Atmos. Chem. Phys. Discuss., 11, C7238–C7240, 2011
www.atmos-chem-phys-discuss.net/11/C7238/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Seasonal features of ultrafine particle volatility in the coastal Antarctic troposphere" *by* K. Hara et al.

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Received and published: 2 August 2011

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

We used two SMPSs in this study. To check data quality, we compared among CN concentrations obtained by CPC-3010, the integrated number concentrations by SMPS (Dp: 10-168 nm) and the integrated number concentrations by TSMPS (Dp: 10-168 nm) during the room temperature scan. Because of remove of aerosol particles by impactor in TSMPS and SMPS, the integrated number concentrations were lower than CN concentration. However, good correlation among CN and the integrated number concentrations was observed. In addition, the integrated number concentration of TSMPS was correlated well to the integrated number concentration of SMPS, although long

tubing of thermo denuder lead to slight under-estimation of concentrations in TSMPS. Consequently, abundance of non-volatile particles can be estimated using TSMPS and SMPS data. Because of different size range in TSMPS and SMPS measurements, number concentrations were integrated in size range of 10-168 nm. Details of procedure of data analysis were added in the text.

In order to compare between aerosol volatility and air mass origin, aerosol volatility was classified based on air mass origin using 5-day backward trajectory. Relative abundance of non-volatile particles in the air mass from Antarctic continent was obviously lower than that in the Antarctic coasts and southern Ocean. The description and figure were added in the revised manuscript.

Detailed comments were improved as follows;

(1) Abstract, line 9: why might? Results clearly show that it does

Author's reply: "might" was removed from the text. The description was changed to "Therefore, the seasonal feature of volatility of ultrafine particles at Syowa was associated with seasonal variations of the major aerosol constituents."

(2) Most aerosol particles are distributed in ultrafine mode > 100 nm. This is not correct, there are many places where this is not the case.

Author's reply: As shown in Figs. 3 and 6, aerosol particles were dominated in the ultrafine mode at Syowa station in the terms of number concentrations. The description was changed to "In terms of the number concentration, aerosol particles in polar regions are dominated mostly in ultrafine mode: smaller than 100 nm in diameter."

(3) Do you have a reference to a new particle formation through nucleation of H2SO4 or it is just best guess.

Author's reply: Reference about new particle formation from H2SO4 was added in the test.

(4) Page 14780, line 21: should be 180 min ?

Author's reply: Here, 280 min. is correct. 180 min. was total scan time in room temperature, 100 C, and 240 C. 280 min is including the heating and cooling time.

(5) Page 14780, line 22: change "one datum" to "one scan"

Author's reply: "one datum" was changed to "one scan".

(6) In chapter 3.4 (lines 25-27) authors argue about effect on climate change. It should be change to effect on climate. Sea salt is natural aerosol and its possible effect as a result of climate change can be discussed if authors show changes in temporal trend in sea salt aerosol number density linked to climate change (changes in sea ice coverage, temperature, etc.).

Author's reply: Here, we suggest that sea-salt particles have potential to affect atmospheric radiation budget and climate. The description was modified as follows; "Because Sea-salts are hygroscopic species, the dominance of sea-salt particles during winter–spring strongly suggests that dispersion of sea-salt particles supplied from sea ice and the sea surface might be an important CCN source in the Antarctic troposphere during winter–spring. The number concentration of sea-salt particles was too low to make a direct effect on climate change. When sea-salt number density is enhanced by strong winds and larger sea-ice extent, sea-salt particles are expected to affect the radiation budget and climate during winter–spring in Antarctic regions through cloud formation (i.e. indirect effect)."

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 14777, 2011.