7.3. Amundsen Scott South Pole Station

Figure 7.3.1 shows total column ozone over Amundsen-Scott South Pole Station as measured by TOMS. In contrast to similar figures for McMurdo and Palmer Stations the entire year is depicted. Until 02/10/99, ozone levels are significantly below values measured during the month of January in years prior to 1999. This observation is interesting since January is usually not affected by the ozone hole. Also ozone values in January 2000 (in particular 01/01/00 and 01/07/00) appear to be lower than the long-term average.

Figure 7.3.1 also shows ozone values measured by TOVS/NOAA during the polar night in 1995 and 1996 (Unlike TOMS, TOVS does not require sunlight for measurements). Ozone values are typically between 300 and 375 DU before they start dropping in August as the ozone hole builds up. Minimum ozone values occur beginning October.

In the austral spring until November 6, ozone values in 1999 were comparable to the long-term average. After this time, they are significantly below the average with three distinct lows on 11/14/99, 11/24/99, and 12/1/99. The ozone column on 12/2/99 is similar to the minimum column value on record for this particular day. The final recovery of the ozone hole occurs on 12/6/99, values remain below average for the remainder of December, however, and stay low also during the first week of January 2000.

Days with low ozone column lead to marked peaks in the noontime values of the 298.51 - 303.03 nm integral (Figure 7.3.2). The change in total column ozone from 180 DU to 318 DU between 12/2/99 and 12/6/99 causes UV levels to decrease by a factor of 9. Values of the 298.51 - 303.03 nm integral in 1999 are above the long-term average during almost the whole austral spring season but stay below all-time maxima. The pattern in the time series of erythemally weighted irradiance (Figure 7.3.3) matches that of the short-wave integral.

Figure 7.3.4 and Figure 7.3.5 show the annual cycles in DNA-weighted daily dose and erythemally weighted daily dose, respectively. Note that 1999 doses in January and February are significantly higher than doses measured in previous years. This is expected because of the comparatively low ozone column in the austral fall 1999. The abrupt change in irradiance observed between 12/2/99 and 12/6/99 can also be seen in daily doses.

In Figure 7.3.6, daily doses in the 400-600 nm range are shown. Volume 9 measurements agree well with measurements from previous years since radiation in the visible is not affected by atmospheric ozone concentrations. The upper limit of the data set is well-defined by clear-sky days. Note that the day-to-day variability in the visible is much lower at South Pole than it is at the other network sites due to the comparatively low attenuation of radiation by clouds.

