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Atmospheric Measurement Techniques
Discussions

Interactive comment on "Characterisation and potential for reducing optical resonances in FTIR spectrometers of the Network for the Detection of Atmospheric Composition Change (NDACC)" *by* Thomas Blumenstock et al.

Anonymous Referee #3

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This paper describes the problem of optical interferences occurring in FTIR spectrometers that are used in NDACC: it describes some laboratory experiments aiming at identifying and characterising these interferences in about 25 of the NDACC FTIR spectrometers and attributes the interferences to the optical elements inside the spectrometers. It is shown that it is essentially the beamsplitter that causes these interferences. These interferences cause channeling in the spectra that make the observation of weak absorptions in atmospheric spectra difficult. The paper also shows test with beamsplitters with different wedges and concludes that beamsplitters (BS) with a wedge of the gap

between the BS and the compensator plate of 0.8° (instead of the actual standard 0.5°) would be a good choice to minimize the channeling and at the same time avoid re-alignments when exchanging BS.

General comments:

The paper is essentially a technical paper. It is very concise and reads easily; the objectives, methodology and conclusions are clearly formulated. However, being a technical paper, I have the feeling that some technical details are missing, or not clearly spelled out.

- Equation (1) provides the formula for the Free Spectral Range of a Fabry-Pérot (FP) etalon, but it is not mentioned how FSR is calculated for 'a resonator due to both substrates, the beamsplitter and the compensator plate' (line 165).

- Tables 3 and 4: at some sites, like Harestua, Garmisch, Altzomoni in Table 3, or Harestua, Zugspitze, Altzomoni in Table 4, some frequencies appear that are very different from the other ones, without any explanation as to their origin: are they due to window effects ? Why are some of these different frequencies classified in Table 2 as the 'standard' F2 or F3 frequencies ?

- In Table 4, A4 (= 21 pro mille) at Ny Alesund corresponds to F4 . Why is this amplitude included in the range of amplitudes of the channeling caused by the gap of the BS, with frequency F1 = 0.9 cm-1) ?

- In Table 4: why at Lauder, 2 different frequencies are assigned to F1 ? The same question holds for a few other sites and other frequencies (F2) in Table 4.

Specific comments:

- Line 49: I would specify 'total and partial column abundances' instead of simply 'column abundances'

- Line 93-94: The sentence is erroneous as it is formulated here. I suggest to replace it as follows: "The Fabry-Pérot etalons generated by these optical components have rather low etendu and therefore the undesired parasitic effects caused in their spectral transmission is well described as an harmonic oscillation." I believe that this is what the authors intend to say. It would also be good to give the definition of 'etendu of a FP' here, or to add a reference to a definition.

- Table 1: Apparently the FSR given in the table assumes theta = 0°. However, in the standard NDACC FTIR spectrometer configuration, theta is typically 45° for the beamsplitter. So I am confused: how has the experiment been set up exactly ?

- Line 117: It is stated that NDACC filters with a wedge of 10', if properly oriented, do not cause channeling. Don't they cause any channeling at all, or are the frequencies of the channeling such that they don't disturb significantly the retrieval of typical NDACC atmospheric spectra ?

- Figure 2: Why has the x-axis been given in 1/Frequency whereas Figure 3 has an x-axis in frequency ?

The paper deserves being published, after some revisions to cope with the above comments.

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