

## ***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 #1(A. Virkkula). We improved our manuscript as suggested by A. Virkkula.

(1) Comment from Reviewer: Syowa is a famous station but still I wish you would write some basic information on it: distance from the open, sea-ice free ocean in summer and winter.

Author's Reply: We add description about circumstance around Syowa station (e.g., distance from sea-ice margin, plausible local contamination and others) into the section of “Measurements”.

(2) Comment from Reviewer: P 7559, L 10. Mention the diameters of the OPC chan-

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nels. Author's Reply: We did not add in the text, because diameters of OPC channels were already listed in the Table 1.

(3) Comment from Reviewer: You mention an impactor, also in table 1. But you show no data anywhere, why? If you don't use it, explain reasons. And if you do use the data, you should explain more about it: flow rates, pumps, subsequent analyses etc. And if you don't use the data at all, you could just as well not mention the impactor at all. But this is a minor thing.

Author's Reply: Because of short description about direct aerosol sampling using impactor in explanation of the Fig.1, we remain the description in Table.1.

(4) Comment from Reviewer: You placed the instruments in an insulated box. Did you heat it in any way? This is important because according to the manual the TSI model 3007 CPC operating temperatures are +10 – +35 degree Celsius and temperatures are lower than that even at ground level. Did you measure the box temperature during the flights? Another thing related to this: when the sonde ascends, it generally goes to lower temperatures and instruments cool down, if the instruments are not in a heated box. When the sonde then comes downwards, the instruments are still cold and water vapor may condense on optics and create erroneous counts. Did you see anything like this or were the concentrations the same both when ascending and descending? Did you compare the concentrations at the lowest altitudes with the ground-based measurements at Syowa – I suppose you have similar instruments there. How big or small were the differences?

Author's Reply: During the aerosol measurements, a few disposable heating pads (commercial products in Japan) were installed in the insulated box together with OPC and CPC. Temperature in the box was monitored by thermo sensor in the OPC. Even in the coldest conditions (ca. -34 °C), temperature in the box was higher than 2 – 3 degree Celsius during the OPC-CPC measurements. Significant difference between the concentrations in the ascent and descent was not observed. In addition, CN con-

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centrations in tethered balloon-borne measurements were matched well to those in the surface aerosol measurements at clean air observatory, approximately 200 m distant from the heliport. Therefore, we concluded that CN measurements in the tethered balloon system were made well. These descriptions were added into the text.

(4) Comment from Reviewer: How about  $\text{CO}_2$ ? The sondes went quite high and pressure decreased. How does this affect the pumps of the OPC and the CPC? Did you make any STP corrections or are all the concentrations at ambient  $t \& p$ ?

Author's Reply: Flow rates of OPC and CPC were 2.83 L/min and 0.7 L/min, respectively. Pressure dependence of flow rates was corrected on basis of test using low pressure chamber in our laboratory. The number concentrations were converted to those under the standard condition (0 degree Celsius and 1013.25 hPa). Some descriptions were added into the text.

(5) Comment from Reviewer: How many soundings did you make? How often? How long time did one full sounding take?

Author's Reply: Because tethered-balloon operation was restricted by surface wind conditions, tethered balloon borne aerosol measurements was made one – three times a month. Speeds of ascent and descent were adjusted to approximately 1 m s<sup>-1</sup> in each tethered balloon-borne measurement as shown in Figure 1. Thus, the longest sounding time (the case of Fig.1) was approximately 4 hours (containing OPC-CPC measurements and direct aerosol sampling). Some descriptions were added into the text.

(6) Comment from Reviewer: Why did you calculate the Junge slope from the diameter range 0.3 – 5  $\mu\text{m}$  and not using also the CPC data? This is  $\text{CO}_2$ , I don't require using it, just explain why?

Author's Reply: We calculated the Junge slope from the diameter range 0.3 – 5 micrometer and not using also the CPC data, because CPC data did not include size

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distribution.

(7) Comment from Reviewer: Does each vertical bar represent trajectories calculated for one sounding or what? Write units for each subplot. Is the altitude on the left the arrival altitude above Syowa? You could mention that.

Author's Reply: Each vertical bar represent air mass history calculated by backward trajectory for each tethered balloon operation. Y-axis height in the figure means start altitude in the trajectory and color contour indicates air mass history calculated in the trajectory. Some descriptions were added into the text. Units were added to each sub plot.

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

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 7555, 2011.

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