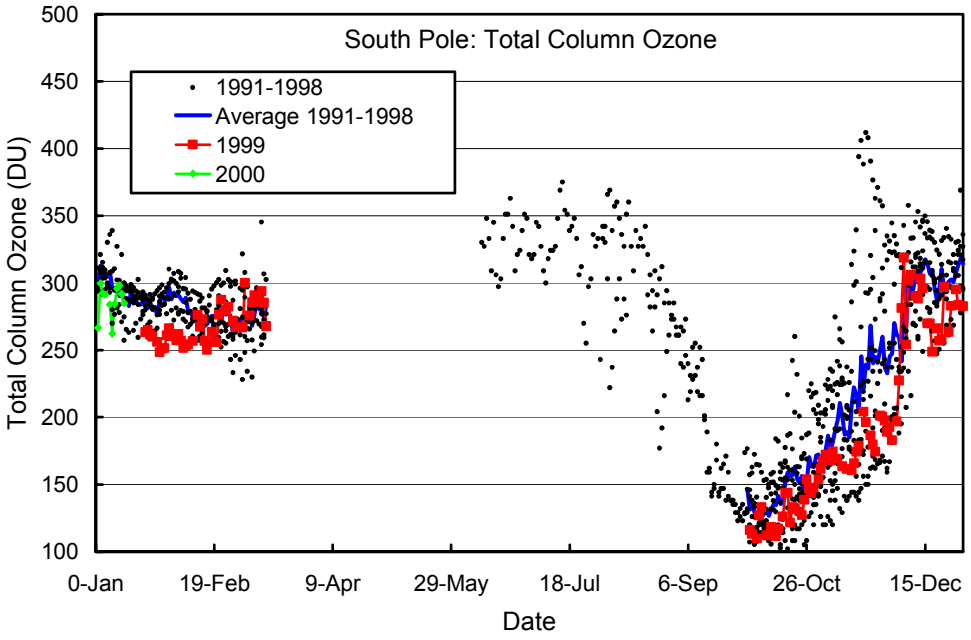

Figure 7.3.1. *Total column ozone at South Pole. TOMS/Earth Probe measurements from 1999 and 2000 are contrasted with ozone data from the years 1991-1998 recorded by TOMS /Nimbus-7(1991-1993),TOMS/ Meteor-3 (1993-1994), NOAA/TOVS (1995-1996), and TOMS/Earth Probe (1997-1998) satellites. Data measured during the polar night are from NOAA/TOVS.*

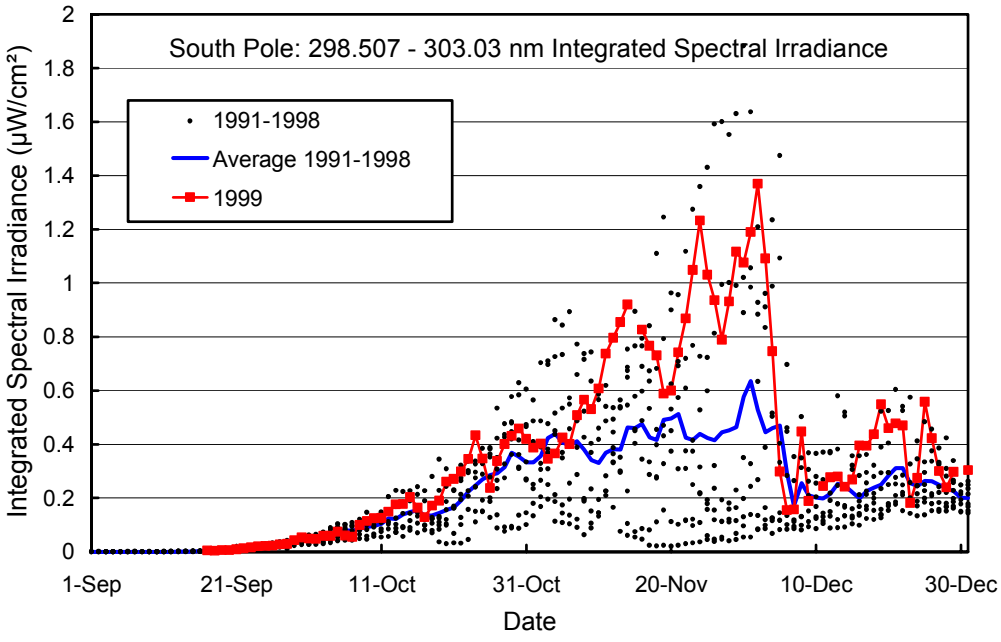

Figure 7.3.2. *Noontime integrated spectral UV irradiance (298.51 - 303.03 nm) at South Pole. Measurements from 1999 (squares) are contrasted with individual data points and the average of measurements taken between 1991 and 1998.*

