

Interactive comment on “Global tropospheric ozone column retrievals from OMI data by means of neural networks” by A. Di Noia et al.

Anonymous Referee #2

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Comments on paper by Di Noia et al., "Global tropospheric ozone column retrievals from OMI data by means of neural networks"

The paper presents the retrieval of tropospheric ozone columns from OMI data using an improved neural network algorithm. This paper is well written and the topic is relevant for AMT. However, two major issues should be addressed and resolved before this paper can be published.

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Major Issues:

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(1) Neural networks are used as a statistical retrieval tool taking as input a significant amount of ancillary data. The actual contribution of OMI reflectance to the obtained TCO compared to the ancillary data (note the strong correlations between actual TCO, temperature profile, tropopause pressure and TCO climatology) should be properly assessed. This can be done by training a second NN with only the ancillary data (without OMI data as input) and comparing the results obtained with OMITROPO3-NN.

(2) The TCO from the NN algorithm are only validated with ozonesonde data (i.e. the same type of data used for the NN training) and it is limited to a few locations over land. The comparison with model is restricted to only two days. This limited validation is not sufficient to justify a publication of an improved NN algorithm that has been already presented for OMI (Sellito et al., 2011) and SCIAMACHY (Sellito et al., 2012). On top of that, the aim of the proposed algorithm is "Global tropospheric ozone column retrievals", therefore the validations should be done on a *global* scale using appropriated tropospheric ozone data from other instruments like for example MLS or other OMI retrieval algorithms like for example Liu et al., 2010.

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Minor Issues:

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P 7676, L2

"a new NN algorithm ..." this is not really a new algorithm, but an improvement of an algorithm already presented by Sellito et al. (2011 for OMI) and (2012 for SCIAMACHY).

P 7677, L 26

The work of Valks et al. is related to GOME/ERS-2 and not TOMS.

P 7678, L 18-19

Add a reference to a validation paper showing that the RMS of OMI-TOC NN is 8 DU.

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P 7678, L 11-12

Explain in detail the “several refinements” used for quality control and filtering.

P 7680, Eq. (1)

The symbol Φ is not explained.

P 7681, L 17-19

What is the link between the text after ii) and the MLP used in this paper?

P 7682, L 18

If a component of x has no effect on y then this component shouldn't be used as part of the state vector.

P 7684, Eq (7)

Define the $\hat{x}$ on the left side of the equations.

P 7684, L 26

There are other shortcomings from NN statistical retrievals that are not mentioned like (1) the solution for a particular observation may not be optimal, the cost function for a single measurement can be better minimized with classical retrieval techniques and (2) a proper error propagation can not be done.

P 7686, L 16

Add a reference to the “early stopping cross-validation”

P 7686, L 26

Justify why the surface albedo is not used as input

P 7687, L 8

What is the source of the cloud fraction? Why is the cloud-top height not used in the

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retrieval?

P 7689, L 15-21

Is the measurement time not used as co-location criteria?

P 7690, L 11

Discuss the errors induced by using just a linear interpolation

P 7691, L 18

Add a quantitative description of the reconstruction errors due to using 20 PCs

P 7693, L 7

Define the Pearson correlation coefficient or provide a reference

P 7694, L 15

Provide at least a preliminary explanation for the underperformance at the Arctic region

P 7696, L 21

Indicate which ozone data is used as input for TM5.

P 7709, Table 1

Indicate the wavelength coverage of UV1 and UV2

P 7717-7718

Figures 5 and 6 could be merged.

P 7724-7725

What is the value added of Fig 13 with respect to Fig 12? Consider showing only one these figures.

P 7726, Fig. 14

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Why are the regions without data much smaller in this figure than in Fig. 9 (large no retrieval areas) or Fig. 15?

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 7675, 2012.