7.3. Amundsen Scott South Pole Station

The Antarctic "ozone hole" in the austral fall of 2003 was one of the largest on record; its size peaked at about 28 million square kilometers in September. However, the size decreased faster than in many of the previous years. UV levels between October and December 2003 observed at the South Pole were equal or smaller than the long-term average, with few exceptions.

On 11/23/03, a partial solar eclipse was visible in Antarctica. At South Pole, the moon started to block the Sun at 22:24 UT. The time of maximum eclipse was 23:18, when approximately 88% of the Sun was blocked. The end of the eclipse was on 11/24/03 00:12. Radiation levels during this time were reduced by more than 90% compared to levels observed immediately before the start of the eclipse. There was little influence by clouds during the entire period. Figure 7.3.1 shows the UV Index measured by GUV-541 and SUV-100 during the time of the eclipse.

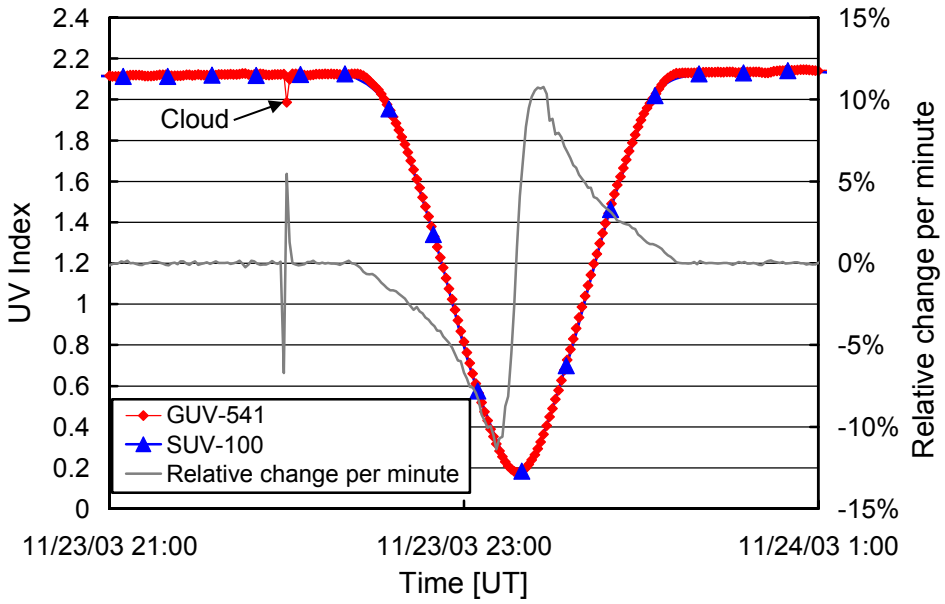

Figure 7.3.1. UV Index measured by SUV-100 and GUV-541 radiometers during the time of the solar eclipse.

Figure 7.3.2 shows total column ozone measured by satellites at the South Pole. The figure indicates that the South Pole was outside the area of the ozone hole (defined by total ozone larger than 220 DU) on several days in November 2003. The ozone hole finally disappeared on 12/5/03.

Figure 7.3.3 shows measurements of the 298.51 - 303.03 nm integral at 00:00 UT. This integral is strongly affected by the total ozone column. Peaks seen in the figure correlate with drops in Figure 7.3.3. Erythemal irradiance (Figure 7.3.4), DNA-weighted daily dose (Figure 7.3.5), and erythemal daily dose (Figure 7.3.6) show a similar pattern but with reduced amplitude due the lesser dependence of these data products on atmospheric ozone amounts.

Radiation in the visible is only marginally affected by total ozone. As the influence of clouds is small at the South Pole, daily doses measured in the visible during the Volume 13 period should be similar to historic observations. Yet Figure 7.3.7 suggest that measurements from 2003 are somewhat lower than typical. This is caused by the upgrade of the radiometer's collector in January 2000 (see Volume 10 Operations Report). Before the modification, the instrument's angular response exhibited an azimuth asymmetry, which was substantially reduced by the upgrade. Daily doses in the visible from the years 2000 - 2003 agree to within few percent (see Section 5.3), and the main bias seen in Figure 7.3.6 is between data sampled before and after the collector modification. We have reprocess our entire data set to remove

the step change. The new data set is called "Version 2" and is available via the website http://www.biospherical.com/nsf/Version2/Version2.asp. Please also check our website for publications related to Version 2.

