

## Black Carbon in the Arctic: In the Arctic Report Card

S. Sharma<sup>1</sup>, J.A. Ogren<sup>2</sup>, E. Chan<sup>1</sup>, A. Jefferson<sup>3</sup>, K. Eleftheriadis<sup>4</sup>, P.K. Quinn<sup>5</sup> and J.F. Bukhart<sup>6</sup>

<sup>1</sup>Environment Canada, Climate Research Division, Atmospheric Science Technology Directorate/Science & Technology Branch, Toronto, Canada; 416-739-5820, E-mail: sangeeta.sharma@ec.gc.ca

<sup>2</sup>NOAA Earth System Research Laboratory, Boulder, CO 80305

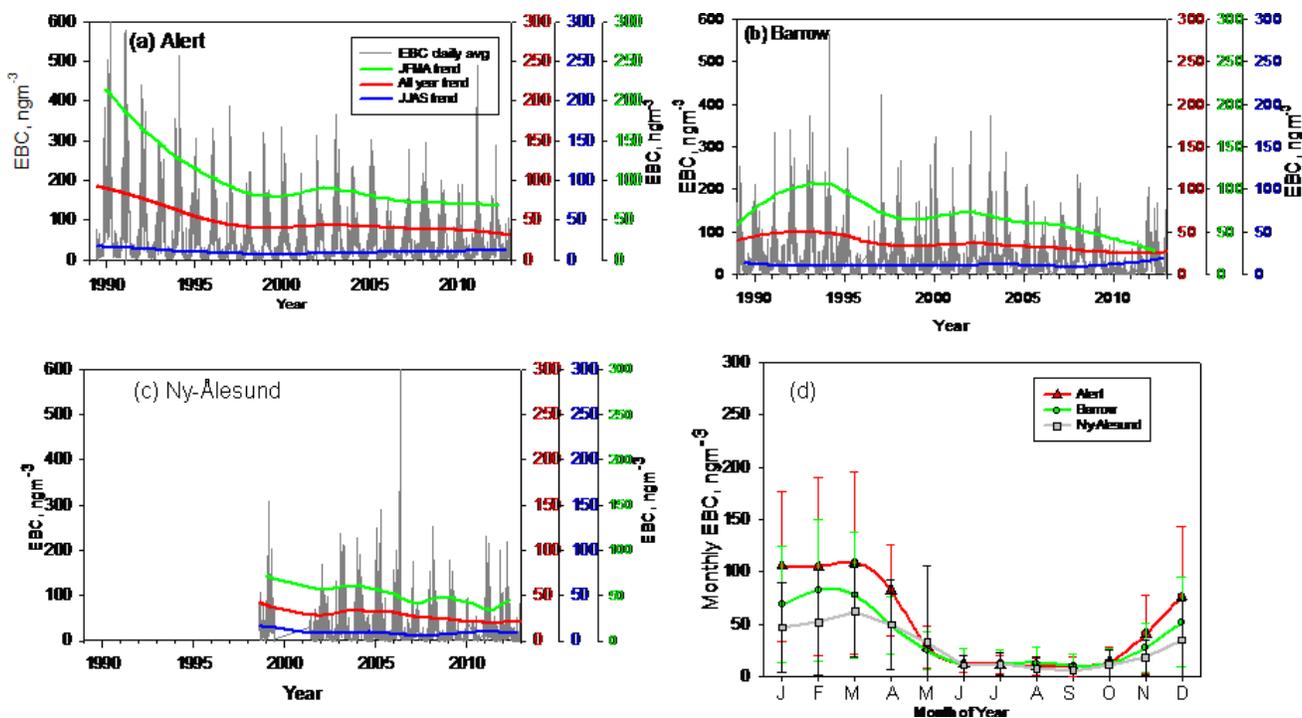
<sup>3</sup>NOAA Earth System Research Laboratory, Boulder, CO 80305

<sup>4</sup>Institut National de Recherche Scientifique et Technique (INRS), Greece

<sup>5</sup>NOAA, Pacific Marine Environmental Laboratory (PMEL), Seattle, WA 98115

<sup>6</sup>University of Oslo, Oslo, Norway

Long-term monitoring of black carbon in the Arctic is critical to understanding sources, transport pathways and environmental impacts in the Arctic, and to provide essential information for the development and implementation of mitigation options. Here we report long-term black carbon observations at three high Arctic locations: Alert (Canada), Barrow (United States) and Ny-Ålesund (Norway). A decline in Equivalent Black Carbon (EBC) concentrations of up to 55% was observed at Alert and Barrow (Figure 1a-c) since the early nineties, and has been related to changes in emissions sources in the Former Soviet Union region. Seasonally, all surface sites show the highest EBC concentrations when influenced by Arctic haze transported from mid-latitude source regions (Figure 1d). Minimal EBC is measured during the summer at these locations due to Arctic front confined to higher latitudes and more frequent wet deposition.



**Figure 1.** (a-c) Daily average EBC at Alert, Barrow and Ny-Ålesund. Trend lines (green, red, blue) were determined using the LOWESS technique (LOcally Weighed Exponentially Scatterplot Smoothing). The red line includes all EBC data, the green line is the average for January to April (JFMA), and the blue line is the average for June to September (JJAS). The % change in EBC between 1990-1993 and 2009-2012 is given for each trend line for Alert and Barrow. No significant (NS) change occurred in summer at those locations. (d) Seasonal variation at the three locations.