6. Description of Published Data

6.1. Overview

Published "Version 0" data from the NSF network include:

- Tables in ASCII comma separated value (CSV) format, denoted "Databases", and described in detail in Section 6.2. There are eight different types of Databases with the following contents:
  - **Database 1** includes system parameters and is maintained for quality control purposes. It does not include solar irradiance data.
  - **Database 2** includes measurements at specific wavelengths, which were extracted from the full-resolution spectra. These databases provide an easy way to analyze time series over extended periods.
  - **Database 3** includes spectral integrals (e.g., UV-B and UV-A) and weighted spectral irradiances ("dose-rates"). A total of six biological action spectra have been implemented, including the CIE action spectrum for erythema and Setlow's action spectrum for DNA damage.
  - **Database 4** combines the most important quantities of Databases 2 and 3.
  - **Database 5** includes information from response scans and can be used for monitoring system stability
  - **Daily Dose Databases** include spectral integrals and dose-rates from Database 3, integrated over 24 hour time periods. Daily dose databases are a new data product, which was first published in Volume 9.
  - **GUV Database 1** includes measurements of GUV multi-channel radiometers at times coincident with SUV spectra. This database is best suited to compare GUV and SUV measurements. GUV Database 1 is first published in this volume.
  - **GUV Database 2** includes measurements of GUV multi-channel radiometers at the sampling rate of the instrument, i.e. minute-by-minute averages. This Database has the best time resolution of all data products, but file sizes are typically large. GUV Database 2 is first published in this volume.

  Ancillary solar measurements with Eppley PSP and TUVR radiometers are part of Databases 1–3.

- **Solar spectra in full resolution** between 280 and 605 nm. Each spectrum is stored in a separate file. File formats are described in detail in Section 6.3.

- NASA TOMS **ozone data** for all network sites, see Section 6.4.

The quality-controlled data set currently encompasses the years 1988 – 2003. The data set is broken into different volumes, shown in Figure 6.1. Network data are distributed via CD-ROM and the Internet. Format and contents of published data have evolved over the year. See Section 6.6 for a detailed description of CD-ROM contents of each volume. Data from previous volumes, including corresponding network operations reports in PDF-format, are available for download from our website, www.biospherical.com/NSF/.

A subset of most current data, which has not yet undergone complete quality review, is posted on the website http://www.biospherical.com/NSF, and is updated frequently. These data have to be regarded as preliminary, and investigators are cautioned that they are subject to revision.

