Strong Wintertime Ozone Events in the Upper Green River Basin, Wyoming

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Observations:
Over the last years elevated ozone (O3) values have been observed repeatedly in the Upper Green River Basin (UGRB), Wyoming, during wintertime, when snow cover is present. Here we focus on high ozone days in late winter 2011 (1-hour average up to 168 ppb). Intensive Observational Periods (IOPs) were performed which included comprehensive surface and boundary layer measurements.

Low windspeeds in combination with low mixing layer heights (~50 m above ground level around noontime) are essential for accumulation of pollutants within the UGRB. Ozone profiles do not indicate any carry over. However, boundary layer air masses contain substantial amounts of reactive nitrogen (NOx) and non-methane hydrocarbons (NMHC) emitted through fossil fuel exploration activities of the Pinedale Anticline. In particular, high HONO levels were observed (maximum hourly median on IOP days: 1,096 pptv). These HONO levels are likely favored by a combination of shallow boundary layer conditions and enhanced photolysis rates due to the high albedo of the snow surface.

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Summary:
Observations in Winter 2011 indicate that photochemical smog in the Upper Green River Basin occurs within a very shallow boundary layer and is enhanced by the high albedo of the snow surface. OH production on IOP days is mainly due to HONO, O3, CH4, and NOx, deposited onto the snow surface and undergoing photo-enhanced heterogeneous conversion to HONO.

Further information:
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