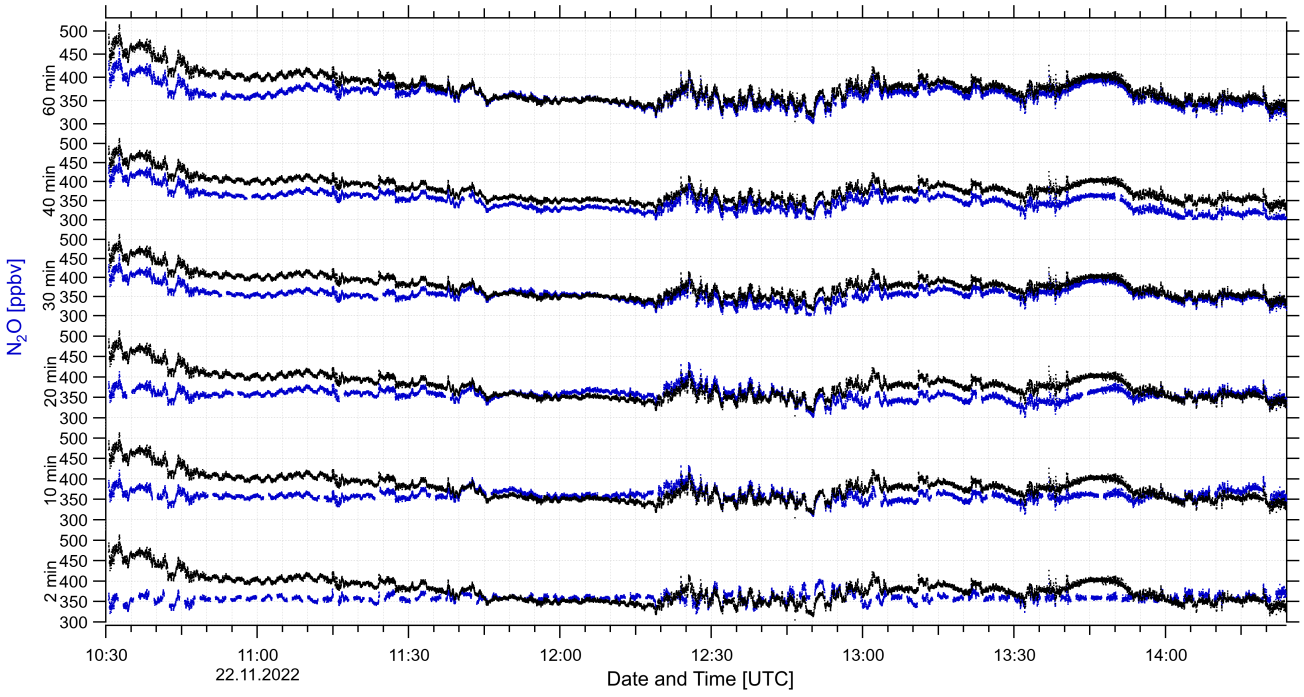


**Figure S2.** Comparison of calibration frequencies of $N_2O$ with data from the test flight on the 22$^{nd}$ of November 2022. Black lines indicate measurements of constant calibration gas processed with only one virtual calibration before the flight of 60 seconds length. In red the same measurements are shown processed and drift-corrected with virtual calibrations set every 2, 10, 20, 30, 40 and 60 minutes from bottom to top, accordingly. The volume mixing ratio of $N_2O$ which is supposed to be measured is 358 ppbv.

