


A 40 year time series of SBUV observations: the version 8.6 processing

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multiple satellites (MEASURES), data from a series of eight SBUV and SBUV/2 instruments have been reprocessed to create a 40 year long ozone time series. Data from the Nimbus 4 BUV, Nimbus 7 SBUV, and SBUV/2 instruments on NOAA 9, 11, 14, 16, 17, and 18 were used covering the period 1970 to 1972 and 1979 to the present. In past analyses an ozone time series was created from these instruments by adjusting ozone itself, instrument by instrument, for consistency during overlap periods. In the version 8.6 processing adjustments were made to the radiance calibration of each instrument to maintain a consistent calibration over the entire time series. Data for all eight instruments were then reprocessed using the adjusted radiances. Reprocessing is necessary to produce an accurate latitude dependence. Other improvements incorporated in version 8.6 included the use of the ozone cross sections of Brion, Daumont, and Malicet, and the use of a cloud height climatology derived from Aura OMI measurements. The new cross sections have a more accurate temperature dependence than the cross sections previously used. The OMI-based cloud heights account for the penetration of UV into the upper layers of clouds.

The consistency of the version 8.6 time series was evaluated by intra-instrument comparisons during overlap periods, comparisons with ground-based instruments, and comparisons with measurements made by instruments on other satellites such as SAGE II and UARS MLS. These comparisons show that for the instruments on NOAA 16, 17 and 18, the instrument calibrations were remarkably stable and consistent from instrument to instrument. The data record from the Nimbus 7 SBUV was also very stable, and SAGE and ground-based comparisons show that the calibration was consistent with measurements made years later by the NOAA 16 instrument. The calibrations of the SBUV/2 instruments on NOAA 9, 11, and 14 were more of a problem. The rapidly drifting orbits of these satellites resulted in relative time and altitude dependent differences that are significant. Despite these problems, total column ozone appears to be consistent to better than 1% over the entire time series, while the ozone vertical distribution is consistent to approximately 5%.

scientific theme: Observations and analyses of total and vertical ozone distribution