Response to comments by Anonymous Referee #1

We thank the referee for his or her comments, which we have addressed as follows:

Comment by Referee

The study by Bernhard et al discusses the variability in total ozone during three solar eclipses. The authors use an improved parameterization, relative to previous studies, for the Limp Darkening correction, which results in a more accurate total ozone retrieval (from direct sun ground based spectral measurements) during solar eclipses. They finally show that the variability in total ozone during such events is much smaller than what has been proposed in previous studies. The study contributes significantly to the understanding of processes that take place in the stratosphere during solar eclipses.

The paper is well written, well structured, and within the scope of the journal.

Authors' Response

Thank you for these kind remarks.

Change to manuscript

None.

Comment by Referee

Minor comments and suggestions for technical corrections:

In addition to the studies that have been discussed and cited by the authors there are a few more recent studies that could be discussed in the introduction. For example:

https://www.mdpi.com/2072-4292/16/1/14

https://www.sciencedirect.com/science/article/pii/S1309104221001823

Authors' Response

There are many papers that address changes in ozone and other atmospheric parameters that occur during a solar eclipse and it would be impossible to cite all relevant papers. We agree, however, with the referee that the two papers suggested by him or her would add valuable information to the paper as they address changes in the vertical distribution of ozone during a solar eclipse (which has not been discussed in our manuscript) and the importance of natural variability and dynamics, which often obscure variations caused by a solar eclipse. We will therefore add the paragraph indicated below to the manuscript.

Change to manuscript

The following text will be added at the end of Section 1.1:

> "Lastly, variations of ozone concentrations during the annular solar eclipse of 21 June 2020 have recently been reported in the upper stratosphere and mesosphere based on observations by the Microwave Limb Sounder (MLS) on NASA's Aura satellite (Li et al., 2023). Accordingly, ozone concentrations slightly decreased near 40 km between 24° N and 36° N near 90° E, and increased conspicuously above 45 km, particularly between 60 and 65 km. These changes are comparable in magnitude with the effect of the day/night cycle on ozone concentrations at these altitudes discussed in Sect. 1.4. However, since approximately 99 % of ozone is at altitudes below 45 km, the effect on TCO is expected to be small. We also note that the MLS dataset is not well suited for observing short-lasting phenomena such as a solar eclipse because the instrument provides only few measurements during the period and over the geographic region of interest. It is therefore difficult to separate dynamical and natural occurring effects from those caused by an eclipse. The challenge in distinguishing between dynamical and eclipse-related processes was also emphasized by Akhil Raj and Ratnam (2021) who discussed changes in the vertical distribution of ozone that they observed during the annular eclipse of 26 December 2019 over India."

Comment by Referee

L342: Do the authors mean "critically dependent"?

L500: Should it be "functions" instead of "function"?

Authors' Response

The two typos were corrected as suggested by the referee.