



Long-term Observations of Carbonaceous Aerosols (including C isotope) at Alert: Inferring Emission Sources of Black Carbon Transported to the Arctic

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Black carbon is a major component of carbonaceous aerosols and formed by incomplete combustion of fossil fuels and biomass burning (including biofuels and open fires). It plays unique roles in Earth's climate system through both direct and indirect effects. Identifying and attributing its emission sources, tracking source changes with time and relating them to radiative forcing are important for understanding the impacts of BC on climate at the global and regional levels, as well as necessary for the strategies targeted to reduce BC emission. However, there are many challenges and uncertainties regarding those aspects, particularly for BC aerosols transported to the Arctic region.

To address the concerns of BC in the Arctic, carbonaceous aerosol observations, including elemental carbon (EC) content as BC mass, C isotopes as a source tracer, and light absorption coefficient as BC's optical property, have been conducted at Alert, a WMO GAW station (82°27'N, 62°31'W) since the early 2000s. In this presentation, nearly a decade of measurements will be presented, with a focus on the isotope results in EC (corresponding data from Beijing will also be shown for the purpose of comparison). Seasonal and inter-annual variations in $\delta^{13}\text{C}$ (EC) have been characterized, inferring emission sources and suggesting source changes over last 5-6 years. Based on the C isotope results, the possible emission sources of BC contributed to the Arctic will be also discussed.