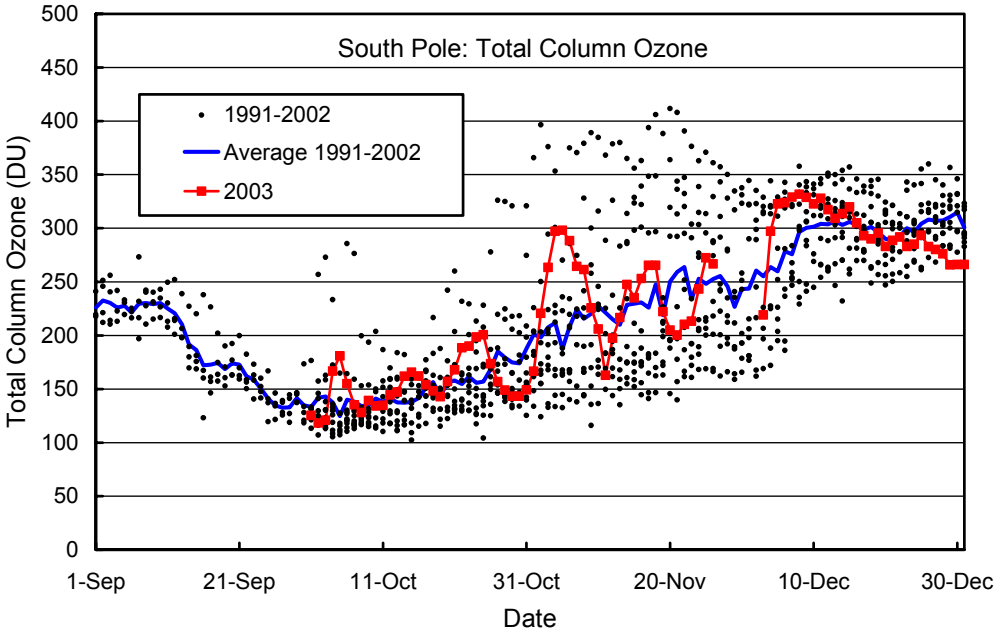

Figure 7.3.2. *Total column ozone at South Pole. TOMS/Earth Probe measurements from 2003 are contrasted with ozone data from the years 1991-2002 recorded by TOMS /Nimbus-7(1991-1993),TOMS/ Meteor-3 (1993-1994), NOAA/TOVS (1995-1996), and TOMS/Earth Probe (1997-2002) satellites. September data are from NOAA/TOVS measured in 1995 and 1996.*

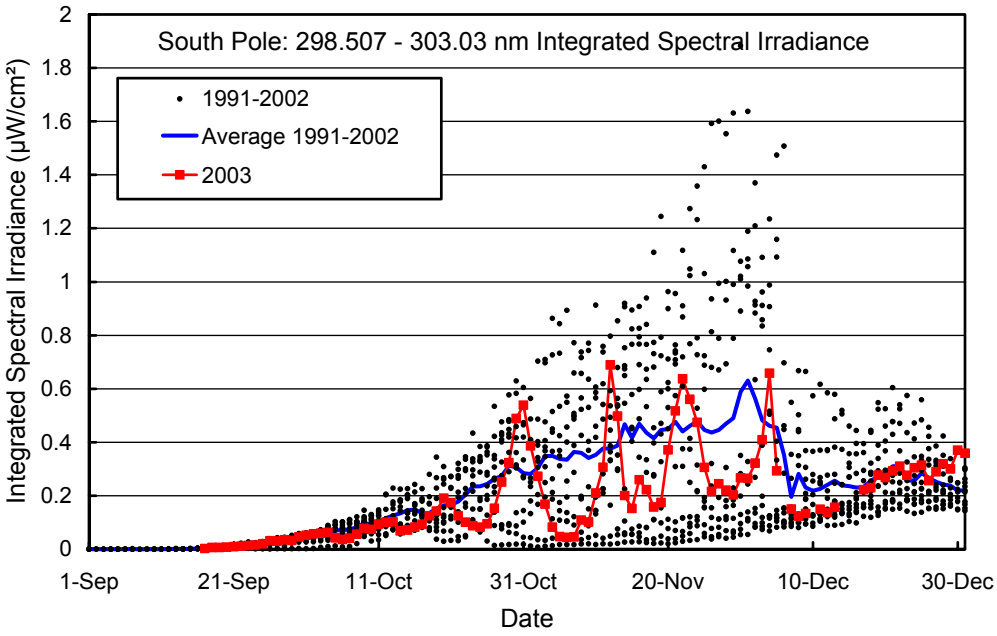

Figure 7.3.3. *Noontime integrated spectral UV irradiance (298.51 - 303.03 nm) at South Pole. Measurements from 2003 (squares) are contrasted with individual data points and the average of measurements taken between 1991 and 2002.*

