

***Interactive comment on* “Simultaneous aerosol measurements of unusual aerosol enhancement in troposphere over Syowa Station, Antarctica” by K. Hara et al.**

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We are grateful for helpful comments and suggestions from Referee #1. We improved our manuscript on basis of comments by Referee #1.

(1) Comment from Reviewer: As the goals of this paper the authors simply state that they aim to elucidate the Antarctic haze phenomenon and shed new light on its vertical structure.

Author's Reply: Description of aim was rewritten to “To elucidate “Antarctic haze” (aerosol enhancement) and the vertical structure, this study combines ground-based

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aerosol measurements, remote sensing, and in-situ aerosol measurements in the upper boundary layer-free troposphere”.

(2) Comment from Reviewer: The only new observation is that >0.3 μm particle (sea salt) is observed in two occasions at altitudes up to 4 km. The meaning and value of this observation remains open.

Author’s Reply: We added results and discussion about vertical and seasonal features of appearance of aerosol enhanced layer over Syowa Station using continuous MPL data into section of 3-3 in the revised manuscript.

(3) Comment from Reviewer: Yet another problem with the paper is that the measurements were limited to particles >0.3 μm in diameter. This size range is inappropriate for the sea salt particle mass or surface area concentration, quantities that were not reported here at all.

Author’s Reply: Aerosol mass concentrations were estimated from aerosol number concentrations assuming aerosol shape (spheres) and density. Profiles of aerosol mass concentrations were added to Figs. 1, 2, 4 and 5. Discussion about aerosol mass concentrations was added also in text of the revised manuscript.

(4) Comment from Reviewer: The number concentration of particles >3 μm is not a very useful quantity as it represents only a subset of the number concentration of sea salt particles, and a negligible subset of the total particle number concentration.

Author’s Reply: During winter – spring, sea-salt particles were dominant in ultrafine – coarse mode at Syowa Station as discussed in our previous studies (Hara et al., 2010, 2011). Particularly, high abundance of sea-salt particles in ultrafine – coarse mode was identified in Antarctic haze and aerosol enhanced conditions (Hara et al., 2010, 2011, 2013). Therefore, the number concentrations of aerosol particles measured by OPC can be useful indicators for sea-salt particles during winter – spring. The description about them was added into the text of the revised manuscript.

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