Increasing Mid-Tropospheric Ozone Above Western North America During Springtime

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The interannual variability of mid-tropospheric ozone above western North America has been investigated from *in situ* measurements collected during springtime, 1995-2008. Data were compiled from all available ozonesondes, a ground-based ozone lidar, MOZAIC commercial aircraft profiles, and research aircraft profiles from a variety of field campaigns. For consistency, all profiles were averaged to a regular 20km x 20km x 200m grid, resulting in a 14-year total of 57,500 ozone data points between 3-8 km. Using all available data in the 3-8 km altitude range, a least squares line fit through the median ozone values for each year yields an ozone increase of 6 ppbv/decade, significant at the 99% confidence interval. To examine the impact of the interannual variability of transport pathways, 15-day FLEXPART retroplumes were calculated for every measurement (a total of 2.3 billion trajectory particles were used in this analysis). The transport history of each measurement, as described by the retroplumes, was used to remove all data points with a significant influence from the stratosphere or North American surface emissions regions. The increase of ozone associated with background mid-tropospheric air entering western North America is 7 ppbv/decade, significant at the 99% confidence interval. The primary transport pathway of these air masses stretches from east Asia to North America in the 20-40 degree latitude band. On-going analysis of the retroplumes is aimed at determining if the ozone increase is associated with a broad hemispheric ozone increase or transport from east Asia.

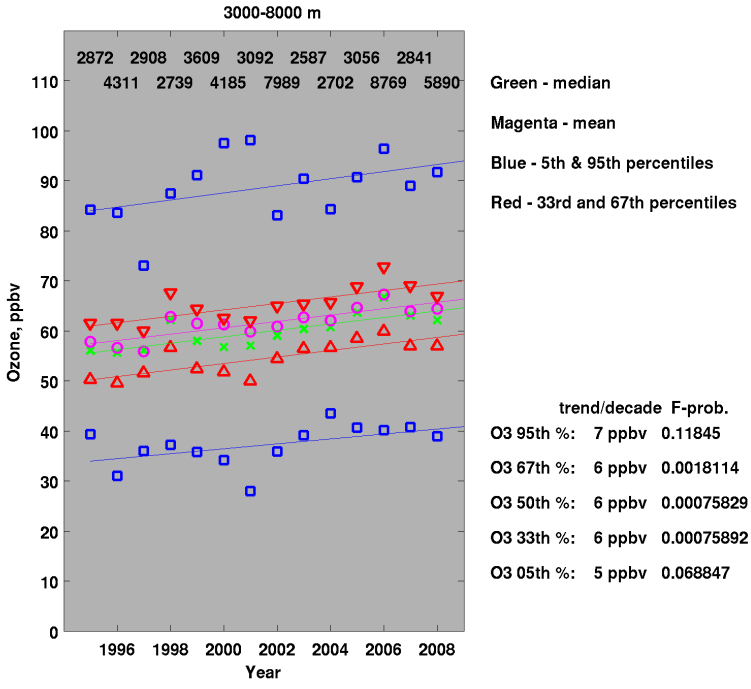

Figure 1. Mid-tropospheric (3000-8000 m) ozone above western North America from all available ozonesondes, lidar stations and aircraft measurements during April-May, 1995-2008. Shown are the means (circles), medians (x), 33rd and 67th percentiles (triangles), and 5th and 95th percentiles (squares) for each year with linear regression lines. The ozone increase per decade is shown to the right, with the linear regression significant at the 99% confidence level for the 33rd, 50th and 67th percentiles.