

Long-Term Tropospheric Ozone Variations at Background Measurement Sites

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The 35-year record of surface ozone measurements at four of the NOAA Baseline Observatories (Barrow, Alaska; Mauna Loa, Hawaii; American Samoa, and South Pole) represents some of the longest continuous records of tropospheric ozone at background locations. At these sites less than 5% of the data are influenced by nearby (<100 km) anthropogenic ozone precursor emissions. This data record is investigated for longer term changes with an emphasis on the 30-year period 1980-2009. The three ten-year periods are compared with particular emphasis on possible changes in the seasonal pattern over this time. At each of these sites strong seasonally dependent processes, such as the springtime boundary layer ozone depletion at Barrow, influence the year-to-year variability and can influence the longer-term changes. At several other regionally representative locations (Bermuda; Barbados; Iceland; Niwot Ridge, Colorado) there are 20+ years of observations, although in all cases there are multi-year gaps in the record. Earlier and more recent portions of the record are compared, again with emphasis on possible changes in the seasonal pattern over this time. At several of the surface measurement locations there are also nearby longer-term ozonesonde observations (Mauna Loa – Hilo, Hawaii; Niwot Ridge – Boulder, Colorado; American Samoa; and South Pole). Changes represented by the surface (continuous observations) and profile (~4 times per month) time series are compared for the overlapping periods of observation.

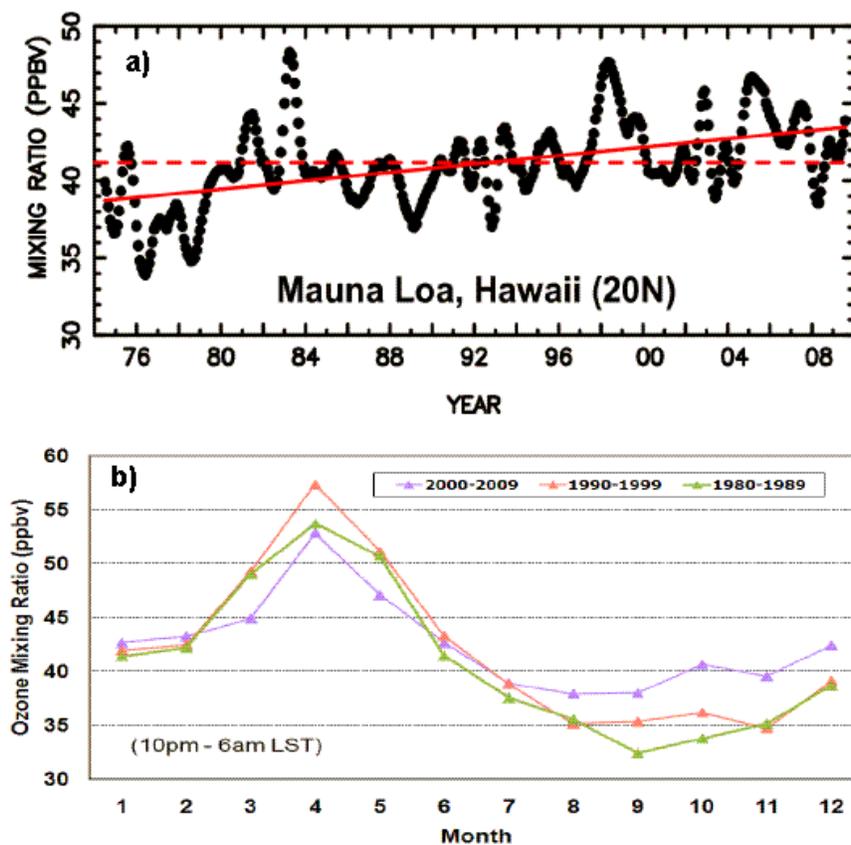


Figure 1. a) Smoothed monthly surface ozone mixing ratios at Mauna Loa Observatory (solid black circles) and a linear fit to the monthly anomalies (solid red line). b) Ten-year average monthly values for three periods: 1980-1989, 1990-1999, and 2000-2009.