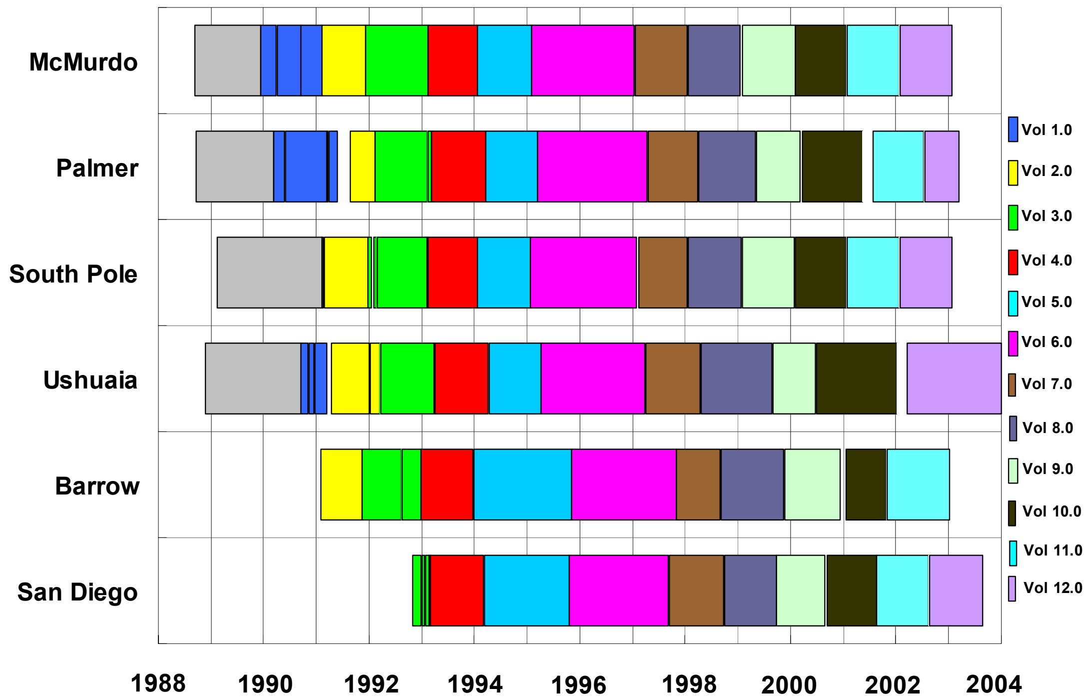

Figure 6.1. *Availability of NSF network data, Volumes 1.0 through 12.0.*

6.2. Contents of Databases

The contents of Databases 1 – 5, the Daily Dose Database and GUV Databases 1 – 2 are described in detail below. The following is specific to Volume 12; differences from previous volumes are briefly explained. Please see historical Network Operation Reports for additional information on the database structure of earlier volumes.

6.2.1. Database 1: Instrument Parameters during Solar Scans

Database 1 is a "housekeeping" database to monitor system performance, and does not include solar irradiance data. It records various system parameters measured during data scans such as system temperatures, the wavelength offset correction, system noise levels, and offsets. Table 6.1 shows the Volume 12 structure of Database 1. The structure is very similar to the format of previous volumes, with exceptions explained below.

The fields "Volume", "AcqVersion", and "AnalVersion", which were not available in the Volume 6 format, were added to Volume 7. Also, some field names were changed to increase compatibility on different computer platforms. The structures of Volume 7 – 12 are identical.

Table 6.1 refers to data scan items as **A**, **B,** and **C** rather than 1, 2, and 3. This notation was first introduced in Volume 6 and differs from the format of previously published CD-ROMs. It accommodates both old (Volumes 1 – 5) and new (Volumes 6 – 12) data scan formats. New-type data scans are performed at two different high voltages, and all variables can be related to either HV setting: **A** (high setting) or **C** (low setting). The format for Volumes 1 – 5 used three different high voltages. The assignment of the labels **A**, **B,** and **C** to the different items of a data scan is shown in Table 6.2 for both formats.

Table 6.1. Database 1 structure of Volume 12.

