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Atmospheric Measurement Techniques Discussions

Interactive comment on "Infrared limb emission measurements of aerosol in the troposphere and stratosphere" *by* S. Griessbach et al.

Anonymous Referee #2

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In this paper the authors have extended the capabilities of MIPAS to discriminate between ice, sulfate aerosol and volcanic ash in the UTLS. Improved methods for height resolved aerosol/cloud detection and discrimination for limb emission sounders and the resulting scientific applications clearly merit publication in AMT. However, the current iteration requires some improvement before it can be accepted for publication. Obviously the paper is concentrating specifically on the limb emission technique, but the substantial background on similar techniques pioneered for nadir sounders should be discussed in appropriate detail. Likewise, investigations of other aerosols present substantially in the UTLS (e.g. mineral dust) have been undertaken for nadir sounding (see reference below) and therefore some discussion of these is warranted.

Improved space borne detection of volcanic ash for real-time monitoring using 3-Band

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Discussion Paper

method, Y. Guéhenneux et al, Journal of Volcanology and Geothermal Research 293 (2015) 25–45.

Prata, A.J., 1989a. Observations of volcanic ash clouds using AVHRR-2 radiances. Int. J. Remote Sens. 10 (4–5), 751–761. http://dx.doi.org/10.1080/01431168908903916.

Prata, A.J., 1989b. Radiative transfer calculations for volcanic ash clouds. Geophys. Res. Lett. 16 (11), 1293–1296. http://dx.doi.org/10.1029/GL016i011p01293.

P4832,L11: Some references and deeper discussion is needed here.

P4836,L25: Make it clear clear that the non-LTE effects occur much higher in the atmosphere (» 25 km) and that the effects on ACI are because the instrument is looking through this NLTE region at the UTLS tangent heights.

P4388, 3.2 Aerosol and Ice Classification. This section is really quite hard to follow. It would be informative to indicate that the imaginary refractive index determines the ir absorption. Suggest calling the 3 spectral regions A,B,C. Maybe replace some of the text with a table or put +/- symbols on Fig 3 to mark the gradient signs.

For example ...

Three spectral columns A,B,C and two rows for Im and Re indices. Then each cell contains + or - (depending on sign of gradient). Ice spectral gradient seems quite flat (?) for Region C. Not sure I got all the signs correct.

A B C Im Ice - - ? SA + + - VA + + -

Re Ice - + ? SA + + + VA + + -

P4389, 3.2.2 Measurements. This section really needs to discuss previous work on BTDs in nadir view since it's hardly a surprise that BTDs also provide cloud/aerosol discrimination in the longer path limb view.

P4394,L14: A U-shaped

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P4394,L24 and P4396,L12: Loss rate of SO2 in presence of clouds is faster than gas-phase chemistry alone. Is the process oxidation or hydrolysis or both?

P4394,L24: I don't think that a qualitative comparison of the location of SO2 and sulphate plumes can be registered as "perfect" agreement. e.g. the height of the SO2 is unknown compared to the sulfate and there is no model used linking formation of sulfate from SO2 so their respective concentrations cannot be compared.

P4395,L13: Is the decay of SO2 consistent with the expected rate?

P4396,L7: Do you mean sulfur as in "sulfur budget" since MIPAS also measures SO2 and sulfate?

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 4379, 2015.