7.2. Palmer Station

The "ozone hole" in the austral fall of 2001 was one of the largest and deepest on record. Ozone levels below 200 DU were observed by TOMS over the Antarctic continent until 12/7/01. This contrasts the situation in 2000, when a very rapid and sustained decrease of the ozone hole area started in October.

Figure 7.2.1 shows total column ozone over Palmer Station as measured by TOMS. In September, ozone values showed large fluctuations between 150 DU and 370 DU. Ozone values as low as 140 DU were observed until October 24, which is exceptional for Palmer as late in the year. From then onward, ozone depletion diminished, except for short episodes centered on 11/12/01, 12/2/01, and 12/9/01.

The influence of the exceptionally low ozone values between 10/18/01 and 10/24/01 lead to high UV levels. The noontime value of the 298.51 - 303.03 nm integral on 10/24/01 was consequently amongst the highest on record (Figure 7.2.2). For the later part of the year, UV levels were below average, except for two peaks on 12/2/01 and 12/9/01, coincident with the low ozone episodes. Because of instrumental problems, no UV data are available for 12/10/01 and 12/11/01. TOMS measurements suggest that UV levels on 12/10/01 may have been similar to the peak value observed on 12/9/01. Erythemally weighted noontime irradiance exhibited a similar pattern with high values on 10/24/01, 12/2/01, and 12/9/01 (Figure 7.2.3).

Figure 7.2.4 and Figure 7.2.5 show the annual cycles in DNA-weighted daily dose and erythemally weighted daily dose, respectively. In general, daily doses show a similar pattern in the day-to-day variation than noon-time UV levels. Both figures also demonstrate that variability in daily UV doses is much lower between January and March than it is between September and November, the period affected by the ozone hole. UV levels measured during the austral spring have frequently been a factor two to three higher, compared to values measured six months earlier. Daily doses in the 400-600 nm range are shown in Figure 7.2.6. Since radiation in the visible is not affected by atmospheric ozone concentrations, Volume 11 measurements are in the range of measurements from previous years. The large influence of changing cloud cover at Palmer Station is apparent from the plot.

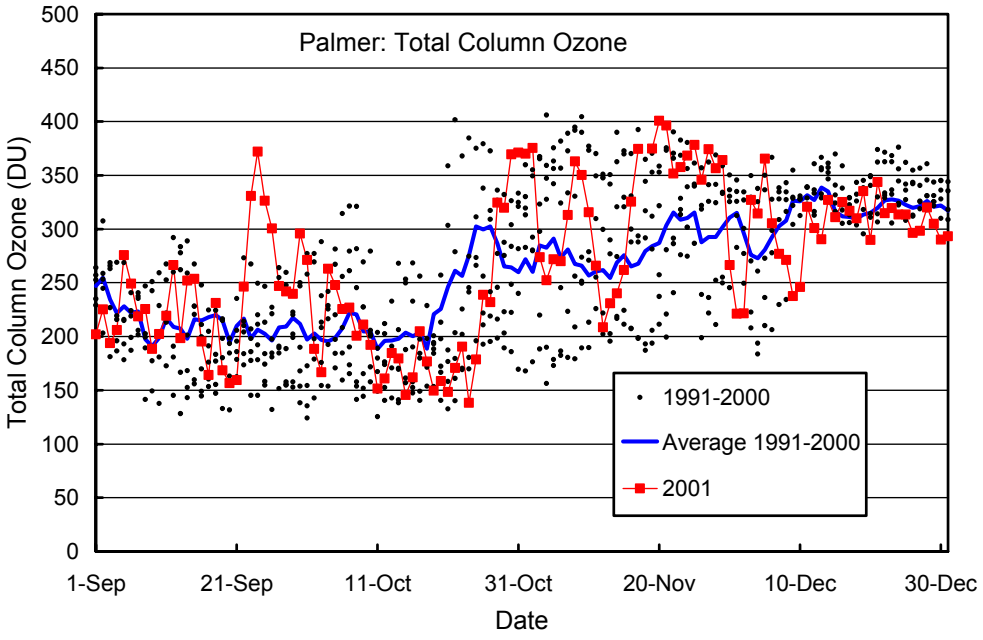

Figure 7.2.1. *Total column ozone in Palmer. TOMS/Earth Probe measurements from 2001 are contrasted with ozone data from the years 1991-1999 recorded by TOMS /Nimbus-7(1991-1993),TOMS/ Meteor-3 (1993-1994), NOAA/TOVS (1995-1996), and TOMS/Earth Probe (1997-2000) satellites.*

