

Long-term and intensive measurements of black carbon aerosols in the Arctic

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Black carbon (BC) aerosols are dark-colored carbonaceous particles (soot particles), which are generated during the combustion processes of fossil fuel and biomass. BC transported from low-, mid-, and high-latitudes to the Arctic region strongly absorbs the solar radiation and may accelerate the warming of the Arctic. BC deposited onto snow also lowers snow albedo and contribute to the warming. Therefore, reliable data on the abundance and size distributions of BC in air and snow are critical to assess the impacts of BC on the climate in the Arctic. In 2012, we started long-term measurements of BC in near-surface air at the two Arctic sites, Ny-Ålesund (Norway) and Barrow (Alaska, USA), using a continuous soot monitoring system (COSMOS). Unlike the other types of filter-based instruments, COSMOS uses a heated inlet to remove volatile aerosol compounds in the sample air and thus enables accurate quantification of BC mass concentrations. We report seasonal variations of BC abundance at these sites (Figure 1) and also discuss their long-term trends (Sinha et al., 2017). We also introduce the preparation for BC measurements using the COSMOS at two other Arctic sites, Baranovo (Russia) and Alert (Canada), to improve our understanding on the spatial distributions of BC in the Arctic.

In addition to the long-term measurements, we conducted intensive measurements of BC in ambient air at Zeppelin station at Ny-Ålesund in March 2017, using a single particle soot photometer (SP2). The SP2 measures BC mass within the individual aerosol particles by a laser-induced incandescence technique. The SP2 is also used to measure BC in snow samples. In this presentation, we show BC size distributions in air and snow. We also show the results of comparison of the BC values obtained by the COSMOS and SP2.

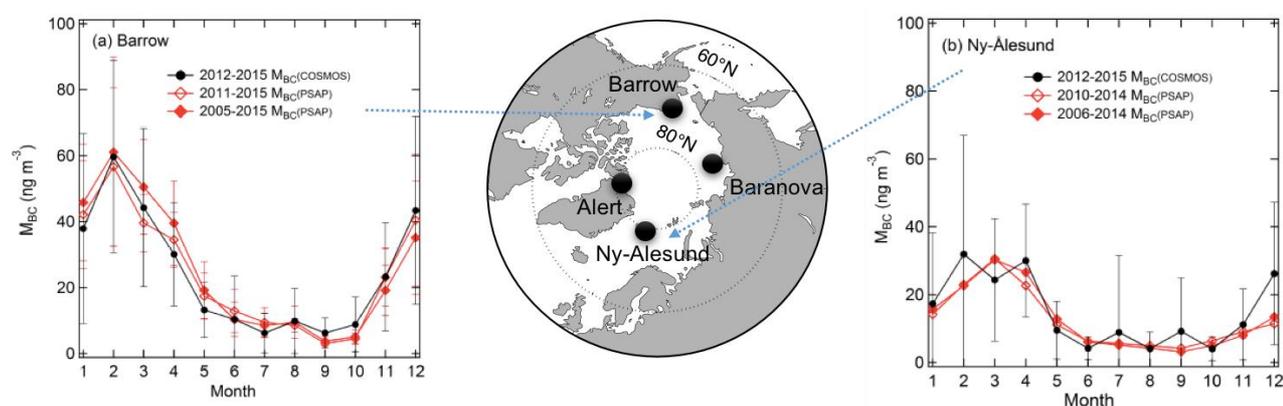


Figure 1. Seasonal variation of mass concentrations of BC in Barrow and Ny-Alesund. Map of the 4 Arctic sites, Barrow, Ny-Alesund, Baranovo, and Alert is also shown.

References

Sinha, P. R., Y. Kondo, M. Koike, J. Ogren, A. Jefferson, T. Barrett, R. Sheesley, S. Ohata, N. Moteki, H. Coe, D. Liu, M. Irwin, P. Tunved, P. K. Quinn, and Y. Zhao, Evaluation of ground-based black carbon measurements by filter-based photometers at two Arctic sites, *J. Geophys. Res.*, **122**, doi:10.1002/2016JD025843, 2017.