Atmos. Meas. Tech. Discuss., 6, C4742–C4745, 2014
www.atmos-meas-tech-discuss.net/6/C4742/2014/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieving aerosol height from the oxygen A band: a fast forward operator and sensitivity study concerning spectral resolution, instrumental noise, and surface inhomogeneity" *by* A. Hollstein and J. Fischer

A. Hollstein and J. Fischer

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Dear Referee,

thank you very much for your very much appreciated feed back and your effort when reviewing this paper. Your input helped us to improve the quality of this paper.

Please find our responses to your specific points in the comments of the pdf supplement document.

We also attached a difference document where changes of the manuscript are highlighted.

Kind Regards,

André Hollstein and Jürgen Fischer

Please also note the supplement to this comment:
http://www.atmos-meas-tech-discuss.net/6/C4742/2014/amtd-6-C4742-2014-supplement.pdf

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 10511, 2013.

Atmos. Meas. Tech. Discuss., 6, C3908–C3911, 2014
www.atmos-meas-tech-discuss.net/6/C3908/2014/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieving aerosol height from the oxygen A band: a fast forward operator and sensitivity study concerning spectral resolution, instrumental noise, and surface inhomogeneity" *by* A. Hollstein and J. Fischer

Anonymous Referee #1

Received and published: 7 January 2014

The manuscript contains genuinely new information relevant to aerosol vertical information retrieval from moderate to high spectral resolution spaceborne measurements of the O2 A band. The main conclusions are clear, however the writing is unclear in many instances, and several important points are hard to understand. The manuscript fits well in the scope of AMT. I recommend publication after the issues specified below have been addressed.

Main points:

Manuscript prepared for Atmos. Meas. Tech.
with version 5.0 of the LaTeX class copernicus.cls.
Date: 2 April 2014

Abstract.

Hyperspectral radiance measurements in the Oxygen A band are sensitive to the vertical distribution of atmospheric scatterers, which in principle allows to retrieve aerosol height from future instruments like TROPOMI, OCO2, FLEX, and CarbonSat. Discussed in this paper is a fast and flexible forward operator for the simulation of hyperspectral radiances in the Oxygen A band and, based on this scheme, a sensitivity study about the inversion quality of aerosol optical thickness, aerosol mean height, and aerosol type. The forward operator is based on a lookup table with efficient data compression based on principal component analysis. Linear interpolation and computation of partial derivatives is performed in the much smaller space of expansion coefficients rather ~~then~~ than wavelength. Thus, this approach is computationally fast and at the same time memory efficient. The sensitivity study explores the impact of instrument design on the retrieval of aerosol optical thickness and aerosol height. Considered are signal to noise ratio, spectral resolution, and spectral sampling. Also taken into account are surface inhomogeneities and variations of the aerosol type.