

Anatomy of Wintertime Photochemical Ozone Production: Uintah Basin, UT, 2013

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The Uintah Basin, Utah with lower elevations of ~1400 m asl is ringed by mountains rising to ~3,000 m. Within this basin are ~6,000 gas wells that produced 10 billion m³ of natural gas and ~4,000 oil wells that produced ~22 million barrels of oil in 2012. In winter, the confined geography in the basin traps effluents from these fossil fuel extraction activities into a shallow layer (a few 100 meters deep) beneath strong temperature inversions when ample snow cover is present. The reflective snow provides for enhanced photolysis rates that in February are comparable to those in June. In 2013, snowfall in the Uintah Basin persisted from December until early March with elevated ozone production occurring in 10-day periods separated by 2-3 days of near background values following frontal induced washouts of the basins. In one ozone event, background ozone levels of 55 ppb were measured from the surface to the lower troposphere on January 30, 2013. By February 1, ozone concentrations from the surface to the top of the 180 m deep temperature inversion averaged 100 ppb. By February 6 ozone concentrations were 165 ppb throughout the same layer. Cleanout of ozone and ozone precursors in the Uintah Basin was observed to occur within 4 hours or less as basin air was replaced with clean air from the west mixing to the surface.

Contour Plot of Ozone Over Ouray, Uintah Basin, Utah, February 6, 2013

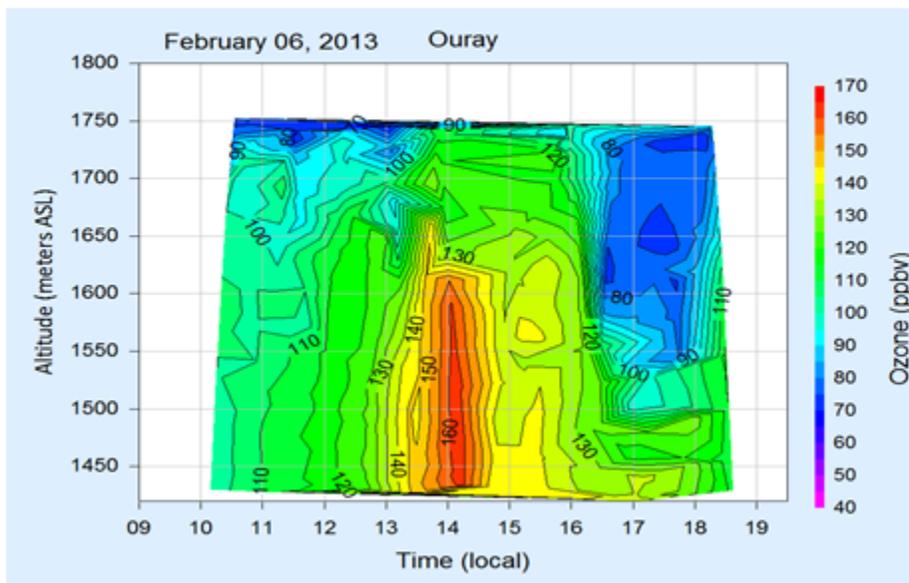


Figure 1. Contour plot of ozone in the Uintah Basin at the peak of an event. Later in the day air from the west began a partial basin cleanout as may be seen in the low ozone air entering the basin beginning around 1600 mst (blue area) descending down to 1550 m.