

Vertical Ozone Profiles on the Wasatch Front

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Abstract:

Poor air quality is a significant challenge in Utah and has serious negative consequences for respiratory and cardiovascular health. Ozone is one of six pollutants for which the EPA maintains a national standard. Collecting data on ozone levels throughout the lower atmosphere is of interest but difficult to accomplish with stationary monitoring equipment and towers. We overcome that barrier by using a hexacopter drone equipped with an ozonesonde to measure the vertical ozone profile at various times throughout the day. Preliminary results show that ozone formation starts at higher altitudes in the morning hours and evolves to become uniform in the atmosphere by midday. The uniform profile persists until the evening hours, when it begins to break up in a non-uniform manner. In addition to collecting flight data, we use computational fluid dynamics simulations to evaluate the airflow pattern around the drone. These simulations provide insight into where to place the ozonesonde's intake tube to minimize dilution and interference from the drone's rotors. They also show that while the ozone profile is developing, there is potential for recirculation directly under the drone that can cause brief inaccuracies in the measurements.