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# Analysis of tropospheric ozone long-term lidar and surface measurements at the JPL-Table Mountain Facility site, California

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Tropospheric ozone is a greenhouse gas, an important oxidant within the troposphere, and an air pollutant impacting human health and vegetation. Its sources and variability are not yet fully identified or understood and recent studies reveal the importance of increasing the number of tropospheric ozone profiling stations and long term measurements. As part of the international monitoring network NDACC, and the U.S.-based network TOLNet, a differential absorption lidar has been performing ozone measurements at the JPL Table Mountain Facility (California) since 1999 throughout the troposphere and lower stratosphere (3-24 km). Surface ozone measurements at the site complement the lidar measurements since 2013. A combined analysis of the surface and tropospheric ozone lidar profiles is presented, focusing on free-tropospheric ozone variability and long-term trends. In order to identify ozone sources, a classification of the air parcels sampled by lidar using 8-days backward trajectories (HYSPLIT) is included. Background tropospheric ozone (unaffected by the boundary layer dynamics and local anthropogenic emissions of ozone precursors) is usually observed, which is expected from the site's high elevation and geo-location. The influence of the stratosphere leading to elevated ozone values is observed with relatively high frequency. Elevated ozone transport from Central America related to the North American Monsoon is also systematically detected in summer. Trend analysis performed over the lidar data for the period 2000-2015 shows a statistically significant positive trend in the free troposphere, especially in spring and summer. The tropospheric ozone trends classified by air mass will also be examined in an attempt to understand the relative contribution of each process to the observed variability above the site.