

Observations of Springtime Surface Ozone Depletion at Toolik Lake, Alaska (AK)

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Surface O₃ concentrations were measured at Toolik Lake, AK (68.63° N, 149.59° W; 720 m elevation) during Sept 2010 – Sept 2011 as part of a larger study investigating the role of snow over tundra and snow over a frozen lake on the chemistry of the near-surface atmosphere. Episodic springtime depletion of O₃ and gaseous elemental mercury (GEM) were observed at this inland site, which sits approximately 225 km from the coast at the northern border of the foothills of the Brooks Range. These observations were compared with surface O₃ data from Barrow, AK provided by the NOAA/ESRL Global Monitoring Division. In certain cases, especially during early spring, depletion events were observed at the coastal Barrow site, yet not at Toolik Lake.

Throughout April and early May 2011, O₃ and GEM depletion were observed at both locations (Figure 1). In all cases when depleted air masses were observed at Toolik Lake, similar events were also recorded at Barrow. In this study, back-trajectory analyses and locally measured turbulence and meteorological parameters are implemented in order to interpret the observed depletion events.

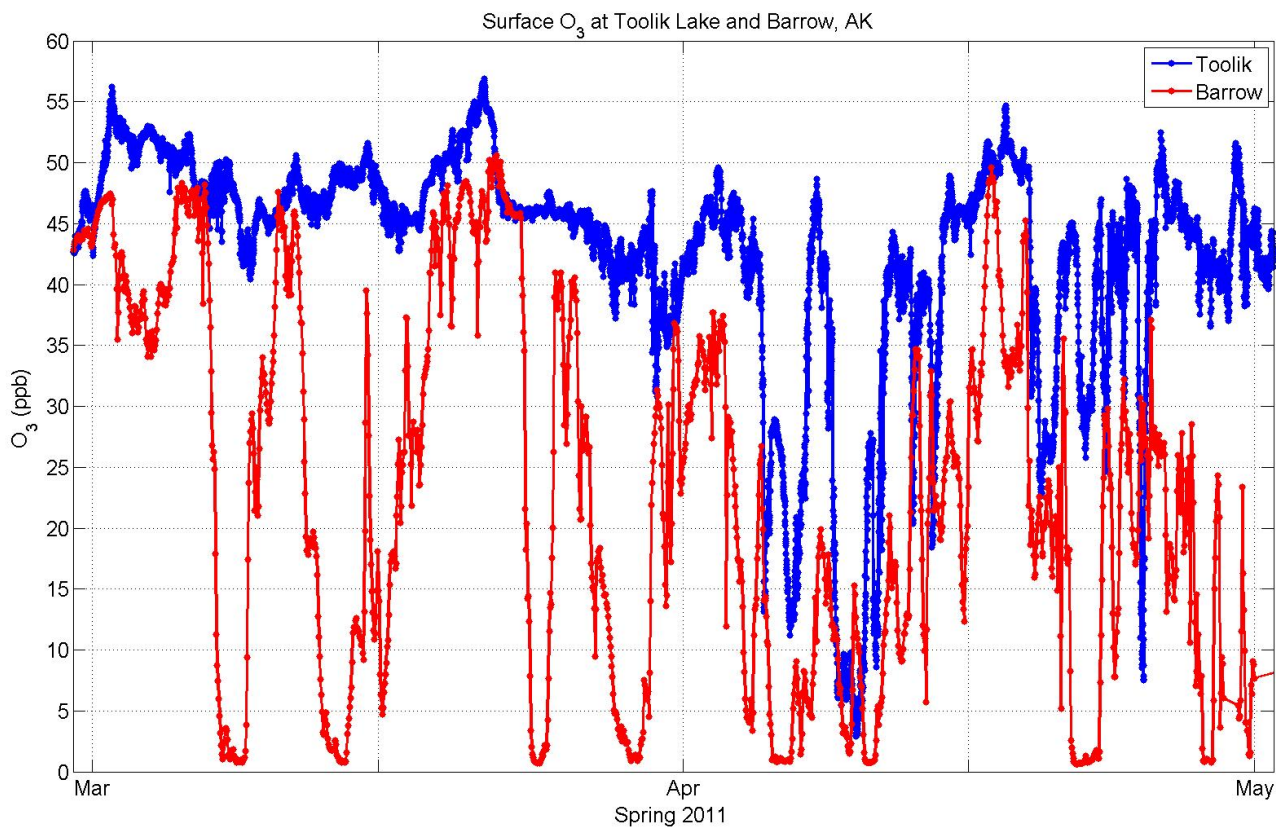


Figure 1. Shown are surface O₃ observations measured by Ultraviolet photometric O₃ analyzers. The red line shows data from Barrow, AK, and the blue line indicates data from Toolik Lake, AK, approximately 400 km to the south-east. As shown by the rapid decreases to near-zero O₃ values, O₃ depletion events were observed at both locations through the spring of 2011.