1.191 Odd oxygen budgets in a polluted winter boundary layer and its implication for wintertime oxidant formation.

Presenting Author:
Caroline Womack, NOAA Earth System Research Laboratory / CIRES, caroline.womack@noaa.gov

Co-Authors:
Erin McDuffie, NOAA Earth System Research Laboratory / CIRES
Dorothy Fibiger, NOAA Earth System Research Laboratory / CIRES
Alessandro Franchin, NOAA Earth System Research Laboratory / CIRES
Lexie Goldberger, University of Washington
Alexander Moravek, University of Toronto
Ann Middlebrook, NOAA Earth System Research Laboratory
Joel Thornton, University of Washington
William Dube, NOAA Earth System Research Laboratory / CIRES
Munkhbayar Baasandorj, University of Utah
Steven Brown, NOAA Earth System Research Laboratory

Abstract:

The mountain valleys of the western US experience high levels of wintertime air pollution, with Salt Lake Valley and its surrounding valleys reporting $PM_{2.5}$ levels that exceed the National Ambient Air Quality Standards on an average of 18 days each winter. These exceedances typically occur during persistent cold-air pools (PCAPs) which trap pollutants near the surface for days to weeks, forming $PM_{2.5}$ with composition strongly dominated by ammonium nitrate. The Utah Winter Fine Particulates Study (UWFPS) was a ground- and aircraft based study which took place Jan – Feb 2017, with the goal of measuring the spatial and temporal distribution of pollutants and their gas-phase precursors, and better characterizing the chemistry that leads to elevated levels of $PM_{2.5}$. We present an analysis of the partitioning among odd-oxygen species ($O_x = O_3 + NO_2 + ClNO_2 + 1.5\ HNO_3 + 3\ N_2O_5 + 1.5\ NO_{3\ (p)}^-$) in a polluted winter boundary layer. We further show the vertical and horizontal distributions of total odd oxygen and its evolution during PCAP events to levels well in excess of that defined by background ozone and NO_x oxidation reactions. This evolution implies an uncharacterized photochemical or primary source of oxidant, which may be one of the key drivers of winter $PM_{2.5}$ pollution.