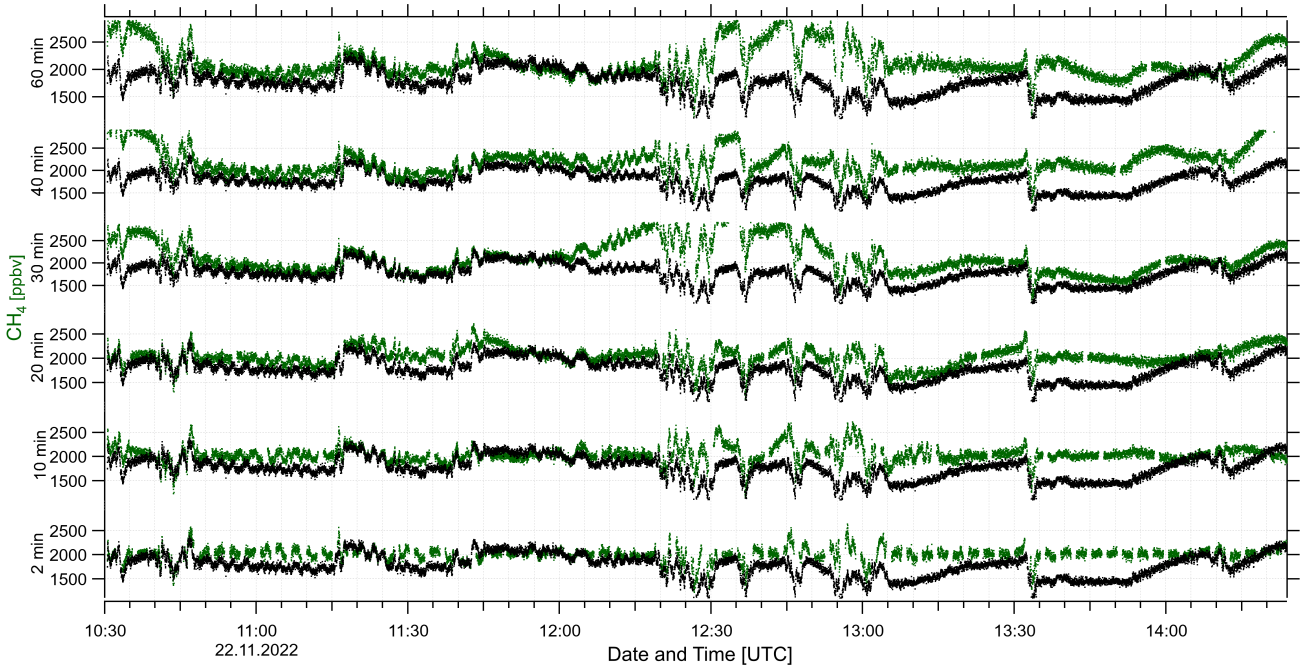


**Figure S3.** Comparison of calibration frequencies of $CH_4$ with data from the test flight on the 22$^{nd}$ of November 2022. Black lines indicate measurements of constant calibration gas processed with only one virtual calibration before the flight of 60 seconds length. In red the same measurements are shown processed and drift-corrected with virtual calibrations set every 2, 10, 20, 30, 40 and 60 minutes from bottom to top, accordingly. The volume mixing ratio of $CH_4$ which is supposed to be measured is 2025 ppbv.

