Review to Chimot et al.:

Minimizing aerosol effects on the OMI tropospheric NO2 retrieval – An improved use of the 477 nm O2-O2 band and an estimation of the aerosol correction uncertainty

The paper introduces and compares two separate algorithms for correcting the aerosol effect in NO2 retrievals through the computation of air mass factor. The implicit method uses an improved version of OMI cloud algorithm (OMCLDO2) where aerosols are treated as opaque Lambertian reflectors similar to clouds. The explicit method is based on a neural network technique aiming to reproduce aerosol scattering effects via more realistic aerosol model. The study analyses OMI NO2 retrievals for cloud-free scenes over East China and South America. Both methods introduced in the manuscript tend to reduce the biases in retrieved NO2, compared to the standard OMI DOMINO NO2 retrieval.

The manuscript covers an important research topic and results obtained in this study are relevant for the current and new satellite missions providing NO2 retrievals. The results in this study also highlight the importance of aerosol corrections in such retrievals, and the results are applicable for other trace gases too. The topic is well suited for AMT. I would recommend the publication of this manuscript after revision.

General comments:

1) The research itself is overall very interesting, but at places the language is not very “reader friendly” and there is room for improvement. In addition, there are typos and order of the words (e.g. p. 12, lines 26-27) that should be corrected. Some of the paragraphs, especially those with only two sentences, need revision and should be merged to other paragraphs.

2) Somewhat more detailed description of the aerosol conditions, in which the algorithms were tested, would be desirable. For example, what is the justification of using the selected SSA values? Can we assume that in East China and South America those SSA values are typical? Were there any cases where dust particles were dominating, how well the correction schemes perform in such situations?

3) In the manuscript it is stated that the aerosol optical properties (g, SSA) are of secondary importance compared to the AOD that is used in the training data. How accurate AODs used in the training data are, e.g. as compared to AERONET?

Detailed comments:

Table 1. The caption should be rewritten in more clear way. While reading the text and especially figures, I needed to go back to the Table 1 to remain myself what were the main differences between different scenarios. The authors could think if it would be possible to shortly indicate in the figure captions what is likely the main reason for the differences; e.g. improved LER etc.
Figure 1: grid lines would help to interpret the image, now it is hard to say when the difference is close to zero, positive or negative.

Figure 2: Is the correct interpretation that the new implicit aerosol correction will improve the retrievals especially in cases of elevated aerosol layers? Why in the OMCLDO2- new the NO2 bias seems to peak at about AOD= 0.6 (w=0.95) at low ALH heights?

Figure 3: The vertical scale of the image could be smaller, also grid lines would be helpful.

Figure 5 b): Extra symbols in the label that should not be there?

Figure 7: The scale could be smaller to see more clearly the differences between the lines.

Figure 8: Please add grid lines

Figure 9. In my version subfigures d-f are missing. The caption could be rewritten.

Figure 11, you could add to the caption what is the SSA.