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Atmospheric Measurement Techniques Discussions

Interactive comment on "Source brightness fluctuation correction of solar absorption Fourier Transform mid infrared spectra" *by* T. Ridder et al.

Anonymous Referee #1

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The paper "source brightness fluctuation correction of solar absorption spectra" by Ridder et al. is an important contribution in the field of solar absorption FTIR spectroscopy and will likely trigger further improvements in the data quality of the NDACC network. The presentation of the topic is clearly structured and the methods applied are presented in a transparent manner. The illustrative results for O3 profiling are impressive (Fig. 4).

However, several important aspects remain unclear in the current discussion paper. I strongly recommend to expand the description according to the list of comments given below.

Major comments:

Introduction: The description of the effects due to variable DC are vague: "...intensity fluctuations can distort the fractional line depth in FTIR". It would be more appropriate to describe the primary effect as ILS distortion due to an additional apodisation which results from the variable atm transmission during interferogram recording.

Please give more details on the MCT detector: Do you use photoconductive or photovoltaic detectors? What is the origin of the offset voltage? (A basic preamp circuit diagram would help.) Is the offset primarily of electrical origin, or is instrumental self-emission relevant as well? To which extent would the suggested methods be affected by nonlinearity effects? How stable is the deduced offset as function of time?

Would instrumental self-emission inflict a loss on the methods proposed? (Self-emission might contribute to both the DC and AC parts of the interferogram, but will not scale with the atm transmission changes)?

Why does the first approach of determining the offset by using a measurement taken with an InSb detector works so properly? We should expect that the interferometer's modulation efficiency depends on wavenumber. Since the InSb spectral responsivity differs from the MCT, even identical filter and optical settings will not guarantee that the same modulation efficiency is found. Which filter bandwidth do you recommend (/did you use in your setup) for this exercise? Finally: the InSb longwave response cut is located at higher wave numbers - how can you cover the MCT spectral region of interest (700 - 1300 cm-1) with an InSb reference measurement?

Application of the OPUS running mean function: Do you apply the OPUS smoothing function with a broad data point window just once? Did you alternatively try repeated smoothing runs with narrower kernel widths instead? Is the result identical? If not, which approach seems preferrable? How do you determine the required amount of smoothing? Is this choice critical?

Section 3.1: It is shown that both methods indicate very similar values for the offset. How sensitive the SBF correction is wrt errors in the offset determination? It would be interesting to include a short sensitivity study to understand how accurately the offset determination needs to be. (I would expect that the correction stays largely intact even if we allow some uncertainty in the offset determination. You could check this by applying different offsets in the retrieval study underlying Fig. 4)

technical / phrasing / typos:

Abstract, line 12 ff "The analysis of trace gas concentrations ... is fundamental." It is not clear to me what the authors want tro express with this statement. (This phrase is repeated on page 446, line 7).

Page 450, line 11: sicnificantly -> significantly

Section 3.1: I assume that the AC IFG in Fig 3 is deduced from the DC IFG numerically (no parallel digitisation of AC and DC ifgs, as also possible with the Bruker acquisition in principle). Please state somewhere where this AC ifg comes from.

Fig. 3: Please mark the zero level for both the black and red spectra, e.g. by dashed lines. Please state that the spectra have been shifted along the ordinate for clarity.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 443, 2011.