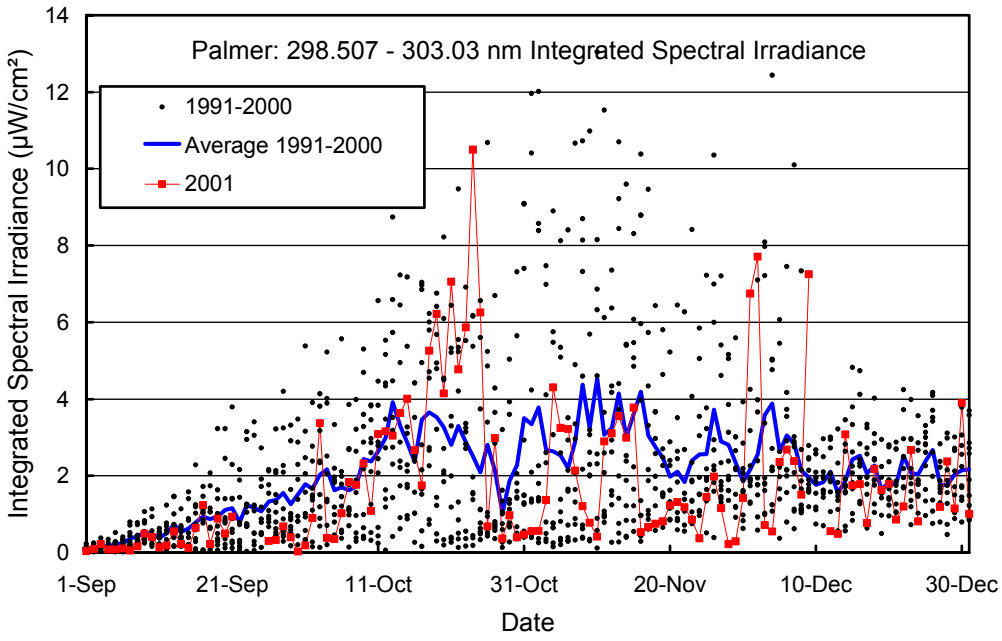

Figure 7.2.2. *Noontime integrated spectral UV irradiance (298.51 - 303.03 nm) at Palmer. Measurements from 2001 (squares) are contrasted with individual data points and the average of measurements taken between 1991 and 2000.*

