Arctic Haze: Trends in Chemical Composition and Optical Properties

P.K. Quinn[1], B. Andrews[2], J. Christensen[3], E. Dutton[2], S. Gong[4], and G. Shaw[5]

[1]NOAA Pacific Marine Environmental Laboratory, 7600 Sand Point Way NE, Seattle, WA 98115;
206-526-6892; Fax: 206-526-6744; E-mail: Patricia.K.Quinn@noaa.gov
[2]NOAA Climate Monitoring and Diagnostics Laboratory, Boulder CO 80305
[3]National Environmental Research Institute, Department of Atmospheric Environment, Denmark
[4]Environment Canada, Toronto, Ontario, Canada
[5]University of Alaska, Fairbanks, AK 99775

It has been more than 50 years since observations of Arctic haze were first reported by pilots flying in the Canadian and Alaskan Arctic. This seasonal increase in pollutant haze and resulting decrease in visibility throughout the lower atmosphere has since been well documented. The longest record of sulfate concentrations in the Arctic (1980 to present at Alert, Canada) revealed no change in sulfate concentrations during the 1980s [Sirois and Barrie, *J. Geophys. Res., 104*, 11,599-11,618, 1999]. However, beginning in 1991, sulfate and other measured anthropogenic constituents began to decline suggesting that the reduction of industry in the early years of the new Eurasian republics was observable in the Arctic. Bodhaine and Dutton, *Geophys. Res. Lett., 20*, 947-950 [1993] reported that both aerosol scattering and optical depth measurements at Barrow showed a maximum in 1982 followed by a factor of two decrease between 1982 and 1992. The decrease was only apparent during March and April corresponding to the time of year when Arctic haze is most pronounced. This presentation will focus on trends in the aerosol chemical composition and optical properties since the 1990s based on data from several Arctic sampling stations (Figure 1).

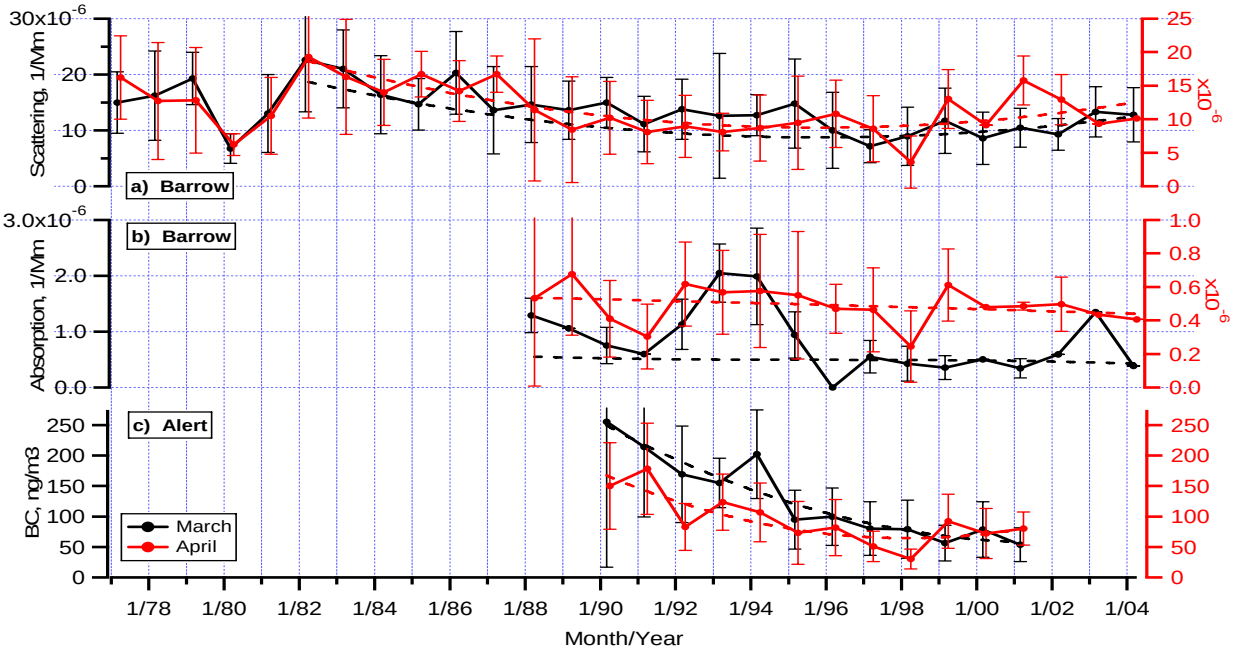

Figure 1. Monthly averaged (a) light scattering and (b) light absorption (Mm^{-1}) for sub-10 micron aerosol at Barrow, and (c) black carbon (ng m^3) for Alert. Averages for March and April are shown. Data made available for Barrow by CMDL and for Alert by the Canadian National Atmospheric Chemistry (NAtChem) Database and Analysis System.