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Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieval of xCO₂ from ground-based mid-infrared (NDACC) solar absorption spectra and comparison to TCCON" *by* M. Buschmann et al.

Anonymous Referee #2

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This paper examines the sensitivity and results for a new product, CO2, from existing data from solar-observing Fourier Transform InfraRed (FTIR) spectrometer at Ny-Ålesund, Spitsbergen. This instrument is part of a world-wide Network for the Detection of Atmospheric Composition Change (NDACC), which has collected data since 1978. The sensitivity and results are compared to a newer network designed to measure CO2, the Total Carbon Column Observing Network (TCCON), which began collecting data in 2004. The paper's goal is to assess whether MIR FTIR spectra could be used to derive a total column CO2 mole fraction.

A previous paper, Barthlott et al, 2015 answers the present paper's goal, in that it found that TCCON XCO2 and MIR FTIR XCO2 are not comparable. Barthlott et al. showed that the NDACC total column changes markedly depend on the prior in the troposphere in Figure 1 and that the sensitivity of MIR FTIR was about 0.25 near the surface, in contrast to $\sim$1 for TCCON. The paper's aim was validation, and validated the NDACC IR columns using model simulations which were compared to both TCCON and the NDACC results and comparisons between TCCON and NDACC to check for biases and scatter. The NDACC IR columns do capture the yearly increase as shown in Fig 8.

The analysis and conclusions of the present paper are very similar to subset of a those of Barthlott et al., 2015 with regards to the compatibility of TCCON XCO2 and MIR FTIR "XCO2". The analysis and results are not qualitatively different from Barthlott et al., showing similar sensitivity to the tropospheric prior for the MIR FTIR results through using a flat versus variable prior and similar sensitivity from averaging kernels results.

The MIR FTIR retrievals are of themselves interesting; just not compatible with TCCON XCO2, as already seen from previous published work. A column which is heavily weighted by the prior near the surface where most of the variability occurs is not the best packaging. It seems like a products more suitable to the MIR FTIR could be a mid-trop/strat partial columns, or separate mid-tropospheric and stratospheric products.

Citation: Barthlott, S., Schneider, M., Hase, F., Wiegele, A., Christner, E., González, Y., Blumenstock, T., Dohe, S., García, O. E., Sepúlveda, E., Strong, K., Mendonca, J., Weaver, D., Palm, M., Deutscher, N. M., Warneke, T., Notholt, J., Lejeune, B., Mahieu, E., Jones, N., Griffith, D. W. T., Velazco, V. A., Smale, D., Robinson, J., Kivi, R., Heikkinen, P., and Raffalski, U.: Using XCO2 retrievals for assessing the long-term consistency of NDACC/FTIR data sets, Atmos. Meas. Tech., 8, 1555-1573, doi:10.5194/amt-8-1555-2015, 2015.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 10523, 2015.