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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Tropospheric ozone from IASI: comparison of different inversion algorithms and validation with ozone sondes in the northern middle latitudes" *by* C. Keim et al.

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Introduction

This paper presents validation results of tropospheric ozone retrieved from IASI using four different algorithms by intercomparisons between different retrievals and comparisons to collocated ozone sondes at selected middle-latitude sites covering a period of about one year. In the first part of the paper the different retrieval algorithms are summarised, three of them are based on a non-linear least-squares fit with some kind of regularisation and one very fast algorithm using a neural network approach. The neural network algorithm is the operational (commercial) retrieval from EUMETSAT who runs

the METOP-A platform carrying IASI. In the second part of this paper, the retrievals from different algorithms are compared against each other as well as with collocated ozone sondes. This part is somewhat brief compared to the first part. The major result is that the iterative inversion algorithms show generally better agreement among each other and with ozone sondes than the neural network approach.

Major points

This is an interesting paper since it provides insight into thermal infrared nadir retrievals of tropospheric ozone. However, the details about the various algorithms are not sufficient to really appreciate their strengths and weaknesses. I suggest to provide a table that summarises various features of the algorithms, e.g. exact wavelength range used for the profile and surface temperature/temperature contrast retrievals. Some algorithms uses different windows for temperature retrievals, other fit both quantities simultaneously. This table should also summarise details on retrieval type and grid, degree of freedom (dof), type of regularisation, spectroscopy data used (for ozone), and list of retrieval parameters other than ozone. This table will be very valuable in distinguishing the individual algorithms on one sight.

The neural network approach is also not very well explained. No information is given what data were used for training the network nor what other parameters other than spectral data were used as input. This information is crucial for the quality of the neural net retrieval. In the conclusion section, the authors mentioned that the training of the network has been updated, but no details are given on how the training was changed and what additional training data were used.

The added information on the retrievals and obvious differences between them should be more strongly associated and underlined with the validation/intercomparison results in the later part of the paper

Itemised list of points

It may be helpful with the aid from a native speaking co-author to improve the English style. It will help to make the paper better readable.

p. 11447, l. 28: "absorption cross-sections for the heavier molecules". What means here "heavier", are the lighter molecules from a different database than HITRAN 2004.

p. 11449, l. 8: LISA uses ozone spectroscopic data from the MIPAS database rather than HITRAN. Are there differences in ozone between MIPAS and HIITRAN databases, if yes please describe and explain the possible impact on the intercomparison/validation results?

p. 11451, l. 10-17. I do not understand this paragraph. Why are only "odd pixels" used in the neural net retrieval. I do not understand why a scaling of total ozone by a factor of 10(!) has to be applied.

p. 11451, l. 23. "The profile in the hidden part is selected by use of the visible part". This sounds awkward. Neural networks also learn from "a priori" profiles, which are provided by the training data set. If there are certain correlations of higher layers with the surface layer, then the neural network will use this to provide information on the "hidden" surface layer.

p. 11452, l. 2. The burst height of ozone sondes is generally about 30 km rather than the cited 35 km.

p. 11453, l. 2. Level-3 ozone column data from OMI are gridded (1degx1deg) but not assimilated.

Fig. 2a: in figure caption change 2008 to 2007

Fig. 2b: Explain the difference between plots in columns 1 and 2 (similarly 3 and 4 as well as 5 and 6) in the figure caption (ppmv vs %). Similarly for Fig. 3a.

Fig. 4. Mention in figure caption the differences between plots in columns 1 and 2 (3 and 4), e.g. AK versus no AK.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 11441, 2009.