Manuscript by Kaifler et. al:
The polar mesosphere cloud dataset of the Balloon Lidar Experiment BOLIDE

General comments:

The manuscript describes PMC data obtained from a stratospheric balloon flight during a 6 day mission from Sweden to Canada. PMC are known since more than 100 years as noctilucent clouds (NLC) and consist of nanometer sized ice particles in an altitude range from roughly 80 to 90 km. They occur during summer at polar latitudes due to low temperatures and enhanced water vapor at this altitude region. Besides their role in the field of climate change, PMC are important tracers for the dynamics at such high altitudes. The ice particles visualize changes in ambient temperature and water vapor as well as show imprints of atmospheric waves at different time scales. In recent years, high resolution lidar measurements (spatial and temporal) of PMC contribute increasingly to the understanding of small-scale dynamical processes induced by the breaking of atmospheric gravity waves and their energy transition into turbulence.

BOLIDE contributes to this topic as balloon-based lidar by profiling PMC layers over an extended longitude section, compared to fixed location ground-based lidars. Results of this experiment have been already published, indicating the significance of the dataset. Here, the authors describe the primary parameter of the lidar soundings (time and range resolved volume backscatter coefficient), along with position data of the ballon. Additionally some mean properties of the dataset are compared to multi-year ground-based lidar data at ALOMAR to confirm general consistency. Special emphasis is put on the determination of altitude and orientation of the moving lidar, which is essential for the interpretation of the observations. In my opinion the manuscript addresses all necessary topics to assist potential users of this dataset in understanding the processing chain.

The dataset is available for download at Zenodo. I was able to extract the data from the NetCDF file. Some quick plots confirmed information given in the manuscript.

The manuscript is well written and structured. The data are of importance for the investigation of high altitude dynamical processes, which are hardly accessible by other experimental methods.
I recommend publication in ESSD after addressing the following specific comments.

Specific comments:

Line 35:
- The tilde sign should not be separated from the number.

Section 2:
- I could imagine that there was a gondola swing and wonder about its impact on the laser beam direction, and hence the spot inside the PMC layer (in addition to the rotation). Please clarify this.

Figure 1:
- Please increase the width of the plots, the significance values in the lower panels are hardly readable.

Lines 95-97, Fig. 2:
- It is good practice to make data users aware of potentially strange data periods. However, showing the belonging plots as first PMC plots in the course of the manuscript appears unwise. I suggest putting Fig. 2 into an appendix and adding some short text to make aware, e.g., that double layers might be caused by 2 single layers at different locations (or something like that).

Line 118:
- Why is A0 influenced by PMC? The background is determined above 96 km, i.e. well above the PMC layers. Please explain.

Line 144:
- … only hinted at at the … (typo)

Figure 4:
- It would be better to have identical y-scalings for all plots.

Line 150:
- Please check if logarithm in the formula for BETAint is correct.

Line 169 and thereafter:
- The longitude of ALOMAR is 16 deg E.

Line 171:
- "intra-annual"; Do you mean year-to-year variations? If yes, please use "interannual".

Figure 5:
- I miss a first part of the caption, describing what is basically shown here.
- Please explain the gray areas (panel b) in the caption.
- I wonder why there are no BETA values at times BETAmax exists (panel e vs panel c). Please check.
- Please add a color bar for panel e.
- I wonder about the low mean BETA values in panel f, even though the data resolution is highest. Fig. 4 shows that at this resolution low BETA values are not significant and thus missed. Hence I would expect larger mean values. Please explain.

Figures 7 and 8:
- Please add vertical axis labels and reduce minor tick numbers in some panels.

Line 260:
- The title is: "Auffallende Abenderscheinungen am Himmel".

Line 262-263:
- The paper is already published.