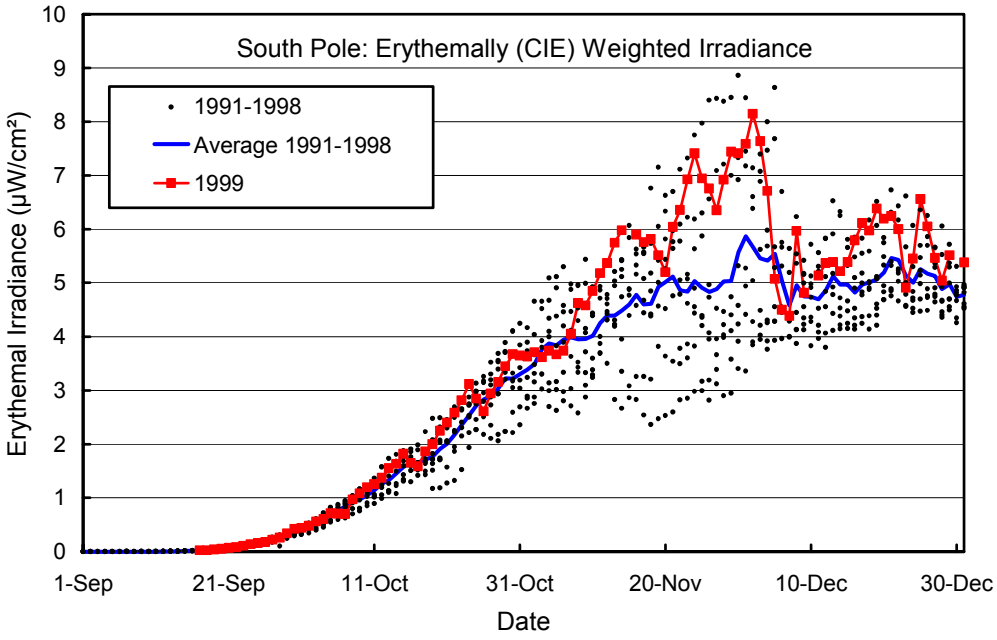

Figure 7.3.3. *Erythemally (CIE) weighted irradiance at South Pole. Measurements from 1999 (squares) are contrasted with individual data points and the average of measurements taken between 1991 and 1998.*

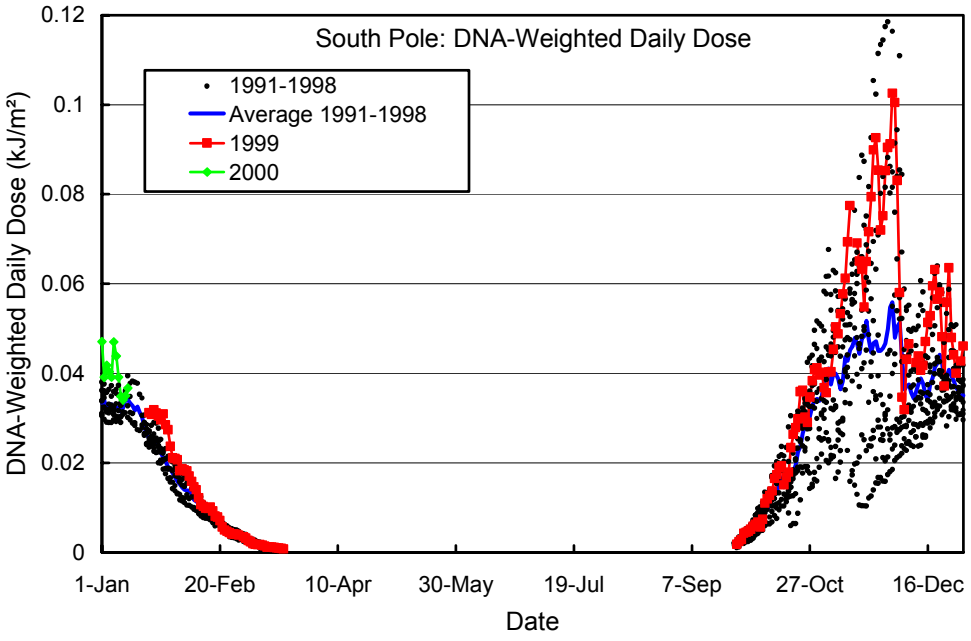

Figure 7.3.4. *Daily DNA-weighted dose at South Pole. Volume 9 measurements from 1999 and 2000 are contrasted with individual data points and the average of measurements taken between 1991 and 1998.*