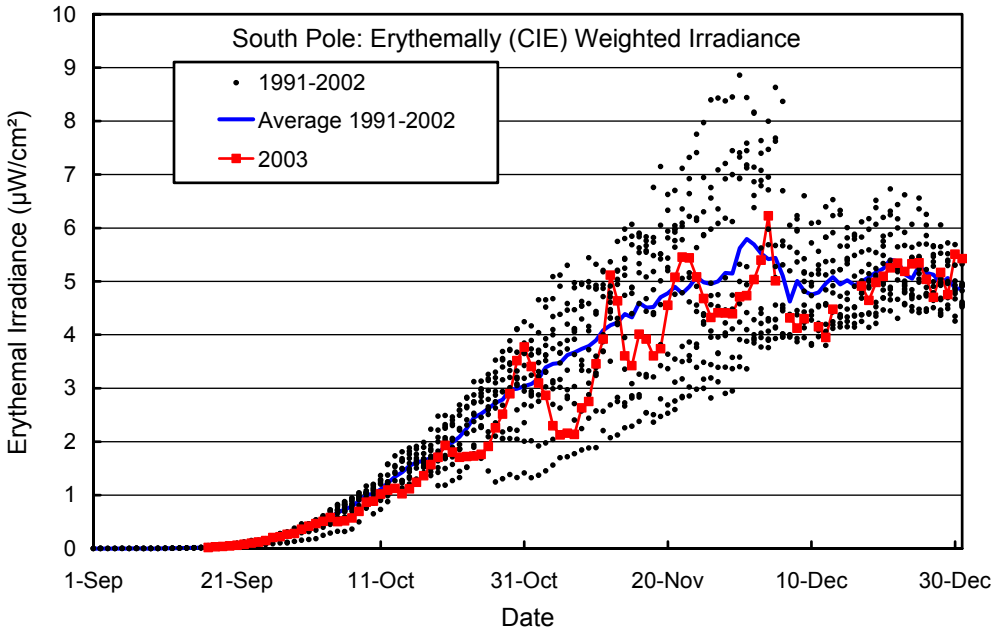

Figure 7.3.4. *Erythemally (CIE) weighted irradiance at South Pole. Measurements from 2003 (squares) are contrasted with individual data points and the average of measurements taken between 1991 and 2002.*

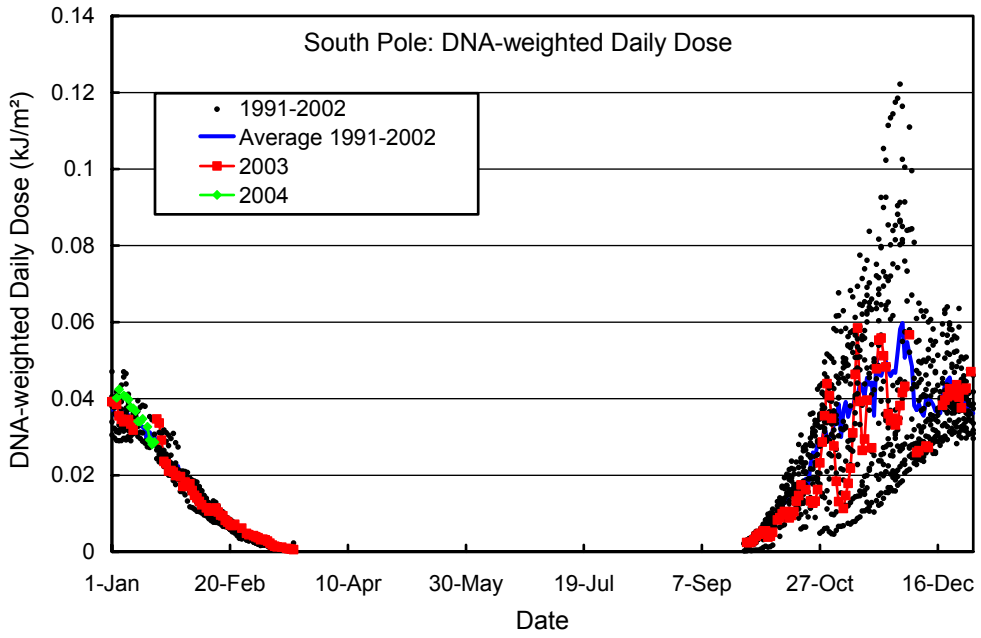

Figure 7.3.5. *Daily DNA-weighted dose at South Pole. Volume 13 measurements from 2003 and 2004 are contrasted with individual data points and the average of measurements taken between 1991 and 2002.*

