Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2019-283-RC2, 2019

Atmospheric Measurement Techniques Discussions

Interactive comment on "Aerosol and cloud top height information of Envisat MIPAS measurements" *by* Sabine Griessbach et al.

Anonymous Referee #2

Received and published: 2 October 2019

In this manuscript, Griessbach and co-workers present a study evaluating a commonly used method to determine cloud/aerosol top heights from MIPAS/Envisat thermal limb emission measurements. The study is based on simulations as well as on comparisons with a variety of independent measurements of the volcanic plume from the Nabro eruption by other satellite and ground-based instruments. The authors conclude that, in addition to the effects of an extended vertical field-of-view and of inhomogeneous cloud cover on the determination of cloud-top altitudes, the cloud/aerosol optical depth is a further important reason for uncertainty. It is suggested that the interplay of these three main contributors to the MIPAS cloud top height uncertainty resolves the puzzle of contradictory results from a variety of previous studies. As an add-on, a comparison of the sensitivity of different remote sensing techniques towards sulfate aerosol is

presented. This work fits well into the scope of AMT and I strongly support publication after a few specific comments are taken into consideration.

Specific comments:

MIPAS-simulations: To be able to estimate how much the instrumental performance itself contributes to the cloud/aerosol top height estimation, it would be interesting to estimate/discuss the errors introduced by the random and systematic uncertainties of MIPAS, e.g. spectral noise, radiometric accuracy, and others as described by Kleinert et al., 2018.

Could you discuss whether it would make sense with respect to detection sensitivity, to use the radiances at the maximum of the sulfate peak around 1100 cm-1 instead of those around 800 cm-1 for the aerosol detection since the absorption seems to be an order of magnitude higher?

Regarding the comparison with CALIOP: could the variability of the CALIOP aerosol top height within the match-criteria be used to estimate the plume's homogeneity at its upper level and be correlated with the MIPAS cloud-top in order to distinguish between cloud-inhomogeneity and optical thickness as the reason for the underestimation by MIPAS?

Throughout the paper it is argued with extinction. However, would a quantity like optical depth covered by the field-of-view not be better suited?

L534-542: It should be made clear that these considerations are valid for the typical size distribution of sulfate aerosols. Could you also consider/discuss cases for other particle sizes (e.g. smaller particles) where scattering in the UV/VIS is decreased but the absorption signal in the mid-IR is not/less affected?

Table 1: SCIAMACHY and OMPS NPP may be added. The first one since it could be directly compared to MIPAS in future work and the second to cover the present time and the future.

Technical comments:

L50: ‘occulation’ -> ‘occultation’

L69: why is ‘However’ used here?

L125: ‘color’ vs. Figure 1 caption: ‘colours’, please harmonize

L269: ‘maximal’ -> ‘maximum’

L306: ‘compareable’ -> ‘comparable’

L416: delete ‘)’

L417: ‘analysed’ but also ‘analyzed’ is used

L445: ‘dicrepancy’ -> ‘discrepancy’

L450: ‘exinction’ -> ‘extinction’

L562: ‘contradicory’ -> ‘contradictory’

L659: ‘underestmated’ -> ‘underestimated’

L679: ‘soon be available’: is the dataset already available?

Table1, last column: ‘1.5 kmˆ-4 srˆ-1’ -> ‘1.5ˆ-4 kmˆ-1 srˆ-1’

Fig. 5, caption: ‘inidcated’ -> ‘indicated’

Fig. 9: could you also show a further panel with the absolute plume altitudes to better judge the difference compared to the absolute value.

Fig. 9: a legend, e.g. in one of the panels indicating the different instruments would be better than only having the information in the caption.

Fig. 13, caption: ‘gray’ -> ‘grey’

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-283, 2019.