Tropospheric Ozone Layer Attributes Quantified by Continuous Wavelet Transform (CWT) and Gradient Analysis

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Ozone laminar structures occur frequently in the troposphere. The formation of ozone laminar structures is believed to be due to the complex dynamical and chemical processes in the atmosphere. However, regional chemical models have difficulty reproducing the observed laminar structure. We developed two independent methods, the CWT method and the gradient method, to study the properties and climatology of ozone laminar structure based on data from ozonesonde and Ozone Differential Absorption Lidar (DIAL) observations. The DIAL profiles show high spatial and temporal variations of tropospheric ozone laminae due to complex dynamical and chemical processes, which suggest to us that the Lidar network would capture the characteristics of the ozone laminar structure.

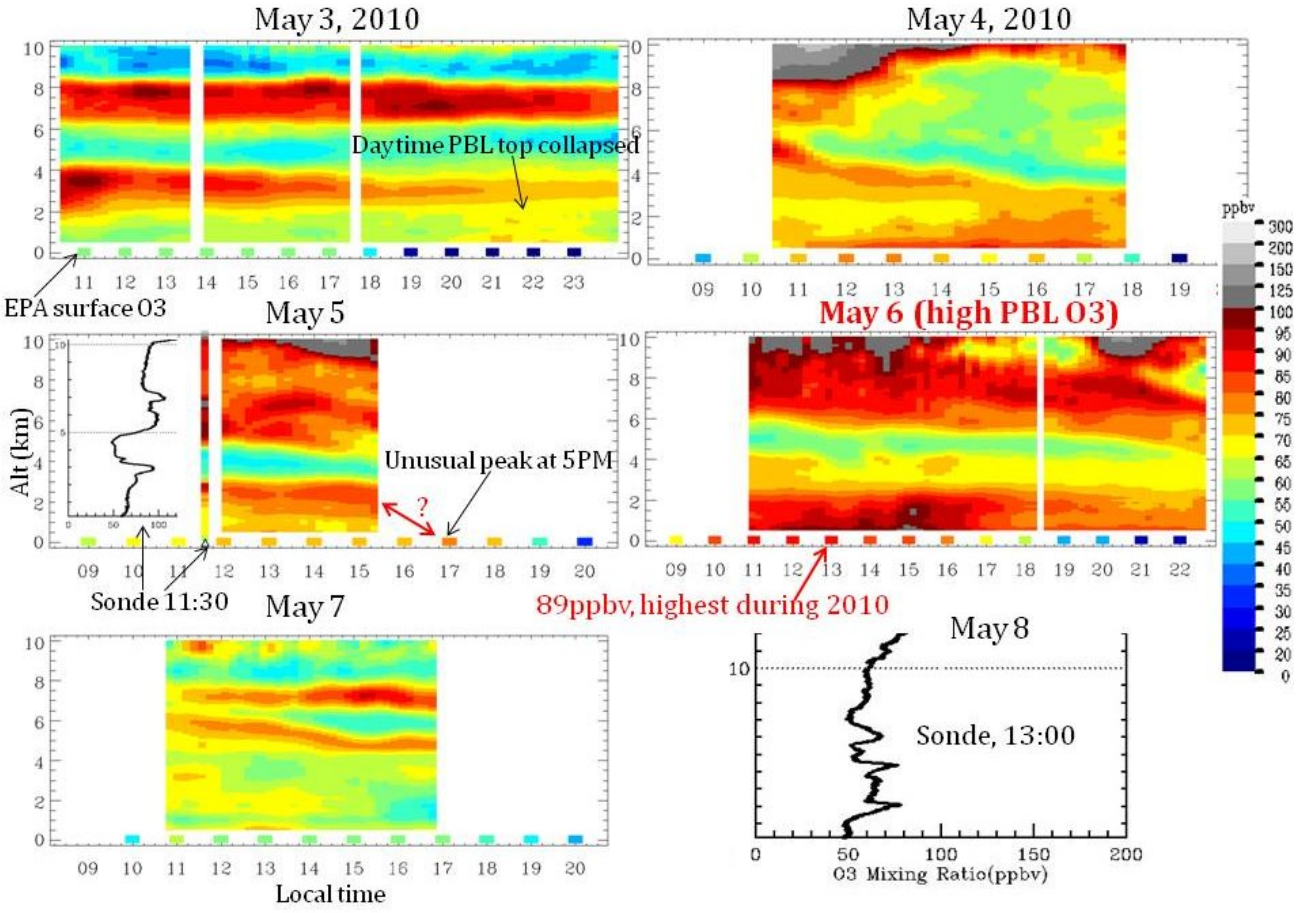

Figure 1. Evolution of a Planetary Boundary Layer ozone enhancement event observed by lidar and sondes during an air stagnation event. High surface ozone (squares at zero altitude) was also observed by the EPA Station in Huntsville, AL. Large differences between ozone at the surface and ozone at higher altitudes often exist, especially during nighttime.