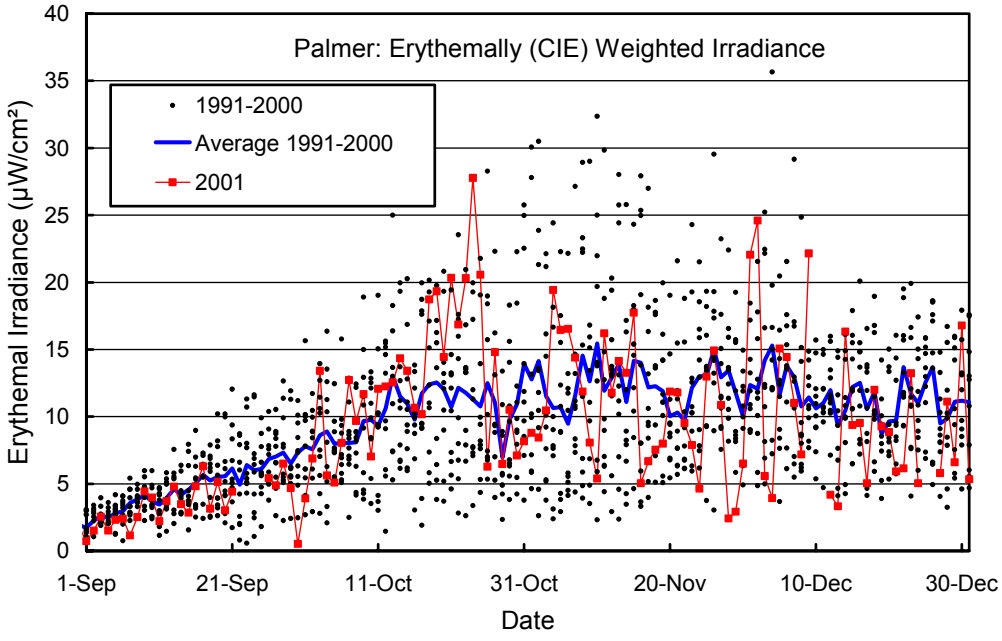

Figure 7.2.3. *Erythemally (CIE) weighted irradiance at Palmer. Measurements from 2001 (squares) are contrasted with individual data points and the average of measurements taken between 1991 and 2000.*

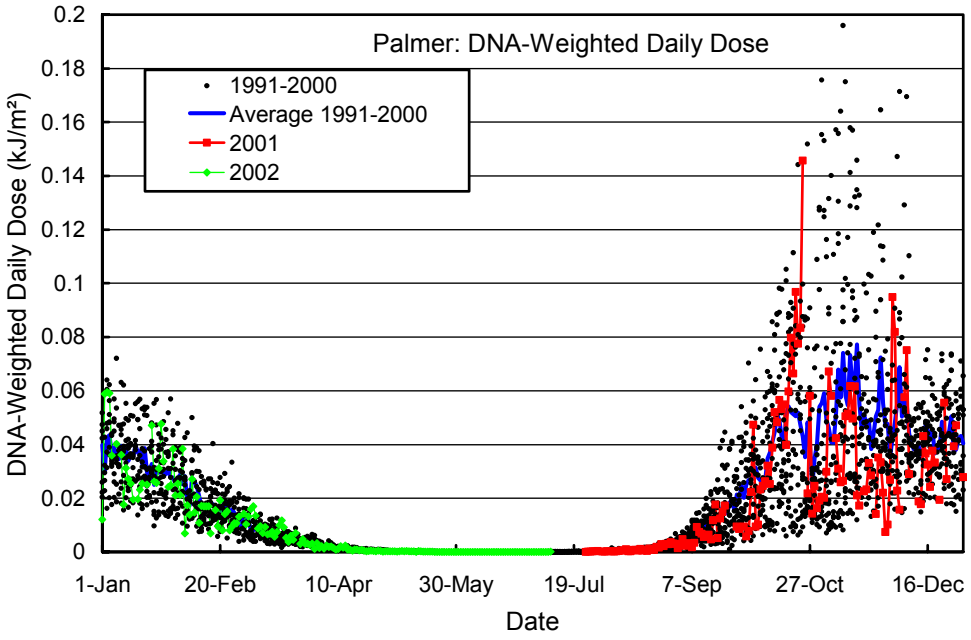

Figure 7.2.4. *Daily DNA-weighted dose for Palmer. Volume 11 measurements from 2001 and 2002 are contrasted with individual data points and the average of measurements taken between 1991 and 2000.*

