Atmos. Meas. Tech. Discuss., 5, C4095–C4098, 2013
www.atmos-meas-tech-discuss.net/5/C4095/2013/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Polarization data from SCIAMACHY limb backscatter observations compared to vector radiative transfer model simulations" *by* P. Liebing et al.

P. Liebing et al.

patty@iup.physik.uni-bremen.de

Received and published: 19 March 2013

We thank the referee very much for the positive review and comments. We will consider the comments in the revised version of the paper.

Answers to specific comments:
Abstract, p 2222, l 19-20, and p 2244 l 20-24: "instrumental phase shift". Please clarify this term in the paper. The effect was discovered during on-ground characterisation of the instrument, when a wavelength-dependent alignment of the PMDs was discovered. From the design it was expected only to be wavelength-independent. Further inves-

tigations revealed that the effect also scaled with instrument temperature. The name initially given to this effect was "polarisation phase shift". However, the effect seems to be best described by (thermally induced) stress birefringence. See also [1]

Unfortunately, the ongoing analysis of the in-flight polarization sensitivity shows that currently it seems impossible to decribe the observed changes by an instrumental effect as described in [1]. This does not exclude such effects to be present but it means that the currently available on-ground data and information contained in the in-flight data does not yet allow for a complete recalibration of the instruments polarization sensitivities. Currently it is only possible to calibrate an "effective instrument polarization sensitivity" wich can be used to retrieve accurate polarization, but not for improving radiometric calibration. Therefore I propose to change the paragraph in the following way:

The study shows that the limb polarization data exhibit a large time dependent bias which is decreasing with wavelength. Possible reasons for this bias are a still unknown combination of insufficient accuracy or inconsistencies of the on-ground calibration data, scan mirror degradation and stress induced changes of the polarization response of components inside the optical bench of the instrument. It is shown that it should in principle be feasible to recalibrate the polarization sensitivity using the in-flight data and the VRTM simulations, thus enabling also the monitoring of its degradation.

I will include Ref. [1] in section 5.4 and in the last paragraph on page 2244 and remove the last sentence on that page.

Introduction, p 2223, l 17-20: In addition to the described sources of polarisation sensitivity, large and strongly wavelength-dependent polarisation sensitivity is introduced through the dichroic mirrors used for channel separation.

A sentence mentioning this effect for the channel boundaries will be added.

p 2224, l 4-9: It is suggested here that SCIAMACHY has 6 PMDs, it is only on p 2227 *l 23-24 that it is mentioned that there are 7 PMDs and that the one with the longest wavelength is not considered in this paper. I suggest to move the relevant passage from p 2227 to p 2224.*

I would prefer to leave the text as it is. Perhaps you have missed the footnote 1 on page 2224 mentioning PMD 6. Integrating the footnote and the discusiion of PMD 6 on pg. 2227 into the main text on page 2224 would lead to a whole paragraph on technical details of PMD 6 already in the introduction only to explain that I won't discuss it further. This would disturb the text flow considerably.

p 2229, l 19: "large errors": Are these errors in the derived q and u values, or in the polarisation correction term? Note that the q and u values were initially only intended for polarisation correction of the science pixels.

This should indeed be clarified in the text. First of all the assumption leads to large errors in q and u. However, only in some special cases when the expected magnitude for both q and u is very small the error on the polarization correction can be expected to be small as well. The discussion in section 5.1 referenced here explains the mechanisms for extracting wrong polarization values. We will clearly express the point that this error propagates into the polarization correction as well.

p 2229, l 24-25: "looking into the instrument": at the location of the spectrometer slit. The configuration of the scanner module (limb or nadir geometry) would affect the definition if it were outside of the instrument, and in order to remove this confusion the location at the spectrometer slit was chosen.

This will be added.

p 2253, l 13, RTS pixels: the RTS effect causes the dark current to jump between two or more different levels. Extensive investigation of RTS effects show that the electronic offset remains constant. A significant number of RTS pixels jump slow enough to allow for accurate dark signal correction when the limb dark measurement of the same state

execution is used.

I will change "electronic offset" to "dark current" on line 13. The procedure described in this paragraph was in fact developed because from observations it was clear that correcting by the limb dark measurement of the same state is not sufficient to obtain reliable values for the virtual sum (which includes basically all pixels of channel 6+). At stratospheric TH even a single pixel experiencing a dark current jump can take the virtual sum to unphysical values. Possibly in the future a better method for indentlifying and correcting RTS can be developed and applied.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 2221, 2012.