Atmos. Meas. Tech. Discuss., 6, C719–C722, 2013
www.atmos-meas-tech-discuss.net/6/C719/2013/

Atmospheric Measurement Techniques Discussions

Interactive comment on "A method to correct sampling ghosts in historic near-infrared Fourier Transform Spectrometer (FTS) measurements" *by* S. Dohe et al.

D. Griffith (Referee)

griffith@uow.edu.au

Received and published: 29 April 2013

This is a quite specialist paper which describes in detail a correction scheme for hardware timing errors in Fourier transform spectra collected by the Total Carbon Column Observing Network (TCCON). The corrections are important because the timing errors lead to small but significant biases in retrieved total columns of CO2, and O2, and thus of column averaged mole fraction XCO2. In its earlier stages this work led to hardware improvements by the manufacturer that have largely eliminated the problem in the latest FT spectrometers. However there are long historic records from TCCON stations which require correction to improve their accuracy and minimise bias between stations

over the entire TCCON time periods. This paper sets out the theory of the problem, a solution for its correction, and a practical route to back correct the historic datasets. As such it is a quite specific, technical paper with probably a narrow audience but of high importance for TCCON and all users of TCCON data. General readers may have trouble to follow some of the detail of sections 2 and 3. It may also have been suitable for an instrument journal such as Applied Optics, but the central importance to retrieval of atmospheric trace gas total columns makes it suited to publication in AMT. I recommend it be published subject to the technical corrections and suggestions listed below.

Technical corrections, suggestions and comments:

I do not see any keywords in the manuscript. These should capture the potential optics and instrumentation readership as well as the atmospheric audience.

P 3546, L13: The mention of ghost to parent ratio needs short clarification in the abstract, as the abstract shoud be able to stand alone to a non-specialist reader. Eg "...inferred from measurements of the ratio of the intensities of the ghost to parent bands in sectra of a lamp taken at Lauder."

P 3546, L13: ..The LSEs (plural)...

P3546 L18: ...may also have contributed to the residual difference.

P3547 L 7-8. A reference to flux inversions would be useful here.

L16: explain here that O2 is used as an internal standard.

L21: It is not yet clear to the reader what this "sampling error" is, in particular if it is an X-axis or a Y-axis error. State explicitly that it is a timing error which affects the X-axis accuracy of the interferogram in a periodic way.

L29: (0.3-2ppm) applies strictly to XCO2, not O2. Remove the words after the ref to Messerschmidt et al to the end of the sentence. They are out of place here.

P3548 L2: Give manufacturer details as for normal equipment specs: Bruker Optics, Ettlingen Germany).

L9: I suggest replace “reposes” with” is based on”. Add “ghost to parent intensity ratio” to clarify – see earlier comment, this will have little meaning to the reader not already familiar with the problem.

P3552 L 6: I suggest capitalising IPP to be clearer and to be on the same footing as GGG.

L19: “The (0,0) band of O2” is not an accurate description of the electronic transition corresponding to the fitted band. Please specify the band.

L22 and many other places – English “double f”, ff, is being substituted by an italic ff symbol in the font used.

P2553 L 10. Suggest replace “Punctual” with “Stepwise”

P3554 L3: either laser interferogram or laser’s interferogram.

L3. Suggest shorten this sentence to “The original measurement signal of the reference laser is actually a cosine oscillation”

P3555 L 19. Please clarify if the additional window was used as well as or instead of the 7290-7360 cm-1 window at Izana.

P3557 L 17: “... the LSE must be determined ...” (delete “to”)

P3558 L23: Should Lamp LSE estimates be section 3.4?

P3559 L 4: please specify which frequency – the wavenumber sigma, not laser frequency, sampling frequency or any other.

Table 1 is rather difficult to follow and could use a better description so it stands alone, or refers to text for explanation (for example, of gamma).

Figure 4: the dashed lines are very hard to see in the printed pdf.

P3560 L 26: tendency (spelling).

P3563 L10. Why not do the 20kHz correction and show that the agreement is further improved. As presented this looks like a lazy omission.

L12: acquired (spelling)

L22: why not show the CH4 bias, so the reader can assess the problem?

P3564 L1-5: Please clarify of the forward and backward interferograms are transformed separately and then coadded, or vice versa.

P3565 L 15: to enable the Conclusions to be read standalone without jargon, spell out LSE as laser sampling error.

L12 TCCON (N missing)

Figures 4,5,6, please use consistent X axis labelling convention.

Fig 7 caption: replace IFGs with interferograms

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 3545, 2013.