

This is a very nice statistical study focusing on coincident measurements of summer time PMSE and NLC over ALOMAR, Norway using 9 years of radar and lidar data. Both datasets are extensive and of exceptional quality. The statistical results are clear and well described, but not unexpected given the current knowledge of the formation of the ice particles in the summer mesopause region. Nevertheless, this statistical study is very useful and worthy of publication as it provides a solid background for relating PMSE, NLC and their satellite equivalence, termed polar mesospheric clouds (PMC). There are no serious comments concerning the analysis and interpretation of the measurements and results. However, the follow comments should be addressed.

1. Some of the statements concerning the PMSE and NLC need further work for better clarification. For example, it is clearly stated in the abstract and the text (line 304-305) that the PMSE lower boundary is below NLC, which should be the case for **bright** NLC only. Most of the cases, according to table 3, case I to VI, “on average”, show that the bottom of the PMSE is higher than the NLC lower boundary, $DZ_{bot}(NLC-PMSE) = -0.88$ km, as stated in line 270-271 on page 9.
2. Use of the terms, such as “overtake” and “force” are descriptive but not scientifically meaningful and need to be qualified.
3. Although it mentioned that measurements were made 24 hour, the only examples given in figure 2 are night time events. It would be helpful to see some examples of NLC and PMSE measurements during the day.
4. How do these results compare with the recent presentation by Rapp et al., (2009 Fall AGU talk) which compared PMC measurements by SOFIE onboard of AIM satellite with PMSE and NLC measurements at ALOMAR? My understanding was that SOFIE detects more NLC events than the radar detections of PMSE, possibly as SOFIE can measure smaller size ice particles and also because (as stated in this paper) the PMSE occurrence depends on not only the ice particle but also the electron density and turbulence while the NLCs exist when there are ice particles, whether or not the lidar can measure them. So in this paper, it must be clarified that the occurrence of NLC as measured by **lidar** instrument is less than PMSE measured by radar.
5. Additional references to previous published work on the relation between PMSE and NLC should be included, such as
Kirkwood, S., Cho, J., Hall, C.M., Hoppe, U.-P., Murtagh, D.P., Stegman, J., Swartz, W.E., van Eyken, A.P., Wannberg, G., Witt, G., 1995. A comparison of PMSE and other ground-based observations during the NLC-91 campaign. *Journal of Atmospheric and Terrestrial Physics* 57, 35–44.
Taylor, M.J., van Eyken, A.P., Rishbeth, H., Witt, G., Witt, N., Clilverd, M.A., 1989. Simultaneous observations of noctilucent clouds and polar mesospheric radar echoes: evidence for noncorrelation. *Planetary and Space Science* 37, 1013–1020.

Some minor points (plus others) need to be addressed:

The use of LT and UT needs to be more consistent.

There are some minor English edits to be made.

Line 23: monostatic **radar**?

Line 38: possible **to be observed** by naked eye

Line 115: lidar sounding volume: 10m x **10km** x 500m?

Line 250-252: I can only conclude that near the lower boundaries of PMSEs, most of the ice particles are large in sizes compared to the those at higher altitudes. There still can be smaller size ice in this region, not detectable by the lidar. Please change the word “complete” to something not so strong.

Line 273: to be visible as NLC “by the lidar”...

Line 297-298: the bottom altitude does not decrease with increasing threshold. As the bright clouds sit at lower altitudes than the dimmer ones, increasing threshold removes the dim clouds from your sample set. It is the brightness of the cloud that affects the altitude not the threshold. Please rephrase.

Line 317-319: reducing the lidar threshold to 0 does not improve the lidar sensitivity. This result is still limited by the fact that lidar can't detect ice <20nm.

Line 354-355: missing PMSE during NLC = $P(\text{NLC}/\text{no PMSE}) = \text{prob.5?}$ so, remove the word “missing”?

Line 394: PMSE layer “can” extends to lower altitudes with the presence of NLC, not always (for 204 h out of 438 h, nearly half of the time, PMSE above and inside NLC as listed in table 1).

Line 405: “As NLC sees large particles....” . The NLCs do not “see” ice particles, they are made of a distribution of ice particles. This sentence needs further clarification.