

Retrieval of decadal record on the deposition of particulate refractory carbon urban and remote sites in Japan

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The atmospheric concentration of refractory carbonaceous aerosol (black carbon, or elemental carbon) concentration are used for the evaluation of their direct radiative forcing. In addition, the deposition of such light absorbing substances on the snow or ice surface will result in the increase of the positive radiative forcing at the surface level. Long-term record of deposition for such relative inert substances is expected to reflect the change in the regional emission strength.

However, the reported measurements of deposition to the ground surface are scarce. We thus have conducted the retrieval of decadal record on the deposition of refractory carbon at two sites in the northern Japan (Rishiri Island: a remote site, and Sapporo City: an urban site). At these sites, the environmental monitoring division of local government have been measuring the total deposition of water-soluble aerosol components in the collected water by use of deposition gauges. To remove insoluble particles from the collected water placed beneath the funnel, a membrane pre-filter is placed at the bottom of the funnel of these deposition gauges. Such pre-filters were stored for more than 18 years for Sapporo site. These can be regarded as the long-term record of the deposited water-insoluble aerosol components in the past, as those in ice-core samples collected in glaciers.

We re-suspend these water-insoluble components into the aqueous phase by dissolving the membrane filter (mixed cellulose acetate) by an organic solvent and re-filter the suspended particles through quartz fiber filters for the analysis of TOT refractory carbon. Before dissolved into organic solvent, carbonate in soil dust particles were removed by the 2N HCl with heat. Collection efficacy of quartz fiber filters were corrected by the amount of retained particulate carbon on the first and second filters placed in series.

The deposition flux of TOT-EC is larger in Sapporo, while that in Rishiri showed a large seasonal variation, in general. In Sapporo, the flux decreased greatly in 2010s compared to those in 1990s, probably due to the introduction of regulations for diesel exhaust emission in 2000s. In addition, the deposition sample has been collected in Oki Island since 2013 spring. The preliminary result for this site will also be shown in the presentation.

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