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MEASUREMENTS OF ATMOSPHERIC BLACK CARBON AEROSOLS OVER THE ARCTIC OCEAN ON R/V MIRAI DURING SEPTEMBER 2014

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Black carbon (BC) particles, generated from incomplete combustion of fossil fuels and biomass burning, is a strongly light-absorbing particulate matter. BC will reduce the surface albedo and accelerate snow/ice melting by absorbing the sunlight upon deposition, affecting the Arctic climate system. Long-term ground based observations and intensive field campaigns using airplanes have been carried out to obtain information of BC in the Arctic regions. However they are still too sparse to fully understand their effect on the Arctic climate. To obtain more information, we carried out measurements of BC over the Arctic Ocean for the first time using a highly sensitive online instrument, single particle soot photometer (SP2), during the cruise of R/V Mirai.

For the BC observation, ambient air was sampled from the flying bridge by a 3m-long conductive tube through the diffusion dryer to dry up the particles, and then introduced to the instrument. The laser-induced incandescence technique was used for detection of single particles of BC. The Figure shows a time profile of the BC mass concentrations over the Arctic Ocean at the stationary point (74-45N, 162-00W). To avoid the influence of ship exhaust from the utilized research vessel, we used only data recorded with relative wind direction and speed within $\pm 60^\circ$ from the bow and $>3\text{m/s}$, respectively. The results suggested that the BC mass concentrations were in the range of $0.01 - 20\text{ng/m}^3$ and the averaged value was $0.85 \pm 0.84 \text{ ng/m}^3$ during this measurement period. The single-particle-based observations enabled measurements of the very low concentration levels and their variations. Considering that the effect of the long-range transport of BC to the Arctic is limited in this season, our observed BC concentrations should be regarded as the background levels in the Arctic region. Further analysis will be included about BC properties such as size distribution, coating, and potential sources in the presentation.

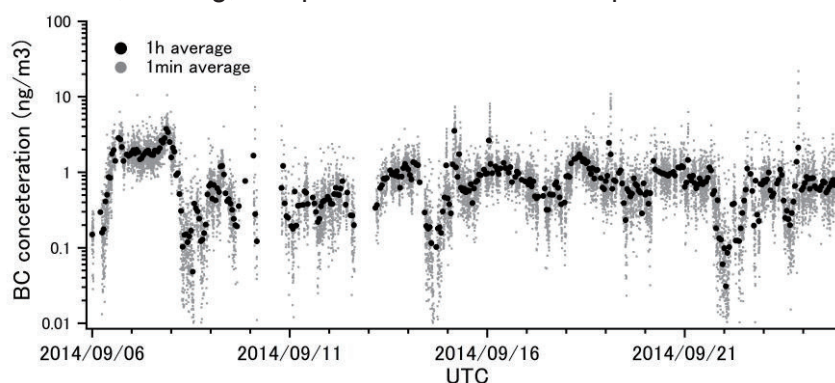


Figure. Time profile of the BC mass concentrations at the stationary point(74-45N, 162-00W)