Mixing States of Aged Black Carbon Collected over the Western North Pacific Ocean

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Atmospheric aerosol particles can play a vital role in the climate change because they influence the radiative forcing on the Earth through absorbing and scattering of solar radiation. Especially, black carbon (BC) is known to a strong absorber of visible spectrum solar radiation in the atmosphere. However, its radiative forcing changes variably depending on its microphysical properties (e.g. mixing state, compositions, and shape). Therefore, it is important to accurately measure their parameters, especially, over the ocean because the observation is limited. In this study, the morphology and chemical compositions of marine aerosol particles including BC over the western north Pacific Ocean were analyzed by the individual particle analyses.

Measurement and samplings of atmospheric aerosol particles were carried out during the R/V Hakuho-Maru cruise (14-30/11/2017). The ambient BC mass concentrations were measured by a particle soot/absorption photometer (PSAP). In this study, we focused on relatively high BC mass concentration events over the western north Pacific Ocean at 26.62˚N, 137.93˚E and at 25.51˚N, 135.77˚E on 19/11/2017. The aerosols collected in both events were analyzed using a transmission electron microscope and an energy dispersive X-ray spectrometer.

In both samples, most BCs were embedded in sulfate particles that have organic coatings. Only a few BCs were attached to sea-salt particles. The backward trajectory analyses suggested that the air masses of both events passed through the land of China and Japan. These results indicate that BCs were emitted in or around the land, and then SO_2 condensed on their surface before organic carbon condensed during transportation. Our result is useful to understand the aging process of BC over the ocean.

Keywords: Marine atmospheric aerosol, Black carbon, Sulfate, Organic carbon, The western north Pacific Ocean, TEM-EDX

