Geographical and Temporal Differences in NOAA Observed Surface Ozone in the Arctic

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The Arctic region is rapidly gaining interest and support for scientific studies to help understand and characterize the processes, sources, and chemical composition of the Arctic environment. In order to understand the Arctic climate system and the changes that are occurring, it is imperative to know the behavior and impact of atmospheric constituents. Surface level ozone in the Arctic is variable in both time and space and plays an essential role on the oxidation capacity of the atmosphere. The ESRL/GMD maintains continuous measurements and long-term records of ground-level ozone from Barrow, Alaska (since 1973), Summit, Greenland (since 2000), and Tiksi, Russia (since 2009). Measurements taken by Thermo-Scientific ozone monitors are collected and examined with the ESRL/GMD Aerosol LiveCPD system. This system of data acquisition and processing allows for data to be quality checked and investigated with regards to wind conditions and aerosol loading. These quality controlled data are used to develop seasonal climatologies, understand diurnal variation, and analyze differences in stations specifics by addressing spatial variability in the Arctic. Once typical ozone behavior is characterized, anomalies in the record can be defined and investigated. Increased ozone events associated with transported pollution and photochemical production of ozone, and ozone depletion episodes related to sea-ice halogen release and chemical destruction of ozone are the primary processes which lead to deviations from expected ground-level ozone conditions. The measurements taken from Barrow, Summit, and Tiksi are critical observations of ground-level ozone to provide fundamental understanding of the behavior and trends of ground-level ozone in the Arctic.

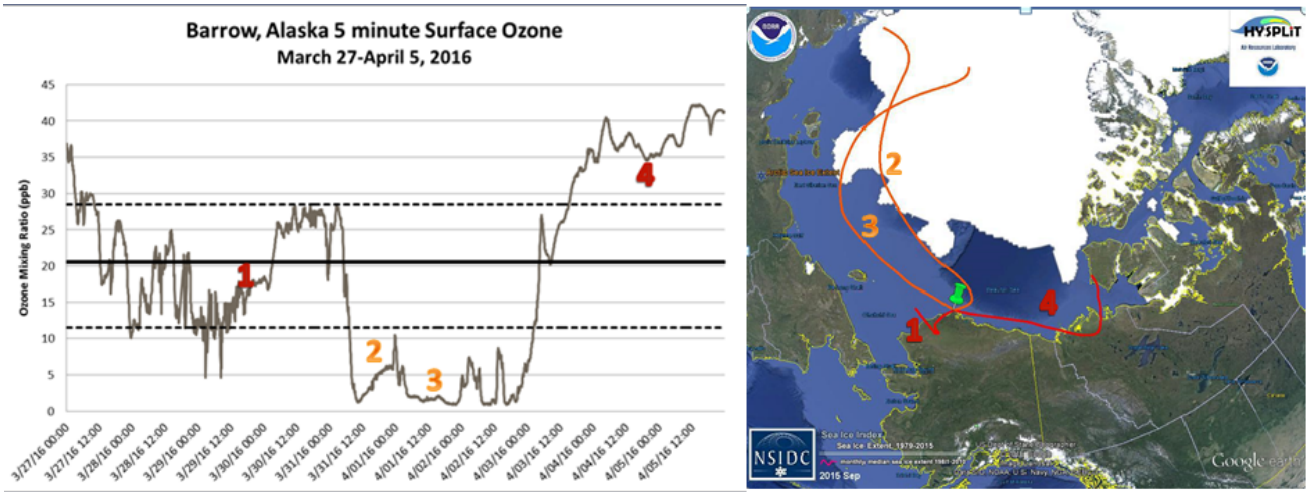

Figure 1. Barrow, Alaska surface ozone data from March 27, 2016 to April 5, 2016 is shown (grey line) with the average, 30th, and 70th percentiles from this time period displayed for reference. NOAA Hybrid Single Particle Langrangian Integrated Back Trajectory analysis is shown for four different time periods. This creates a visualization of the path which the air mass traveled before reaching the measurement station. The ozone depleted air masses have origins over the arctic sea where they were influnced by bromine released from the melting sea ice.