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Atmospheric Measurement Techniques Discussions

Interactive comment on "Strategy for high-accuracy-and-precision retrieval of atmospheric methane from the mid-infrared FTIR network" *by* R. Sussmann et al.

M. De Maziere

martine.demaziere@bira-iasb.oma.be

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This paper reports extensive work on the determination of a best strategy for retrieving methane total column amounts from high-resolution solar absorption spectra in the mid-infrared. The description is very detailed and the results are very interesting.

Nevertheless, three major questions are not addressed adequately to my opinion:

- the paper argues that the precision of the retrievals is very sensitive to interferences with water vapour (H2O and HDO). This so-called interference error is quantified in an empirical manner. This quantification relies on the silent assumption that the errors caused by the different microwindows that are fitted simultaneously in a strategy can

be added linearly. I don't think that this is always verified. This linearity assumption should result in an abs. interference error of a strategy (X) that is equal but opposite in sign to the relative interference error of the strategy MW(12345 without X). In view of the results in Tables 4 and 5, this is OK in some cases, but not all, see the last 2 columns in Tables 4 and 5, where the reasoning made in the paper should lead to an abs IF error for MW(135) that is identical with opposite sign to the rel. interference error for MW(24). The largest disagreement is the Wollongong case in Table 4, but there are other cases where the agreement is not so good. So, can the authors explain why their linearity assumption can be made and - if so- what causes the discrepancies observed in the Tables between the abs IF error for MW(X) and the rel. interference error for MW(12345 without X)? If not, is the selection of the best retrieval strategy based on the rel. interference error as determined in this paper still valid?

- If the various retrieval strategies have different sensitivities to water vapour interferences and if these are really 'perturbing' the CH4 retrieval, why are the diurnal variations on each row in Tables 4 and 5 almost the same in all cases? Because of the diurnal variation of the water vapour amount, one would expect an impact on the diurnal variation associated with the retrieved CH4 amounts. Moreover, the diurnal variation for the selected retrieval strategy (MW(135); Hitran2000) is not the smallest one among all others. Can the authors clarify why the diurnal variation is so little sensitive to the choice of retrieval strategy? And can the authors clarify why a minimal diurnal variation is not another criterium to be verified by the selected "best" retrieval strategy ?

- The paper discusses essentially the precision of the retrievals. I haven't found the arguments for a high accuracy of the selected retrieval strategy, as evoked in the title of the paper. Moreover, the Outlook section states that the evaluation of accuracy is 'ongoing work and will be published elsewhere'. So to my opinion, the title should be corrected.

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