Col.	Field Name	Units	Comment
1	DataScan		See Section 6.2.9.*Glossary of Database Notation*
2	Volume		"12" for Volume 12
3	ErrorCode		All should be 0 (otherwise error condition)
4	RespScan		See Section 6.2.9. *Glossary of Database Notation*
5	WlScan		See Section 6.2.9. *Glossary of Database Notation*
6	WlCorr		Identifies wavelength calibration source
7	LampCal		Identifies responsivity calibration source
8	AXSSCorr		Identifies AXSS calibration source
9	TimeA		Start time of Item 1 data scan. See Section 6.2.9. *Glossary of Database Notation*
10	Site		Site identifier. See Section 6.2.9. *Glossary of Database Notation*
11	WlOffset	nm	Wavelength offset before correction was applied
12	Bandwidth	nm	Bandwidth of 296.728 nm mercury peak
13	HV_A	V	High voltage settings. HV_A > HV_C. See Table 6.2.
14	HV_C	V	
15	DC_A	nA	Dark PMT current at each high voltage. See Table 6.2.
16	DC_C	nA	
17	maxC_A	nA	Maximum PMT current at each high voltage. See Table 6.2.
18	maxC_C	nA	
19	MonoT_A	°C	Averaged monochromator temperature at the beginning of data scan
20	MonoT_C	°C	Averaged monochromator temperature at the end of data scan
21	TSI_A	V	Averaged TSI reading at the beginning of data scan
22	TSI_C	V	Averaged TSI reading at the end of data scan
23	WlPot_A	nm	Averaged wavelength analog potentiometer reading at the beginning of data scan
24	WlPot_C	nm	Averaged wavelength analog potentiometer reading at the end of data scan
25	UpBoxT_A	°C	Averaged upper enclosure temperature at the beginning of data scan
26	UpBoxT_C	°C	Averaged upper enclosure temperature at the end of data scan
27	PSP_A	mW / cm²	Averaged Eppley PSP reading at the beginning of data scan
28	PSP_C	mW / cm²	Averaged Eppley PSP reading at the end of data scan
29	TUVR_A	mW / cm²	Averaged Eppley TUVR reading at the beginning of data scan
30	TUVR_C	mW / cm²	Averaged Eppley TUVR reading at the end of data scan
31	Ground_A	V	AXSS ground reference at the beginning of data scan
32	Ground_C	V	AXSS ground reference at the end of data scan
33	LoBoxT_A	°C	Averaged lower enclosure temperature at the beginning of data scan
34	LoBoxT_C	°C	Averaged lower enclosure temperature at the end of data scan
35	TSIcv		TSI coefficient of variation (cloud change indicator)
36	DCstdevA		Dark current standard deviation at each high voltage. See Table 6.2.
37	DCstdevC		
38	AcqVersion		Version of data acquisition software
39	AnalVersion		Version of data analysis software

Table 6.2. Data scan item identification.

Label in Database 1	Volume 1-5 Format	Current Format
A	Item 1	Item 1
B	Item 2	Not available
C	Item 3	Items 2, 3 and 4

6.2.2. Database 2: Solar Spectral Irradiance at Selected Wavelengths

Database 2 contains a variety of selected spectral irradiance values at specific wavelengths. These wavelengths were chosen to either mark "round numbers" (i.e. 300 nm) or meet the requests of various investigators who have expressed a particular interest in certain wavelengths. Irradiance is calculated based on linear interpolation from the two nearest data points. The TSI data are the averages of all readings during each data scan segment. The PSP and TUVR data are the averages of the readings taken over the second item.

Table 6.3. Database 2 structure of Volume 12.

