

## Observations of Wintertime Ozone Production in the Uintah Basin of Utah in 2013

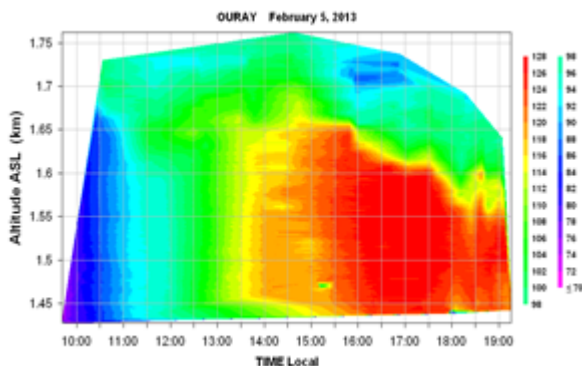
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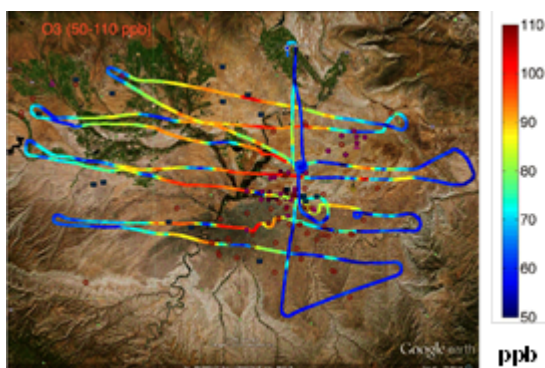
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During January and February 2013, ozone concentrations in the Uintah Basin of Utah routinely exceeded U.S. national air quality standards and surface ozone hourly averages reached values in excess of 160 ppb. In many respects the winter of 2013 mimicked the pattern observed in 2010 and 2011 but with even more persistent high ozone amounts. All three years had extensive snow cover throughout the Basin and strong temperature inversions. High ozone levels were not observed in 2012 when the ground was not snow covered. In late January and early February of 2013 extensive vertical profiles of ozone and meteorological variables were obtained using a tethered balloon-borne ozonesonde at three sites in the Uintah Basin. These soundings covered two major multiday ozone enhancement events including the development of an event from the time of its initial onset through its peak with ozone values exceeding 160 ppb. In addition, six aircraft flights measuring *in situ* ozone and several other constituents including CH<sub>4</sub>, CO, CO<sub>2</sub>, and NO<sub>2</sub> and 12 discrete air samples per flight documented the large enhancement of ozone throughout the Uintah Basin during the course of the event in early February. The tethered balloon measurements show the late morning buildup of ozone through a shallow layer (~100 m) in the morning, a continuing buildup through an increasing depth of the boundary layer during the afternoon, and then slow decline in the evening. In the upper portion of the boundary layer there was large variability that appears to be related to fluctuating wind direction (Fig. 1). The aircraft data indicate that ozone is produced as precursors with sources located primarily in the gas field in the eastern portion of the basin spread westward so that the entire basin is blanketed with high ozone concentrations (Fig. 2).



**Figure 1.** Time-height cross-section of ozone mixing ratio at Ouray, UT on Feb 5, 2013 from tethered ozonesonde profiles.



**Figure 2.** Low altitude aircraft ozone mixing ratio observations across the Uintah Basin on Feb 2, 2013.