Ozone Profile Trends from Ground-Based and Satellite Data

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In view of the upcoming World Meteorological Organization (WMO) Ozone Assessment, and with four more years in the ozone record, evaluation of the current state of the ozone layer is of interest to the scientific community. The 2006 Ozone Assessment suggested that the long-term ozone decline over the mid-latitudes had stopped and that ozone had stabilized since 1996. When extended to 2008, the ground-based and satellite data in the middle and upper stratosphere continue to show no significant changes to the ozone layer beyond its natural variability. Moreover, over the northern mid-latitudes, the recent increase in the observed total ozone column is not caused by the expected recovery of upper stratospheric ozone, but rather by changes in the lowermost stratosphere. We will present analyses of upper and low stratospheric ozone changes at northern mid-latitudes with respect to the stratospheric abundance of Ozone Depleted Substances (ODS). We will use the time series of well-established and calibrated ground based Dobson Umkehr instruments, several quality assured European ozone-sounding data, and the Solar Backscatter Ultraviolet Radiometer (SBUV/2) Merged Ozone Dataset. We will also discuss the impact of the recent years on the mid-latitude ozone recovery. Analysis will be done by using the Effective Equivalent Stratospheric Chlorine (EESC, A1_2010A WMO scenario) curve fit to the long-term ozone data. A second approach involves the use of the Piece-Wise Linear Trend (PWLT) model. Results from both approaches are compared for the slopes before and after the turning point in the EESC curve. Comparisons of the PWLT-determined ozone recovery rates and those predicted by the EESC curve help to identify changes unrelated to declining ODS concentrations.

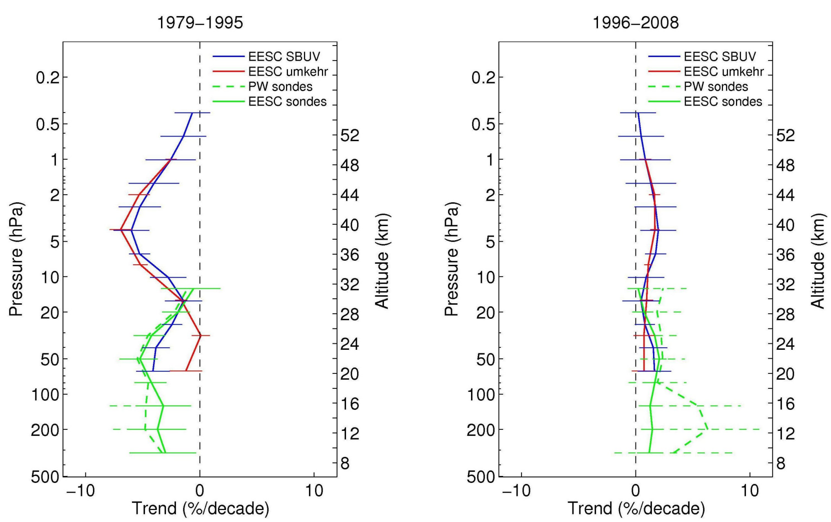

Figure 1. Vertical profile of ozone trends over northern middle-latitudes estimated from ozone sondes, Umkehr, and SBUV(/2) from 1979-2008. The trends were estimated using regression to an EESC curve and converted to %/decade using the variation of EESC with time from 1979 to 1995 (left panel) and from 1996 to 2008 (right panel). PWLTs with inflexion point in January 1996 derived from ozone sonde data is also shown. The altitude scale is from the standard atmosphere. The error bars correspond to 95% confidence interval.