

Review of ACP Manuscript egusphere-2025-1888

The authors describe the depletion of the meteoric Na, Ni, and Ca layers observed with lidars at several mid-latitude sites in eastern China during a Super Substorm in Nov 2021. The paper is well-organized, clearly written, and certainly of interest to the upper atmosphere science community. The metal layer depletion, coincident with the substorm, is unequivocal and the authors provide a well-reasoned description of a chemical mechanism that is plausibly responsible for the depletions. The paper is easy to read, logically organized, and shows convincingly that the depletions are unusual and highly correlated with standard indices used to characterize geomagnetic activity.

I recommend the paper be accepted for publication in its current form, subject to some minor editorial corrections and suggestions listed below.

Line 33 typo “field”

Line 46 typo “winter”

Line 55 typo “geomagnetic”

Figure 2 this is an important figure that contains a large amount of relevant information, but in its current form it is hard read because the panels and text are small. I suggest rotating the figure 180° to make it a 4x5 figure (which could be expanded to a full page), and perhaps consider using a color scale for the density contours. Alternatively, perhaps the authors could prepare separate figures for the different metals, although there is value in including all the metals in a single figure.

Lines 133-140 change the density units from “particles/cm³” to “atoms/cm³”

Figure 3 I could not see the error bars. Perhaps it is sufficient to just quote an upper bound such less than x% in the caption.

Lines 172-176 I found this sentence confusing and was especially surprised at the very low cross-correlation between the Pingquan Na and Yanqing Ca abundances. I wonder if this calculation should just be eliminated because Figs. 2 and 3 clearly show all measurements at the lidar sites showed significant depletion of the metals during the substorm. While the cross-correlation coefficients are interesting, the values may raise more questions than they answer.

Line 196 “there were no significant changes in the MLT...”