Review of "Cross-calibration of GOME and SCIAMACHY Spectrometers Enhanced by Polarization Monitoring Devices Data"

Comments based on https://egusphere.copernicus.org/preprints/2025/egusphere-2025-4942/
Preprint, retrieved 18 November 2025

General comments

Dear authors,

The paper is in general written in a clear and succinct manner and the reasoning is good to follow. The subject is highly relevant for long term atmospheric data records and this pre-study shows how the PMDs could be used to improve the cross calibration between GOME and SCIAMACHY.

However there are some points where the paper could be improved: Table 1 does not list the differences between GOME and SCIAMACHY, this is probably not intentional and should be corrected. Furthermore some of the information on the instruments should be given earlier in the text and not only in the discussion.

The fact that the PMDs can be used to extend the cross calibration beyond the PICS can be emphasized even more in the abstract. If the paper is framed as a pre-study for future work, the low number of pixels used to derive the transfer functions is explainable.

You have chosen a structure where the paper is divided in methods, results and discussion. It might improve the overall readability of the paper and avoid lengthy repetitions if you outline the different steps in a few bullets and discuss each step in detail including the used method, result and discussion. And of course summarize in the conclusion.

Please find below specific comments on the content and in a separate table technical comments on typos, phrasing and layout of figures.

Specific comments

Item	Section	Line	Comment
SC1	0	14	Please add "from GOME and SCIAMACHY". It's otherwise not clear that both instruments had PMDs on board.
SC2	1	60	"is has been assumed", can this point not be proven or confirmed? I would rephrase and include a reference where it has been shown.
SC4	2	103	"four channels" Which ones? You only name 3 (UV, VIS, NIR)
SC5	2	104	Spectral resolution in NIR is missing.
SC3	2	115	Table 1 and it's caption is identical to Table 2. The listed differences between the instruments should include the LTAN, size and spectral resolution of the PMDs, the spectral resolution and range of both instruments, spatial resolution,...

SC6	2	119	You refer that you use SCIAMACHY L1c data, but then you mention the preprocessing from L1b to L1c, please correct. Either L1c is input and you can discard the discussion on the cluster concept and refer instead to the specification of the tool or you start from L1b data and then do the pre-processing.
SC7	2	133	Please explain why you use reflectance (most instrument effects divide out)
SC8	2	140	What is the spatial resolution of the PMDs? Please be specific.
SC9	4	188	What is the Akima interpolation scheme? Please explain or give a reference.
SC11	4	204	Why do you use a 3rd degree polynomial? Have you done any over- and underfitting tests? The UV and VIS still show some features which are not fitted but consistent for all cases, what is the reasoning to not fit them? Please explain this in the paper. (I assume you will to keep spectral features)
SC12	4	213	higher temporal resolution: the specifics could be added to the updated Table 1 and referred to here.
SC13	4	244	threshold T (T is not defined in Eq.(10))
SC14	4	Table 1	You could add in the caption 757-773nm for the O2 A-band
SC15	5	255	The number of 151 is quite low, this is for one year of data? It might be good to repeat that here.
SC16	5	258	"all scanlines" what do you mean by all scanlines? Over different regions? Far away from the PICS. Or do you mean the groundpixels close to but not overlapping with the PICS?
SC17	5	268	Are the differences between Nadir, East and West not present for VIS and NIR? Please add this in the text or show the different directions for VIS and NIR in a plot.
SC18	5	279	"nearly constant value", please be more specific, the fit is close to 0.94 and you then chose this value? Or did you average the value left & right of the O2 A-band?
SC19	5	283	Why are the uncertainties larger? Is that because you combined all views? Would it improve if you distinguish East, West and Nadir?
SC20	5	286	Some more instrument details would be useful (add in Section 2). Are the PMD matched to the spectral channels in wavelength? Earlier in the text you write they are broadband. Is the field of view the same as for the spectrometer views?
SC21	5	300	PMD variability GOME & SCIAMACHY: do you have an explanation why the variability is higher? Are they bigger (please add PMD size to Section 2) ?
SC22	5	306	Only 39 pixels left over? The seems rather little.
SC23	5	Fig. 4	(c) Sudan 1 -> Libya 4?

SC24	6	328	"higher spatial sampling frequency" , how much higher the sampling is should be included in Section 2
SC25	6	347	This may be attributed... Please be specific, is it a guess or do you have any evidence for this statement?
SC26	6	350	It is a bit late to provide all this PMD and instrument information only in the discussion. Please move all this information to Section 2.
SC27	6	358-362	This part has already been discussed in the results section. It does not need to be repeated here. And as in line 347, can you show that the sites are less homogenous in these wavelengths than in others (maybe from other instruments?)
SC28	6	all	For the discussion, apart from extending the scenes to derive TFs, what is the wider implication can this method also be used to cross-calibrate other instruments? Could this also be used to cross-calibrate to instruments without PMD but also a higher spatial sampling for certain wavelengths (small pixel columns in OMI for example). It is a good point to close the loop with the abstract where the need to cross calibrate instruments over many decades is described.
SC29	7	397	“spectral channels with strong absorption” : this suggests more than the O2 A-band was excluded, is this correct? Then this should be mentioned already much earlier. If not just refer to the O2 A-band.
SC30	7	417	Please call it cross calibration, the absolute calibration of both sensors has not been investigated.

Technical comments/typos

For all figures, please check if these can be read by colourblind people. Make use of different linetypes and use a different colour scheme.

Item	Section	Line	Comment
TC1	0	5	was --> is
TC2	0	14	presented-->presents
TC3	1	30	The focus arises -> this sentence does not read well, please rephrase
TC4	1	47	is one of the well-known methods -> is a well-known method, the "one of" implies that you should also mention other methods
TC5	1	49	". Many other man-made" implies that deserts or oceans are man-made. Rephrase to ", or man-made features, ..."
TC6	2	Fig 1	Please increase the size of axis and text labels.
TC7	3	Fig 2	Caption: "except" -> excluding. Figure: please make sure the steps in the figure have the same name as in the text.
TC8	4	Fig 3	Please increase the size of axis and legend and make it colourblind proof. The degree sign is missing for the numbers

TC9	4	175	is *the* pseudo
TC10	4	185	The sentence reads difficult, there seems to be a word missing. Consider to rephrase: "C1 and C2 are the correction factor and offset for scene dependent effects"
TC11	4	203	represented ->represent
TC12	4	206	1nm-width wave -> 1nm wide wavelength intervals
TC13	5	276	indicating a ____ across (word missing).
TC14	5	Fig. 6-10	Figures 6, 8, 9 and 10 should have less white around them and the text should be larger. If you change the aspect ratio and scale to the actual data points, it would be easier to read.
TC15	5	315	))_ and (space missing)
TC16	5	Fig 10	Caption: panels g to i are not described
TC17	6	328	of *the* TF
TC18	All	All	Please reconsider when you use the past tense, for example cross calibration *is (not was)* important.
TC19		Fig 6/10	When plotting the NIR data vs wavelength, please consider a interrupted scale and focus the plot more on where you do use data.