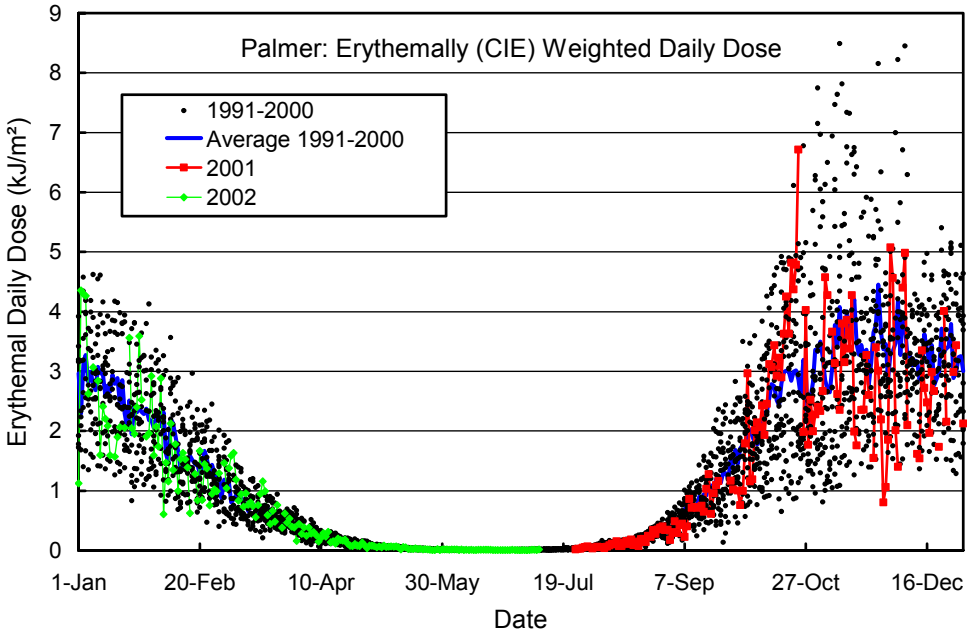

Figure 7.2.5. *Daily erythemal dose for Palmer. Volume 11 measurements from 2001 and 2002 are contrasted with individual data points and the average of measurements taken between 1991 and 2000.*

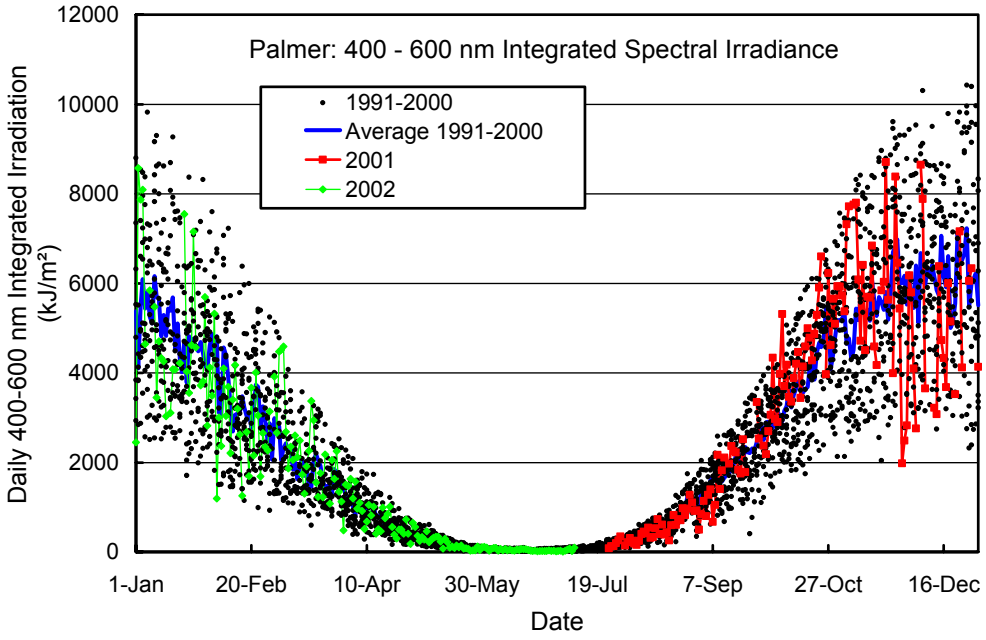

Figure 7.2.6. *Daily irradiation of the 400-600 nm band for Palmer. Volume 11 measurements from 2001 and 2002 are contrasted with individual data points and the average of measurements taken between 1991 and 2000.*