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Atmospheric Measurement Techniques Discussions

Interactive comment on "A technical description of the Balloon Lidar Experiment BOLIDE" *by* Bernd Kaifler et al.

Anonymous Referee #2

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The manuscript decribes the design, development and first results of a novel lidar operated on a NASA long duration balloon mission. The lidar operated for 6 days in July 2018 and sucessfully recorded Polar Mesospheric Clouds (PMC). The manuscript describes the technical aspects of the lidar development and performance estimations for the detection of PMC. The estimates are compared to one example on July 11, 2018. The paper is well written and allows for an easy understanding of the complicated topic. It was a pleasure to read the manuscript.

I only have some minor comments in addition to those by Referee #1:

Page 4, Line 101: "180 μrad" $\rightarrow$ "165 μrad"?

Page 6, Line 136: "First mirror" $\rightarrow$ "Motorized mirror"

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Page 6, Line 146: "100 Hz rotations..." what is the actual chopping frequency? For balance reasons I would guess the chopper blade has more than 1 hole.

Page 9, Line 197: what are "the laser replacement heater and radiator bias heaters"? Does that statement mean the same thing as the "replacement heaters" in line 191?

Page 11, Lines 255 to 265: For me the detailed discussion of the plans for launches from Mc Murdo seem disturbing. At the end the summary is that 2° to 45° is the range of relevant solar elevation angles. Fig. 6 then shows solar elevation angles between <1° and ∼40°, I see no discrepancy here, but the text was just slightly confusing to read.

Page 12, Line 282: "We used this profile scaled ..." → "We used the profile of β_{PMC} scaled ..."

Page 306 and 362: "... surpassed that of the largest ground-based lidar systems" and "... with better quality (higher resolution and lower detection threshold) than ground-based lidar experiments."

It is unclear what the actual parameters of the ground-based lidar systems are. I guess the statement is probably true at times, but I also guess that the performance of a ground based lidar varies substantially throughout the day, even more than the variation seen in BOLIDE (Fig. 6).

I suggest revisiting this statement, probably with updating the reference to "ground-based lidar systems" given on Page 3, line 79: There is one reference given to a rather old publication (Fiedler et al., 2011) where a decadal scale dataset was analized with a resolution that was for this purpose chosen to be 14 minutes. Since then a couple of publications have shown lidar observation of NLC with a resolution higher than 14 minutes and some with resolutions well below 30 seconds and 100 m. Measurement uncertainties have been reported as low as $0.1 \times 10-10$ m-1 sr-1.

Kaifler et al., JGR, 2018; https://doi.org/10.1029/2018JD029717

Ridder et al., JASTP, 2017; http://dx.doi.org/10.1016/j.jastp.2017.04.005

Fritts et al., JASTP, 2017; http://dx.doi.org/10.1016/j.jastp.2016.11.006

Kaifler et al., ACP, 2013; http://dx.doi.org/10.5194/acp-13-11757-2013

Baumgarten, GRL, 2012; http://dx.doi.org/10.1029/2011GL049935

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