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## ***Interactive comment on “Seasonal variations and vertical features of aerosol particles in the Antarctic troposphere” by K. Hara et al.***

**K. Hara et al.**

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We are grateful for helpful comments and suggestions from Referee #2. We improved our manuscript as suggested by Referee #2.

(1) “Introduction” was improved in accordance with your comments and suggestions. Repetition of description about free tropospheric aerosols was corrected. In addition, some description of interactions among aerosols, Antarctic climate, and ice core records were added into the text.

(2) Description about circumstance around Syowa station (e.g., location of operating site, plausible local contamination and others) into the section of “Measurements”. Because tethered-balloon operation was restricted by surface wind conditions, tethered

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balloon borne aerosol measurements was made one – three times a month. Direct aerosol sampling was made in all measurements. The insulator box was heated using a few disposable heating pads (commercial products in Japan) to keep warm condition inside the box. Temperature in the box was monitored by thermo sensor equipped in the OPC (KR12A). Even in the coldest condition (ca. -34 degree Celsius), temperature in the box was higher than 2 – 3 degree Celsius during the measurements. Considering the temperature difference between ambient air and inside of the insulator box, the number concentration might be measured mostly under the dry conditions. Ground base aerosol measurements were carried out simultaneously at clean air observatory, ca. 200 m distant from balloon-operating site (C-heliport). Flow rates of CPC and OPC are 700 cm<sup>3</sup>/min and 2.83 L/min, respectively. The aerosol number concentrations were converted to those under the standard condition (0 degree Celsius and 1013.25 hPa). These descriptions were added into the text.

(3) In this study, we classified “lower troposphere (observed range)” into the surface inversion layer (ca. <300 m), boundary layer (ca. 1000 m), and lower free troposphere (ca. >1000 m) according to vertical features of air temperature (e.g., temperature inversion) and relative humidity in each tethered balloon measurement.

(4) Section of 3-2-1 (Variation of coarse and fine particles) was improved as your helpful suggestions. Structure of description was changed as follows; 1) seasonal characteristics, 2) concentration enhancement periods, and 3) low concentration periods. Also comparison with aerosol measurements at surface was added into the text.

(5) Comparison with CN data at surface was added into the text in the section of “3-2-2 Seasonal and vertical features of CN concentration”. Moreover, description in Section 3-3 was corrected and compressed in the revised manuscript. Description about possibility of local contamination was moved to top of Section “3-2-1 Variation of coarse and fine particles”.

(6) Other minor points were updated and corrected in the revised manuscript.

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