



Biogenic and fossil contributions to organic aerosol at two sites on the North Slope of Alaska

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Aerosols both directly and indirectly affect the Earth's albedo by scattering or absorbing solar radiation and acting as cloud and ice condensation nuclei. In order to better understand the variability of aerosol sources in the Alaskan Arctic, this study utilizes radiocarbon analysis for the apportionment of total organic carbon to fossil and contemporary carbon sources. Fossil sources include fossil fuel combustion and secondary organic aerosol (SOA) from fossil precursors while contemporary sources include biomass combustion, primary biogenic emissions, and SOA produced from biogenic and biomass combustion-derived precursors. Total suspended particulate (TSP) samples were collected in August/September 2012, 2015, and 2016 at two Department of Energy Atmospheric Radiation Measurement climate research facilities. Barrow, AK, is located on the northern most point of the United States; the site is 7.4 km north of the village of Barrow (population 4,581). Research shows the site receives minimal aerosol contribution from the village with dominant contributions from long range transport. Oliktok Point, AK, is 300 km south east of Barrow in a region of intense petroleum development. It receives contributions from the petroleum industry surrounding it as well as from long range transport. The proximity of the two sites allows for a finer spatial analysis of Arctic carbonaceous aerosol source contributions. Samples were analyzed for organic carbon (OC), elemental carbon (EC), and radiocarbon (^{14}C) abundance. Preliminary results for 2015 show Barrow had OC concentrations from 0.05 to 0.16 $\mu\text{g}/\text{m}^3$, while Oliktok had concentrations of OC from 0.11 to 0.27 $\mu\text{g}/\text{m}^3$. EC concentrations ranged from 0.002 to 0.013 $\mu\text{g}/\text{m}^3$ in Barrow, 0.002 to 0.088 $\mu\text{g}/\text{m}^3$ in Oliktok. In Barrow, ^{14}C abundance shows the contribution of fossil sources remained in the range of 21% to 28%. At Oliktok, analysis reveals an increase from 30% contribution from fossil sources in August to a 70% contribution at the end of September.