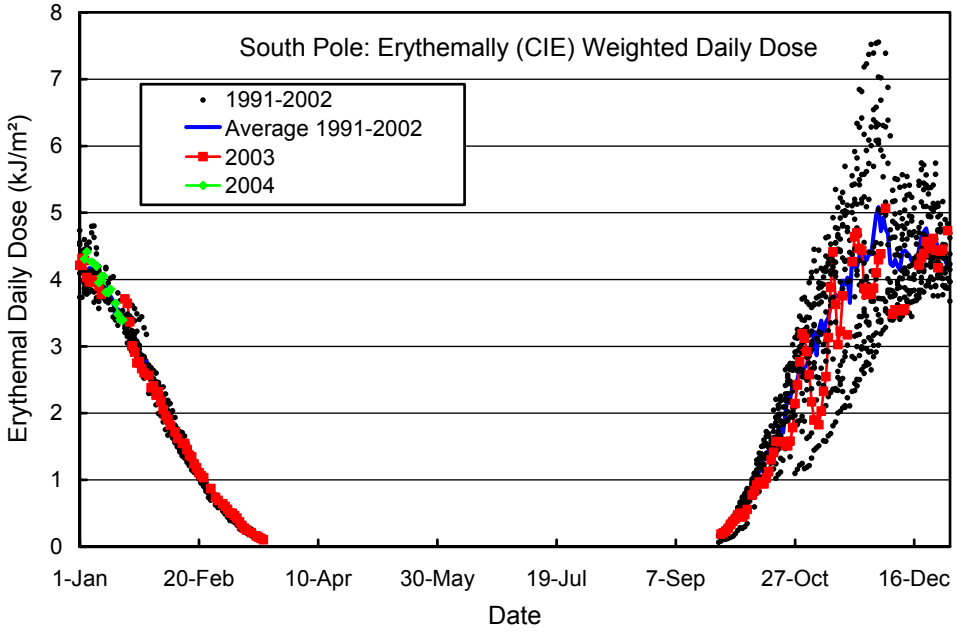

Figure 7.3.6. *Daily erythemal dose at South Pole. Volume 13 measurements from 2003 and 2004 are contrasted with individual data points and the average of measurements taken between 1991 and 2002.*

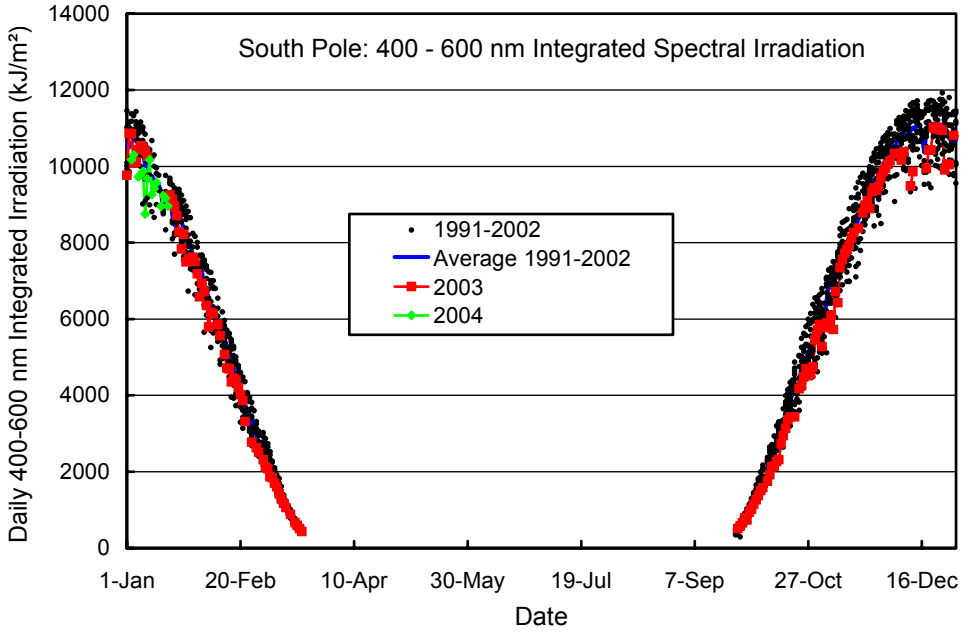

Figure 7.3.7. *Daily irradiation of the 400-600 nm band at South Pole. Measurements from 2003 - 2004 are contrasted with individual data points and the average of measurements taken between 1991 and 2002.*