Enhanced Climate Monitoring Activities at Alert, Canada: A Partnership in the Study of Environmental Arctic Change (SEARCH)

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In 2004 NOAA joined in partnership with Environment Canada to upgrade an existing Global Atmosphere Watch (GAW) facility at Alert, Canada (82.5°N, 62.3°W). Enhancements combine a condensation nuclei counter (CNC) with an existing nephelometer and Particle Soot/Absorption Photometer (PSAP) to monitor in situ aerosol properties, ancillary meteorological instruments, and a suite of radiometers to measure the surface radiation balance and atmospheric opacity. Project support comes from the interagency Study of Environmental Arctic Change (SEARCH). Alert's complement of instruments will permit long-term monitoring of many important climate variables needed to improve our understanding of the Arctic climate system, to validate satellite retrievals, and to verify model results. Alert is the first observatory, supported by SEARCH, to be part of a planned circum-Arctic network. It is the third Baseline Surface Radiation Network (BSRN) site to operate in the Arctic. GAW and BSRN activities are being coordinated to monitor climate representative of the central Arctic. Aerosol and cloud effects are of particular interest because there are large uncertainties associated with simulating their climate impacts.

The deployment took place between March and August 2004. Descriptions of the instrument suites and observations are given. Time series (to date) and statistical summaries of key variables are presented to illustrate the unique characteristics of this northernmost, permanent monitoring site on Earth. Alert's climate is one of extremes that vary dramatically in response to the changing solar cycle and regional circulation patterns. In winter it is often within the polar vortex which is subject to ozone loss and also the accumulation of Arctic haze. Clouds profoundly impact the surface energy budget and thermal regime there. Snowfall is minimal but covers the ground all but several weeks of the year, imposing further constraints on the regional energy budget. The annual cycles of aerosol properties at Alert (Figure 1) show similarities to Barrow, Alaska. Preliminary analyses confirm that monitoring efforts at Alert will reveal important insights on the peculiar processes that determine Arctic climate, which in turn influences lower latitude weather patterns.

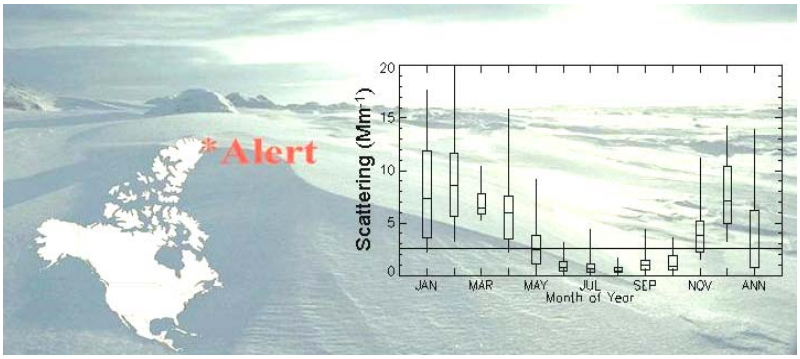

Figure 1. The first year of (550 nm) light scattering measurements at Alert show a similar cycle to that at the CMDL Barrow, Alaska, Observatory. The plot shows the 5th, 25th, median, 75th, and 95th percentiles computed from 1-minute data.