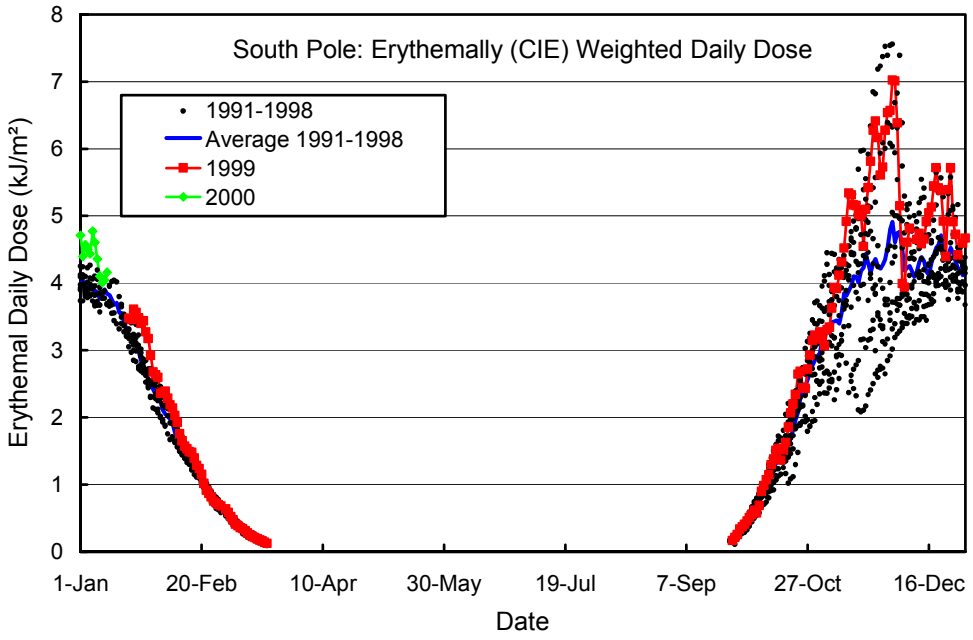

Figure 7.3.5. *Daily erythemal dose at South Pole. Volume 9 measurements from 1999 and 2000 are contrasted with individual data points and the average of measurements taken between 1991 and 1998.*

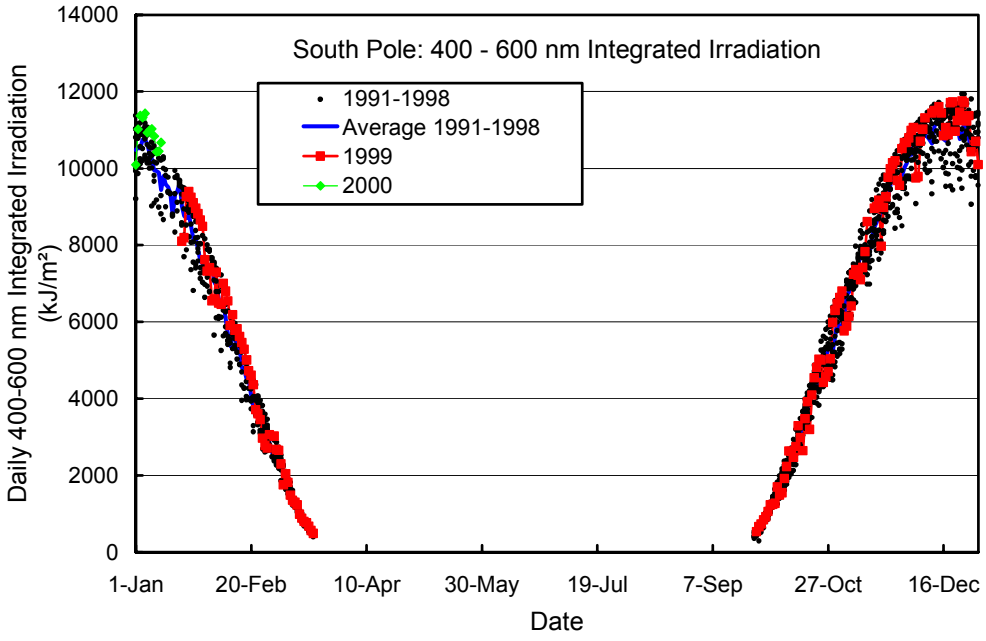

Figure 7.3.6. *Daily irradiation of the 400-600 nm band at South Pole. Volume 9 measurements from 1999 and 2000 are contrasted with individual data points and the average of measurements taken between 1991 and 1998.*