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Interactive comment on "SCIAMACHY Level1 data: Calibration concept and in-flight calibration" *by* G. Lichtenberg et al.

Anonymous Referee #1

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General comments

The paper is well-written and provides a good overview of the SCIAMACHY calibration concept, and highlights specific calibration issues which arose after launch.

Emphasis is on the level 1 data product quality, though occasional impacts on level 2 products are mentioned as well.

The paper focuses on the problems observed with calibration, but does not fully take the opportunity to illustrate (rather than just mention) how well SCIAMACHY and the calibration are performing.

For the on-ground calibration, specific goals and requirements were defined. With the

on-ground calibration knowledge, predictions were made for in-flight performance. It would be interesting to see more comparisons (where possible) between the predicted and actual performance, as in the radiometric and wavelength performance covered in the paper. But perhaps this is beyond the authors' intended scope for the paper.

It is difficult to judge the impact of the various calibration issues highlighted in the paper. The propagation of errors from level 1 data to level 2 data products is complex but must be investigated, as illustrated by e.g. the CH4 total column sensitivity to a single bad pixel.

If not in this paper, then at least in a follow-up publication, it would be extremely interesting to see how the calibration issues identified here affect the level 2 data products. This would immediately point out the importance of certain corrections or lack thereof.

Specific comments

p8932 line 9: which kind of resolution, spectral or spatial?

p8932 eqn 1: QE(T_det) is a function of lambda as well, with larger variations towards longer wavelengths.

p8938 eqn 3: Note that the QE(T) variation results in a minor polarisation sensitivity change as well, and that an ice layer may affect the polarisation as well. This is due to variations of the angle of incidence on the detector material depending on pixel location. A change in QE is a change in refractive index, and thus the polarisation dependent absorption coefficient. Likewise, the ice layer may affect the overall absorption/reflection coefficient of the ice/detector lens. The radiance/irradiance effects of the ice layer will cancel using the proposed calibration concept, but possible polarisation effects may not. This is perhaps not a significant effect, but should not be forgotten in the case that it is significant. On-ground calibration data for multiple detector temperatures exists.

p8940 line 22: Similar wavelength shifts were observed during on-ground calibration,

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in particular between thermal cycles. They were attributed to settling of the detector assemblies as the result of large thermal gradients during heat-up and cool-down. Once at operational temperature again, no change was observed nor expected.

p8943, line 20: these numbers seem to be based on on-ground calibration data. Are they consistant with what is observed in orbit? (E.g. compared with theoretically calculated spectra for the relevant ozone profile and illumination geometry)

p8947, footnote: due to stress-birefringence in the prism, an OBM-temperature dependent effect.

p8961, degradation: The channel edges show clear signs consistent with dichroic mirror outgassing, in particular channel 4/5 overlap around 800 nm. The signal lost in channel 4 is gained in channel 5 at approximately the same wavelengths.

Technical corrections

p8954 eqn 16: right bracket missing

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 8925, 2005.