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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A high ozone episode in winter 2013 in the Uinta Basin oil and gas region characterized by aircraft measurements" *by* S. J. Oltmans et al.

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We have shortened the paper by eliminating or moving to the supplemental material more than half of the original figures. We have highlighted new findings in the manuscript. Several of these new results are enumerated below. Since none of the data used in the analysis for this manuscript have previously been published in the refereed literature we feel we need to include more than the recommended two to three figures but agree that the story can be told with fewer figures than in the original manuscript.

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Interactive Discussion

Discussion Paper

Following are new findings that we highlight in the revised manuscript: 1. The presentation of a set of multiday airborne observations encompassing a geographical basin undergoing large scale wintertime ozone formation. 2. High levels of non-methane hydrocarbons (NMHCs) strongly correlated with methane shows that the strong relationship between NHMCs and methane observed at the surface at Horse Pool (Helmig et al., 2014) was present throughout the basin. Our data show that the likely source of the methane and NMHCs is the natural gas field in the eastern portion of the Uinta Basin. 3. That elevated ozone and elevated methane are strongly correlated across the basin at relatively lower concentration but at the highest levels of methane (>8 ppm), ozone was not correspondingly elevated. Ozone also increased with increasing CO (indicative of a combustion source with accompanying NO) except in the southwestern portion of the basin where CO levels were much higher than in other sectors. 4. Profile measurements across the basin showed that the inversion capped boundary layer beneath which the ozone was forming was at a relatively uniform altitude across the Basin independent of surface topography. This demonstrates that the source of the high levels of these constituents beneath the inversion was within the basin. 5. Ozone and other constituents have the highest mole fractions in a layer ∼50-200 meters above the surface that is marked by nearly constant temperatures and constituent mole fractions. This layer results from mixing, due to daytime heating, of the surface even though it is snow covered and cold (<-50C). Ozone formation is evident throughout this layer. 6. Methane (and CO) builds up during the first several days of the episode but does not continue to rise in the latter stages of the episode. This is attributed to advection loss of air out of the basin through the top of the inversion.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 20117, 2014.