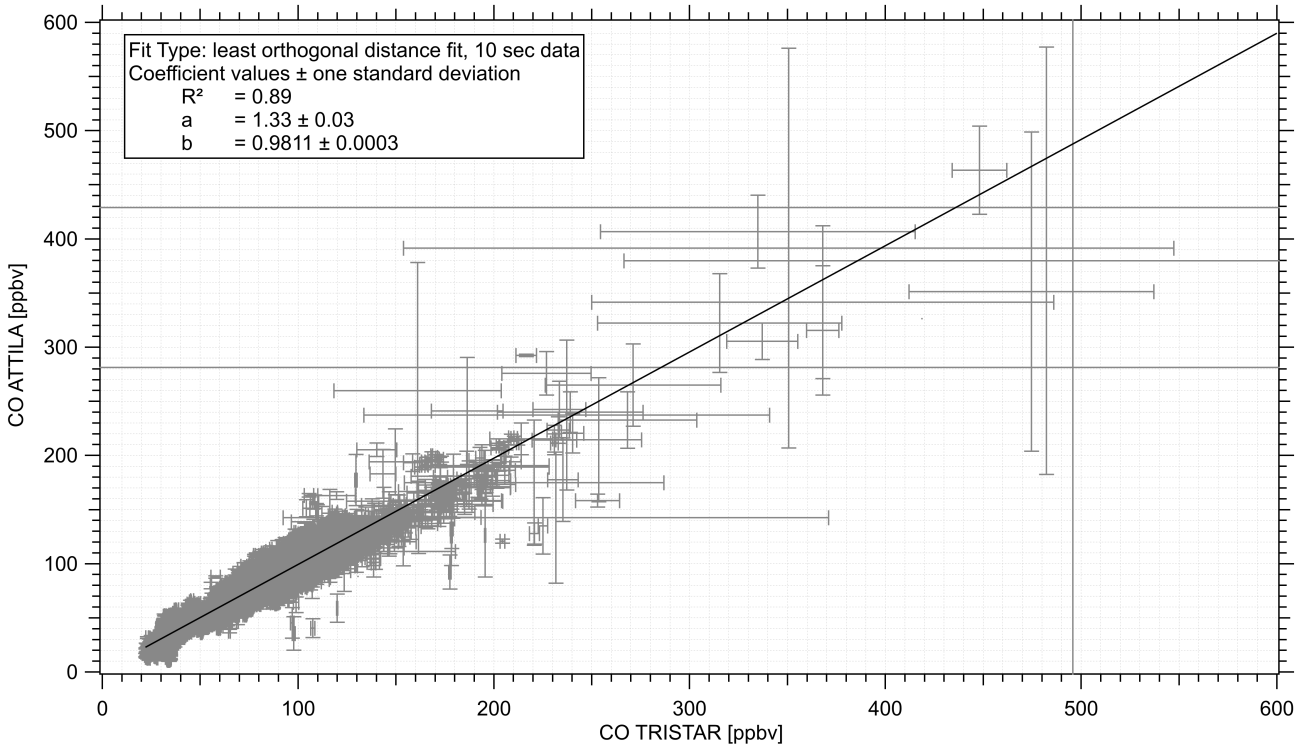


**Figure S4.** Correlation of all 10 seconds averaged CO ambient measurements from ATTILA on the y-axis and from TRISTAR on the x-axis over the whole CAFE Brazil campaign, excluding the two test flights. The data has been fully processed and corrected. A least orthogonal distance fit has been performed, including the standard deviation of the averaged data.

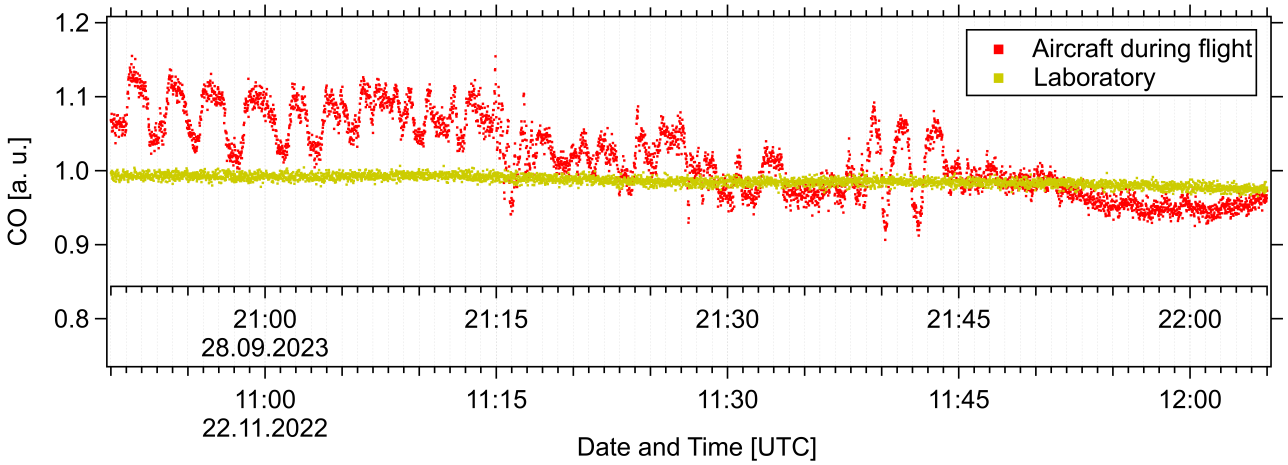


**Figure S5.** Two time series of constant gas measurements of CO while the ATTILA instrument was built in the rack and located in the laboratory (yellow) and inside the aircraft HALO during the test flight on the 22nd of November 2022 (red). Both time series have been normalized to the standard concentration of the gas bottles used for a better comparison. The concentrations of the standard gas bottles are at 156 ppbv and 245 ppbv for the flight and laboratory, respectively. The measurement uncertainties for the laboratory CO measurements are 1.6 ppbv (0.665 %) and for the aircraft on ground measurement at 8.2 ppbv (5.3 %).

