

Ozone Vertical Profile Measurements in the Northern Front Range of Colorado in July-August 2014 during FRAPPE and DISCOVER-AQ

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Ozone (O_3) and temperature profiles were measured from tethered ozonesondes, from release ozonesondes, and continuously from a 300 m tower instrumented at two levels during the FRAPPE/DISCOVER-AQ campaigns in summer 2014. Tethersonde measurements were made on 3 days at a site west of Fort Collins typically, between 8:30 AM and 4:30 PM, averaging 40 profiles a day. Forty release ozonesondes were flown from Platteville with multiple profiles on a number of days. Continuous O_3 profiles from a tall tower (6 and 300 m) east of Boulder tracked O_3 variability through the experiment. The release ozonesondes demonstrated the important role of morning mixing from the upper boundary layer or lower free troposphere into the lower boundary layer. This mixing established the mid-morning boundary layer O_3 mixing ratio from which the daily photochemical production progressed. The generally constant mixing ratio with height and highest mixing ratios above the surface seen in the near-continuous tethersonde profiles indicate that photochemical O_3 production was taking place throughout the profile. This suggests that O_3 precursors are mixed through the boundary layer enabling widespread O_3 production. Tethersonde wind measurements on August 3, a high O_3 day at Fort Collins, showed consistent winds out of the southeast indicating a source of O_3 precursors from oil and gas operations. O_3 growth rates on high O_3 days (peak hourly value ≥ 75 ppb) computed during the time of peak O_3 production (10:00 AM – 3:00 PM) was in the range of 4.5-6 ppbv/hour through the measured profile from both the tethersonde and tower measurements.

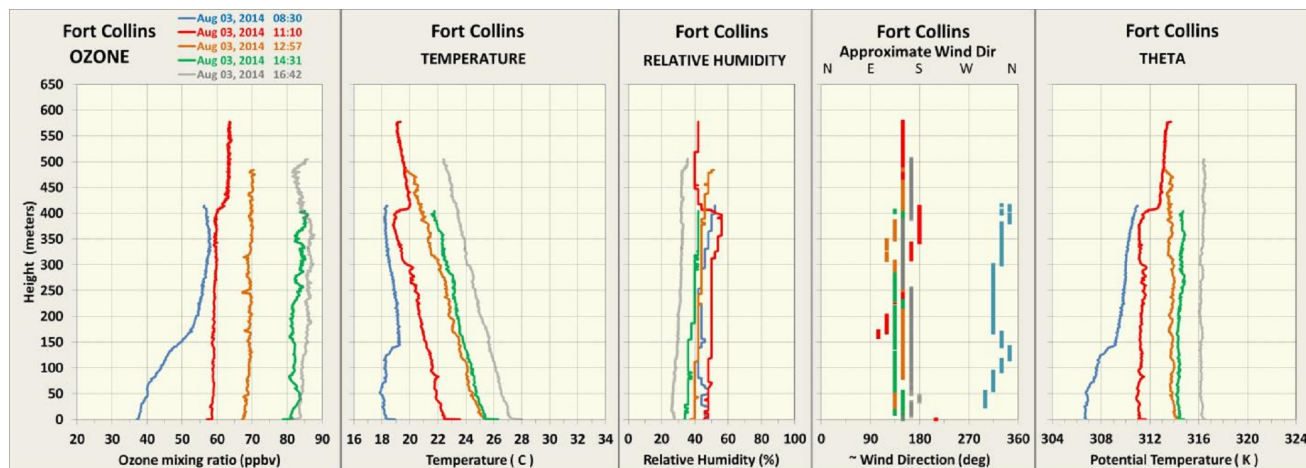


Figure 1. Tethered ozonesonde profiles from Fort Collins on August 3, 2014 showing ozone buildup during the day.