

Review for manuscript titled “Has the 2022 Hunga eruption impacted the noctilucent cloud season in 2023/24 and 2024?” by S. Wallis, M. DeLand, and C. von Savigny

The manuscript tries to answer the question whether the water vapour injected by the Hunga Tonga-Hunga Ha’apai eruption in 2022 had an impact on the noctilucent cloud (NLC) occurrence in 2023-2024. To answer this question, authors show observations from MLS and OMPS-LP instruments for both hemispheres. Authors also compare observations for 2024 to several previous years to highlight the difference. Despite an increased water vapour mixing ratio in both hemispheres were shown, it was not possible to find a significant change in NLC occurrence frequency. Based on the results shown, authors conclude that it took roughly 2 years for the water vapour injected by the Hunga Tonga-Hunga Ha’apai eruption to reach the polar summer mesopause.

The article is well written and presents results relevant to the journal of Atmospheric Chemistry and Physics. However, there are some minor issues that authors could fix to strengthen the article. I therefore recommend a minor revision that should not be difficult for the authors to perform. Comments are summarized below.

General comments:

Throughout the text, authors use “SH NLC season 2023/2024” but “NH NLC 2024 season”. It would look better if authors could homogenize it. For example, the year always follows the word season or the opposite.

Figures 2-8 state years 2013/2014 to 2020/2021 in the legend, but the average is shown for 2016/2017 – 2020/2021 referred to as reference period in Section 2.1. It is unclear why one would show more years than needed to calculate the average.

Minor comments:

Abstract

Line 9: abbreviation NLC is used without being described.

Line 11: authors could consider replacing “seem to” with something more solid like “based on analysis performed in the study, we show/believe/demonstrate/assume”

Section 3

Figure 2: please consider adding years to the panel b. This is because many different years are shown in panel a, and it would be easier for the reader to understand which of those years you show in panel b.

Line 107: does occurrence frequency exceed 3 std at the end of February or January?

Line 130: this is the first time seasons 2013/2014 to 2022/23 are mentioned. Please see my general comment on how this is related to the reference period mentioned in Section 2.1.

Line 136-138: based on Figure 6, it does not look like the NLC occurrence frequency in 2023/24 is always higher than in previous years.

Line 139: “Similar scatter plots for latitudes 60°S - 65°S and 65°S - 70°S are shown in Figure S7...”, but latitude band 65 – 70 S is already shown in Figure 6, right?

Line 143: consider adding “in the NH” after “is also detected”

Line 151: consider adding “that could explain the decline in NLC occurrence in Figure 7a” after “compared to the mean average”. Otherwise, this assumption is only mentioned in the conclusion.

Line 152: please add that the limited vertical resolution of MLS was already mentioned in Section 2.

Section 4

Line 206/209: could high H₂O amount be explained by the time of the year when maximum climatological values take place and not be a result of volcanic contribution?