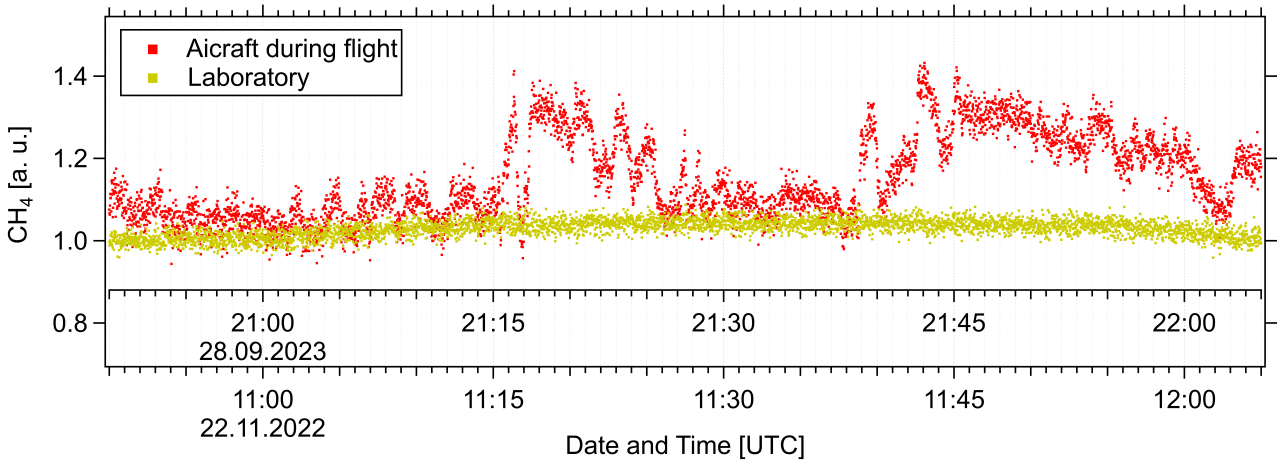


**Figure S6.** Two time series of constant gas measurements of $CH_4$ while the ATTILA instrument was built in the rack and located in the laboratory (yellow) and inside the aircraft HALO during the test flight on the 22nd of November 2022 (red). Both time series have been normalized to the standard concentration of the gas bottles used for a better comparison. The concentrations of the standard gas bottles are at 1920 ppbv and 2024 ppbv for the flight and laboratory, respectively. The measurement uncertainties for the laboratory $CH_4$ measurements are 42.52 ppbv (2.1 %) and for the aircraft measurement at 195 ppbv (10.2 %) for the shown period.

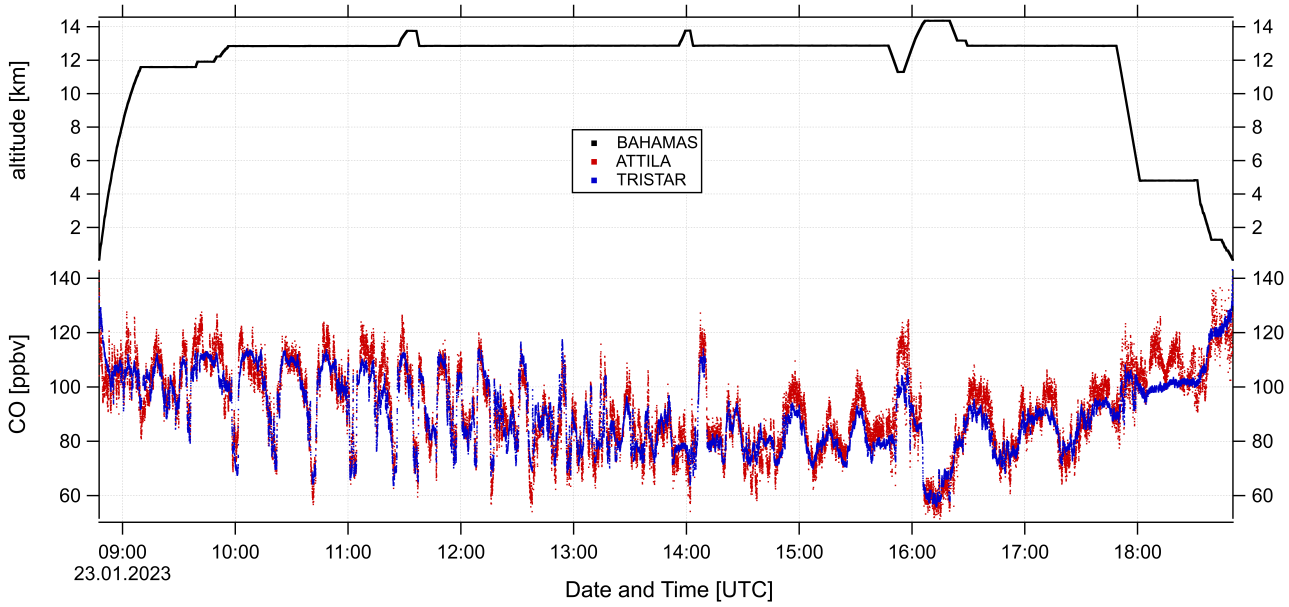


**Figure S7.** An example research flight (RF19) of fully processed ambient CO data during the CAFE Brazil campaign is shown. The CO mixing ratios of ATTILA are shown in red and from TRISTAR are shown in blue. Additionally, the GPS altitude given by the BAHAMAS instrument (DLR, Oberpfaffenhofen, Germany) is displayed in black. The measurement uncertainty of this flight was at 2.5 % and 7.8 % for TRISTAR and ATTILA CO measurements, respectively.