

Interactive comment on “Modelling the impact of noctilucent cloud formation on atomic oxygen and other minor constituents of the summer mesosphere” by B. J. Murray and J. M. C. Plane

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We thank referee 3 for the helpful comments. The referee’s comments are listed below in italic and are followed by our response.

Introduction: page 7181 line 25: Delete reference Gadsden and Schröder (1989) and include the first references related to the formation of NLC ice particles by nucleation of water vapor: E. Hesstvedt (1969), Nucleation and growth of noctilucent cloud particles, Space Research IX North Holland, Amsterdam p. 170-174. The first good model work on ice particle formation was done by G. Reid (1975), Ice clouds at the summer polar mesopause, J. Atmos. Sci. 32, p. 523-535. You could consider adding this reference

as well.

We referenced Gadsden and Schröder, because we wanted to point the reader to some background material on NLCs. This first sentence of our manuscript is not meant to be a detailed historical review of NLC formation and we therefore consider Reid and Hesstvedt inappropriate references for this sentence. We have included reference to the review of Thomas (1991) to this sentence. Both Reid and Hesstvedt are referenced in Gadsden and Schröder's book.

Introduction page 7182 line 3: Observations from space (PMCs) date back to: a) Donahue, T.M., B. Guenther, and J.E. Blamont (1972), Noctilucent clouds in daytime, circumpolar particulate layers near the summer mesopause, J. Atmos. Sci., 29, 1205-1209. And b) G.E. Thomas and J.J. Olivero (1986), The heights of polar mesospheric clouds, Geophys. Res. Lett. 13, 1403-1406. I suggest replacing Hervig and Debrestrian and adding the earlier PMC references.

Have replaced Hervig and Debrestrian with Donahue.

Page 7184 Lines 1-9: The authors should consider adding a reference to this part.

Added Brasseur and Solomon (1984).

Page 7187 line 21: space missing between a and Kzz Same page line 22: Kzz is not derived from density measurements alone it is derived from a fast measurement of the density and its fluctuation.

Corrected lack of space. Term 'density fluctuations' used instead of density.

Page 7188 lines 7-10: The sentence "This was because using " is not well understandable and should be rephrased.

Sentence altered accordingly.

*Page 7189 line 4: I would slightly change this sentence: Below 83 km, the modeled [O] is around $4 \times 10^{*8} \text{ cm}^{-3}$ and lies within the range of measurements.*

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Sentence clarified.

Page 7189: line 14: I suggest to add after OHx the word family.

Now reads ' the OHx family'

Page 7192: line 14: rephrase the sentence "That is, (greek gamma) would need ...

Modified.

Page 7192: line 21: give an altitude of the mesopause (88-90 km)

Done

Page 7192: lines 24-26: take out "after nucleation" in order to avoid a misunderstanding.

Done

Page 7193: line 1: give a lower limit size of visible NLC particles ($r > 25 \text{ nm}$)

Lower limit added to previous line where it is more appropriate.

Page7194: line 18: Unit (cm^2 , cm^{-3}) is not understandable change to (cm^{-1}).

The referee did not understand these units because there is an extra comma. The units now read $\text{cm}^2 \text{ cm}^{-3}$. This is to emphasize that the Mie scattering is expressed in units of cross section per unit volume of atmosphere.

Page 7185: line 17: The sentence "At 83 km, there is predicted ..." is bad English, please improve

Sentence improved.

Page 7197: line 25: delete misprint t in front of symbol (greek Chi).

Done

Fig. 4: It could be that the model O profile in both figures does not match the local

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time 12:00 and 24:00 used for the odd hydrogen family (I assume that O is modeled for 02:00 LT and 14:00 LT).

In this Figure shows the model O and HOx at 12:00 and 24:00. This has been clarified in the caption.

Fig. 6b: The unit of Mie absorption should be changed to cm^{-1} /

See comment above.

Fig. 7: The caption should include \geq after the uptake coefficients and a reference to table 1 for the profile c and e for better understanding.

Made reference to Table 1

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