

In the paper, “Year-round stratospheric aerosol backscatter ratios calculated from lidar measurements above Northern Norway”, the authors present a multiyear stratospheric sulfate aerosol (SSA) dataset from lidar observations at the ALOMAR research station. This paper provides valuable insight into lidar-measured SSA over the Arctic, and the study is appropriate for AMT, however I have a few major concerns with the paper in its current form. These include the overall writing quality of the manuscript and lack of important details of the study. Thus, I recommend a major revision. The authors should address the major and minor comments outlined below for the revised manuscript.

Major comments:

1. Writing quality of manuscript: Many grammatical errors and misspellings are found throughout the text, and acronyms need to be defined. The paper should be thoroughly proofread.
2. Lack of study details: There are several instances in the manuscript that I believe need additional information, as follows:
  - a. Page 4, Lines 7-10: Please add more description of ECMWF (e.g., spatial resolution). Why ECMWF? Are there other options? What are the uncertainties associated with the parameters from ECMWF? When you state “converted to a 5 min and 150 m grid”, converted from what? Also, add more details on how the Rayleigh and ozone corrections are done.
  - b. Sensitivity studies: Please comment on the choices made, and any sensitivity studies completed for normalization altitudes (Page 5, Line 11), wavelengths for elastic/inelastic signals (Page 5, Lines 22-23), and lower limit of data availability (Page 7, Lines 13-14).
  - c. Equation 1 (Page 3): Where is this from (reference), or how was it determined?
  - d. Page 6 (Section 4): Please add more discussion/explanation for this section, and the importance/purpose of each figure (Figures 4 through 7). For example, why are you showing  $R_{355/387}$  for Figure 5 instead of R at other wavelengths? Also, please state why a correction is needed for  $CR_{1064/355}$ .
  - e. Page 7 (Figures 9 and 10): Explain how these figures were created (e.g., averaging), as was included in the figure captions.
3. Conclusions: I believe this entire section needs to be re-worked. Please address the following:
  - a. Re-define all acronyms.
  - b. I recommend not referencing figures in this section.
  - c. Please do not state results that have not been already discussed earlier in the paper. For example, the uncertainties stated in Line 10 of Page 8. This belongs in the Results section.
  - d. As mentioned above there are grammatical errors in this section.

- e. The narrative does not flow well (including ending with a lone sentence), so I recommend re-writing the entire section.
- f. I suggest including bullets or something similar to summarize the main findings of the study.

Minor comments:

1. Page 1, Lines 1-12: Please add a few sentences to the abstract describing the primary results of the study.
2. Page 1, Line 5: Define ALOMAR.
3. Page 1, Line 15: Define SSA. All acronyms should be defined at their first use in the paper.
4. Introduction section: State the location and dates of the study.
5. Page 2, Lines 31-33: lidar measurements of what? R and CR? Explain the parameters of interest. Also, add more motivation as to why this study is important. What is being accomplished/what is the general purpose of this paper?
6. Page 3, Line 5: Add the elevation of the ALOMAR station.
7. Pages 3 and 4 (Section 2): I suggest not using dashes when listing the processing steps. Bullets may work better.
8. Page 4, Line 14: How was this relative uncertainty computed? Please add an explanation to the text.
9. Page 6, Lines 1-2: The layers are also not associated with PSCs because of the PSC screening metrics described on Page 5, correct?
10. Page 7, Line 20: Rephrase "The first picture".
11. Page 7, Line 31: Significantly lower altitudes? Are you comparing 12-18 km to 12-22 km? If so, this sentence does not make sense. This paragraph is confusing, so I recommend revising it.
12. Page 8, Lines 1-4: How do these findings compare with other studies?
13. Figure 2: Add labels, like a-d, to the plots, and refer to them in the caption. How was the altitude range of the stratospheric aerosol layer determined? Also, as a general comment, mention whether the altitudes are referenced to above ground level (AGL) or above mean sea level (AMSL). This should be stated in the text of the paper as well.
14. Figure 4: For the x-axis, I suggest not using a slash symbol (/) here, as this could be confusing. Maybe use "or" instead. Also, the colored shaded areas representing the measurement uncertainties are very difficult to see.
15. Figure 5: Please mention in the caption what the shaded area in blue and black vertical line at  $R_{355/387} = 1$  represent.
16. Figure 8 caption: I suggest re-wording "Time of available data".
17. Figures 1-10: I suggest making the text larger for both the axes and color bars.