

Response (black) to the reviewer's comments (blue italics) by the authors:

We thank the reviewer for his input and inspiring questions.

Page 9, lines 169-171: Now that you have demonstrated the ability to visually identify NLCs at Southern Hemisphere mid-latitudes, have you considered trying to recruit volunteer observers at appropriate locations in Argentina to supplement your measurements?

Yes, also thanks to your question, we felt encouraged that this is indeed worth it. One of us is in contact with astro-photographers and astronomers that are active in Argentina and will support them in making suitable observations. We will also contact spaceweather.com (which had a story on one of the events observed from Rio Grande before) to post a request with the start of the next season in November. It occurred to me that it would also be beneficial to create and distribute teaching material for primary school students on the topic. I have some ideas for hands-on physics experiments that I will pursue.

Page 12, lines 205-208: You have noted that your NLC observations are influenced by special conditions (e.g. gravity waves, meridional transport). Are there reasons to believe that these conditions would consistently produce higher altitudes and larger vertical extent for NLC?

That is a very good question. I (nk) think it might be possible. In a very quiet, natural environment, NLC particles can reach low altitudes and form thin, unperturbed layers. Special conditions will likely increase variability, that is if a specific duct is at a certain altitude, NLC will form there. It might be a different altitude in the next case. Strong wave activity will lead to even a thin layer populating a wider vertical range. That might mean that even more statistics is needed to arrive at a reliable mean value. But with this picture of quietly sedimenting, growing ice particles that sublime almost instantaneously at the lower boundary, it is plausible that such a setting will result in the lowest mean altitudes, in contrast to a strongly perturbed environment.

Page 12, lines 210-212: Local time dependence is certainly present in Northern Hemisphere lidar NLC data, with peak occurrence frequency and brightness in the early morning [e.g. Fiedler et al., 2017, J. Atmos. Solar-Terr. Phys. 162, 79-89].

We added "Considerable local time variations with peak occurrence frequency and brightness in the early morning are known from northern hemisphere observations \cite{Fiedler2017}."

Page 17, lines 279-280: You may wish to note that the response of NLCs to solar variations has been significantly reduced since the early 2000s, as discussed in some recent papers [e.g. Hervig et al., 2019, Geophys. Res. Lett. 46, 10,132-10,139; Vellalassery et al., 2023, Ann. Geophys. 41, 289-300].

The text was extended: "A potential source of inter-annual variability is the variation of the solar flux with the solar cycle. Solar Lyman alpha radiation photodissociates water vapour, resulting in fewer NLC during solar maximum \cite{Garcia1989}. \cite{DeLand2002} found an anti-correlation with no phase lag in the southern hemisphere from a satellite record spanning two solar cycles. After 2020, however, satellite and model results suggest a significantly reduced response of noctilucent clouds to solar variations \cite{Hervig2019,Vellalassery2023}."

Page 17, lines 297-299: Previous studies do show the complex nature of possible attribution of NLC formation (or enhancement) to rocket exhaust. However, given the unfavorable normal background conditions at this location, episodic water vapor enhancement is certainly a viable option, and may be worth investigation for selected cases.

Thank you for your comment. It will be interesting to continue observations into the future, and even if the interplays are complex, maybe a trend will eventually crystallize. The pollution of the MLT region by the exponentially increasing space traffic with both exhaust and debris might result in numerous effects not limited to NLC in the future. I think this development demands monitoring by scientists.

Page 18, line 319: "dislays" should be "displays".

Fixed, thank you.