

Interactive comment on “Improvement of OMI ozone profile retrievals by simultaneously fitting Polar Mesospheric Clouds” by Juseon Bak et al.

Anonymous Referee #2

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General comments:

This manuscript deals with the effects of polar mesospheric clouds (PMCs) on stratospheric ozone profile retrievals from OMI nadir observations. This PMC effect is generally neglected in ozone profiles retrievals using similar measurements with other instruments. It is demonstrated that neglecting PMCs in the retrieval can lead to substantial ozone retrieval errors in the upper stratosphere/lower mesosphere. The study also introduces a simultaneous PMC retrieval that clearly improves the ozone profile retrieval performance. The paper is overall well written, is suitable for publication in AMT and provides new and important information to the satellite retrieval community. I ask the authors to consider the specific comments listed below.

Specific comments:

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Lines 73/74: I suggest citing the following (correct) references for GOME and SCIAMACHY:

Bovensmann, H., Burrows, J. P., Buchwitz, M., Frerick, J., Noel, S., Rozanov, V. V., Chance, K. V., & Goede, A. P. H., SCIAMACHY: Mission objectives and measurement modes. *J. Atmos. Sci.*, 56, 127 – 150, 1999.

Burrows et al., The Global Ozone Monitoring Experiment (GOME): Mission Concept and First Scientific Results, *J. Atmos. Sci.*, 56, 151 – 175, 1999.

Line 132: Period missing at end of sentence

Line 140: 'few%' -> 'few %'

Section 2.3: It would be good to briefly discuss how independent the PMC and the ozone retrieval are. I assume both quantities are well separated by the retrieval – and this should be stated clearly.

Line 189: 'based on the particle shape plays a minor role in the UV scattering'

Grammar incorrect, I think.

Line 197: 'climatological data above'

Please mention what climatological data was used here.

Line 210: 'the retrieval could be adequately resolved below ~ 0.5 hPa in the stratosphere'

I don't fully understand this statement. What do you mean by 'the retrieval could be adequately resolved' ? What is the threshold for the vertical resolution that you use to distinguish adequate from inadequate vertical resolution?

Caption Fig. 1: I suggesting splitting the first sentence in two sentences; one for the description of the upper panels and one for the lower panels.

Figure 1: please comment briefly on the origin of the 'discontinuity' of the OMI O3
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profiles around 1 hPa.

Figure 2: I'm not sure if Figure 1 and Figure 2 are consistent. In the lower panel of Fig. 1 the 'discontinuity' in the OMI profiles appears as a positive enhancement near 1 hPa. However, this positive anomaly does not show up in the comparisons with MLS presented in Figure 2. Why not?

Line 233: 'We can see that the PMC effect on OMI retrievals starts at ~ 6 hPa (~ 35 km)'

This is only a minor point, but looking at Figure 2, the PMC effect on OMI ozone profile retrievals only starts at 40-45 km, not at 35 km.

Figure 4: Do the top panels of this Fig. really show Jacobians? I think this is not the case. They just show the percent change in radiances for different tau values, right? This is also what's described in the text. So it's ΔI , not $d I_{\text{nl}} / d I_{\text{tau}}$. This should be clarified. Does Fig. 4c show the quantity listed in the ordinate label?

Line 321: 'This result are'

Line 434: 'induced by not PMC scatterings' -> 'not induced by PMC scattering' ?

Line 348: 'above 6 hPa'

This is misleading. You mean altitudes above the 6 hPa level, but pressure levels below 6 hPa, right?

Line 350: '... impact .. are' -> '... impact .. is'

Line 394: 'by our algorithm using continuous wavelengths of 270-330 nm'

This appears to contradict the statement in line 153, where you write that 5 discrete wavelengths between 267 and 293 nm are used for the OMI PMC retrievals. Or does the statement refer to the O3 retrieval? If yes, this should be stated explicitly.

Line 405: 'We compare' -> 'We compared'

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Line 410: 'stray lights' -> 'stray light'

Line 411: 'The impact .. are' -> 'The impact .. is'

Line 560: 'Transactions on' ?

The reference list contains several typos (which I'm not listing explicitly). Please go through the reference list again carefully. Thanks.

Interactive comment

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2016-104, 2016.

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