Trends in Tropospheric Ozone

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Surface and ozonesonde observations are used to characterize long-term changes in tropospheric ozone. Key sites with records longer than ~15 years have been chosen to represent broad geographic regions over the globe. Although many of the sites are not immediately impacted by local ozone pollution sources, several of the ozonesonde sites are near urban areas, and lower altitude measurements are influenced by nearby sources. Several statistical models were applied to the time series, most of which extend through 2003.

In the Southern Hemisphere the tropics and polar latitudes show little evidence for long-term change. The decline seen through the 1980s at South Pole has mostly reversed over the past few years to reach levels seen near the beginning of the record. At Cape Point, South Africa, small increases noted in the mid-1990s have accelerated. Midlatitudes do not show evidence for significant changes.

At higher latitudes in the Northern Hemisphere the declines seen in tropospheric ozone at several Canadian ozonesonde sites during the 1980s have reversed during the 1990s giving small overall changes over the length of the entire record. At Barrow, Alaska, the long-term record going back to 1973 shows no significant change. At midlatitudes, where the records extend back to the 1970s, sites in Europe and Japan showed marked increases into the 1980s that were smaller in the most recent decade. Over North America there is little evidence from the longest records for sustained changes over the 30+ years of observations. At Mauna Loa, HI, in the mid-Pacific there has been a small overall increase with ozone amounts in the 1990s somewhat higher than those in the 1970s.

Long-term changes in tropospheric ozone show a complex pattern over the globe that, in some cases, are driven by regional influences. At Zugspitze in southern Germany, for example, the very hot summer of 2003 over Europe led to the highest summertime ozone amount seen in the record. At Cape Point, where there has been a strong upward trend since 1995, the increase was seen during all seasons and was not accompanied by increases in CO that perhaps would be expected with enhanced biomass burning.

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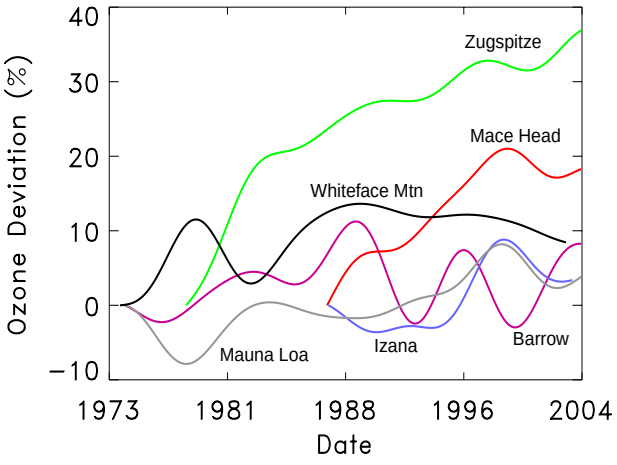

Figure 1. Trend curves showing the change in surface ozone at selected Northern Hemisphere locations.