Atmospheric
Measurement
Techniques
Discussions

Open Access

Interactive
Comment

Interactive comment on "Performance of a geostationary mission, geoCARB, to measure CO_2, CH_4 and CO column-averaged concentrations" *by* I. N. Polonsky et al.

Anonymous Referee #2

Received and published: 4 January 2014

Manuscript "Performance of a geostationary mission, geoCARB, to measure CO2, CH4 and CO column-averaged concentrations", submitted by Polonsky et al. for publication in Atmos. Meas. Tech. (AMT) contains new interesting scientific material relevant for AMT and is well written. Referee number 1 gives a nice summary of the paper, which is not repeated here. I recommend publication in AMT after the mostly minor comments listed below have been considered by the authors.

General: I have the same question / concern as Referee number 1: Where is the XCO2 accuracy requirement of 0.7% (2.7 ppm) coming from and is this good enough to address the targeted application areas ?

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

Abstract, page 9398, lines 12-13: Please correct "could provide opens the possibility" by deleting the first 2 or the last 3 words.

Introduction:

Page 9400, lines 3-4: Please add a reference / justification for the statement "Nevertheless both are manageable using data from a star tracker and landmarks on the surface of the earth".

Page 9400, line 17: "The study is guided by the excellent work that has been done for . . .". It is understood that the authors like papers which they co-authored but please use a more neutral statement here.

Section 3.2:

Page 9406, line following: "No attempt was made to impose spatial correlation on the aerosol and cloud fields, because it was thought that maximizing the variability of cloud and aerosol, while still maintaining a link to reality through CALIPSO, would make the tests of the retrieval algorithm more stringent." I wonder if this is really true. If I understand correctly, spatial correlations are neglected, which means that cloud and aerosol related errors are essentially treated as random errors rather than spatially coherent systematic errors. As systematic errors are likely more critical than random errors, it is not clear for me why the selected approach is more stringent. Please clarify. It is also not clear for me how "Such correlations should assist in correcting for aerosol and cloud when estimating the trace gas concentrations.". How to distinguish, e.g., erroneous regional CO_2 enhancements from a local source?

Section 4.1:

Page 9410, lines 20-22: Concerning the two types of aerosols: To avoid urging the reader to read the other publications: Please add details on how this is achieved / dealt with in the retrieval algorithm and add a short description of the two aerosol types 2b and 3b.

Section 5.1.2:

Page 9416, line 12 (item 3): In contrast to the earlier used scaling factors, esp. the use of a scaling factor of 1000, why is 100 the largest scaling factor used here?

Section 5.1.3:

Page 9417, line 11 following: An overall bias can have many causes, incl. the selected a priori information, and may not be critical for inverse modelling of surface fluxes (if it is constant). Therefore it is not clear why "On the negative side, it causes the bias in retrieved XCO2 to shift" is a major issue. It would only be an issue if the bias is not constant.

Sections 5.2-5.4:

Please add a table to provide an overview about the results obtained for the different experiments.

Section 5.5:

Page 9422, line 11 following (and corresponding assessments later in the paper): Analysis approach: "... and illustrates the advantage of fine temporal sampling with subsequent averaging of multiple snap-shots". I don't think that, except under very rare circumstances, individual snap-shots can/should be averaged and successfully analyzed in terms of emissions. A changing meteorology (wind) will change the (direction of the) emission plume (e.g., within one hour)! How to deal with this?

Section 5.5.1:

Page 9422, bottom: Please mention that more details on s(x) will be given in Sect. 5.5.2.

Page 9424, line 10 following: Not only number of snap-shots matter but also SNR etc. Furthermore, I don't think that adding of snap-shots is possible (see above). Therefore, it is not clear that GEO is better than LEO under all circumstances as suggested by

the text. Instead, there are pros and cons for each observation mode. I recommend modifying the text to reflect his.

Section 5.5.2:

Page 9425, line 9: Where are the listed four parameters coming from? Do the results critically depend on them? If yes, how to deal with this (e.g., where to get these parameters from)?

Page 9425, line 15: It is a bit strange that the water cloud is considered to be part of the aerosol.

Page 9425, line 17-18: The assumption of a scene independent (i.e., constant) albedo appears quite unrealistic.

Page 9426, line 3: Where is the value of 0.15 coming from?

Page 9426, line 27: "the the".

Section 5.6:

Page 9428, line 11 following: Vertical profiles: It seems that the trace gas profiles in the emission plume are not enhanced in the boundary layer as it should be as the source is at the surface and the observations are made near the source. Please clarify.

Page 9428, line 22: "AOD exceeds the threshold of 0.1 set in the PPF": Is this the AOD threshold? Larger values are mentioned earlier in the paper!? Using AOD for PPF requires that the retrieved AOD is sufficiently accurate. Is this the case? Please clarify.

Page 9429, line 13 following: How large would be the emission errors for the mentioned XCO_2 biases of 1.1 and 1.3 ppm? Is this really within the "acceptable range" as stated in line 16.

Section 6:

Page 9430, line 18: The estimated emission accuracy of 3% (which I consider very

optimistic) is only valid for the assumptions made, e.g., no modelling related errors, perfect knowledge of the meteorology, averaging of individual snap-shots possible (i.e., very stable conditions), etc. This needs to be clearly mentioned here. Same for "The power plant results are robust" (line 27).

Page 9431, lines 7-8: "mission requirements": No clear what is meant here: XCO2 error or CO2 emission error requirement. If the latter, what is the emission error requirement?

Table 6: Replace (2x) hPa by ppm for XCO2.

Figure 7: Add unit for x axis.

Figures 11 and 12: Please use the same x axis for all panels where possible.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 9397, 2013.