Tropospheric ozone lidars are well suited to measuring the high spatio-temporal variability of this important trace gas. Furthermore, lidar measurements in conjunction with balloon soundings, aircraft, and satellite observations provide substantial information about a variety of atmospheric chemical and physical processes. Examples of processes elucidated by ozone-lidar measurements are presented, and modeling studies using WRF-Chem, RAQMS, and DALES/LES models illustrate our current understanding and shortcomings of these processes.

**Lightning-induced tropospheric ozone enhancements**

<table>
<thead>
<tr>
<th>Modelled and lidar-measured O3</th>
<th>Model-simulated O3 enhancement due to lightning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CNTRL</strong></td>
<td><strong>LCT</strong></td>
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<tr>
<td>Lidar</td>
<td>Lidar</td>
</tr>
<tr>
<td><strong>Daily lidar-model comparisons</strong></td>
<td></td>
</tr>
<tr>
<td>Total CG flashes (top-left) and total precipitation (top-right) ending at 1200 UTC, July 14, 2013.</td>
<td></td>
</tr>
<tr>
<td>Backward trajectories calculated using WRF 36 km wind fields, starting from 18 UTC, July 14, 2011, at Huntsville, AL, backward for 24 hours. Backward trajectories at 9000, 8000, 7000, 6000, 5000, 4500, 4000, 3500, and 3000 meters AGL.</td>
<td></td>
</tr>
</tbody>
</table>

**Influence of the Smoke Transport on the Surface, June 12, 2013**

Lidar and EPA obs. at Huntsville on June 10-12, 2013

**PBL/FT O3 diurnal variations**

Suggesting the ozone diurnal variation on Sept. 6, 2013 at Huntsville is largely controlled by local emissions and chemical production.

**Lightning events occurring within spatiotemporal regions resulted in an ozone enhancement of 28 ppbv at 7.5 km AGL over Huntsville on July 14, 2011.**

**Topography and Wind Flow**

Climatology of the region indicates:
- Downwelling winds typically before 5:00 MDT
- Upwelling winds begin near 8:00 MDT due to convective events
- Deep upletope flow has developed near 12:00 MDT in the domain (possibly affecting high mountain elevation sites)
- Return to downwelling winds near 16:00 MDT

**Collocated O3 DIAL and HSRL observations**

Comparison of the UAH O3 lidar, UAH ozonesonde, and NOAA P3 aircraft measurements.

**Ozone Lidar Observations for Air Quality Studies**

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TOLNet: [http://www-air.larc.nasa.gov/missions/TOLNet/index.html](http://www-air.larc.nasa.gov/missions/TOLNet/index.html)

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