Col.	Field Name	Units	Comment
1	DataScan		See Section 6.2.9. *Glossary of Database Notation*
2	Volume		"12" for Volume 12
3	TimeB		Start time of Item 2 data scan. See Section 6.2.9. *Glossary of Database Notation*
4	Site		Site identifier. See Section 6.2.9. *Glossary of Database Notation*
5	Abnormal		Identifies data with reduced accuracy
6	ZenithB	degrees	Sun position at the beginning of Item 2 data scan. See Section 6.2.9.
7	AzimuthB	degrees	Sun position at the beginning of Item 2 data scan. See Section 6.2.9.
8	E285_A	µW / (nm cm²)	Solar spectral irradiance at 285 nm from Item 1 data scan
9	E285_C	µW / (nm cm²)	Solar spectral irradiance at 285 nm from Item 3 data scan
10	E290	µW / (nm cm²)	Solar spectral irradiance at 290 nm
11	E295	µW / (nm cm²)	Solar spectral irradiance at 295 nm
12	E297	µW / (nm cm²)	Solar spectral irradiance at 297 nm
13	E298	µW / (nm cm²)	Solar spectral irradiance at 298 nm
14	E299	µW / (nm cm²)	Solar spectral irradiance at 299 nm
15	E300	µW / (nm cm²)	Solar spectral irradiance at 300 nm
16	E302_5	µW / (nm cm²)	Solar spectral irradiance at 302.5 nm
17	E305	µW / (nm cm²)	Solar spectral irradiance at 305 nm
18	E306_5	µW / (nm cm²)	Solar spectral irradiance at 306.5 nm
19	E307_5	µW / (nm cm²)	Solar spectral irradiance at 307.5 nm
20	E308_26	µW / (nm cm²)	Solar spectral irradiance at 308.26 nm
21	E310_1	µW / (nm cm²)	Solar spectral irradiance at 310.1 nm
22	E313	µW / (nm cm²)	Solar spectral irradiance at 313 nm
23	E313_5	µW / (nm cm²)	Solar spectral irradiance at 313.5 nm
24	E316_8	µW / (nm cm²)	Solar spectral irradiance at 316.8 nm
25	E320	µW / (nm cm²)	Solar spectral irradiance at 320 nm
26	E325	µW / (nm cm²)	Solar spectral irradiance at 325 nm
27	E332_01	µW / (nm cm²)	Solar spectral irradiance at 3332.01 nm
28	E337_28	µW / (nm cm²)	Solar spectral irradiance at 337.28 nm
29	E340	µW / (nm cm²)	Solar spectral irradiance at 340 nm
30	E349	µW / (nm cm²)	Solar spectral irradiance at 349 nm
31	E350	µW / (nm cm²)	Solar spectral irradiance at 350 nm
32	E380	µW / (nm cm²)	Solar spectral irradiance at 380 nm
33	E400	µW / (nm cm²)	Solar spectral irradiance at 400 nm
34	E500	µW / (nm cm²)	Solar spectral irradiance at 500 nm
35	E600	µW / (nm cm²)	Solar spectral irradiance at 600 nm
36	TSI_A	V	Averaged TSI reading from Item 1 data scan
37	TSI_B	V	Averaged TSI reading from Item 2 data scan
38	TSI_C	V	Averaged TSI reading from Item 3 data scan
39	PSP_B	mW / cm²	Averaged Eppley PSP reading from Item 2 data scan
40	TUVR_B	mW / cm²	Averaged Eppley TUVR reading from Item 2 data scan

Spectral irradiances in Table 6.3 are extracted from various items depending on what data scan format was employed at the time, i.e. for Volumes 1 – 5 format of data scans:

- Parameters 10 through 23 are calculated from Item 1
- Parameters 24 through 31 are from Item 2
- Parameters 33, 34, and 35 are from Item 3

while for the new type data scans

- Parameters 10 through 29 are determined from Item 1
- Parameters 30 trough 33 are from Item 2
- Parameters 34 and 35 are from Item 3

The fields "Volume", "Abnormal", "E313", and "E380", which were not available in the Volume 6 format, were added to Volume 7. Some field names were changed (e.g., decimal points were replaced by underscores to increase compatibility on different computer platforms).

6.2.3. Database 3: Integrals and Dose-Rates

Database 3 contains a variety of integrals and dose-rates, for example erythemally weighted irradiance (column 27 of database 3). Table 6.4 shows the header of Database 3, while Tables 6.5 and 6.6 include the database structure for integrals, and dose-rates, respectively.

Table 6.4. Database 3 structure of Volume 12 (Columns 1-7).

Col.	Field Name	Units	Comment
1	DataScan		See Section 6.2.9. *Glossary of Database Notation*
2	Volume		"12" for Volume 12
3	TimeB		Start time of Item 2 data scan. See Section 6.2.9. *Glossary of Database Notation*
4	Abnormal		Identifies data with reduced accuracy
5	Site		Site identifier. See Section 6.2.9. *Glossary of Database Notation*
6	ZenithB	Degrees	Sun position at the beginning of Item 2 data scan. See Section 6.2.9.
7	AzimuthB	Degrees	Sun position at the beginning of Item 2 data scan. See Section 6.2.9.

All integrals are defined by $\int_{\lambda_1}^{\lambda_2} E(\lambda)d\lambda$, where λ_1 and λ_2 are specified in Table 6.5. In some cases, the mean values of the TSI sensor and Eppley PSP and TUVR radiometers during the particular spectral integration are also available.

Table 6.5. Database 3 structure of Volume 12. Integrals and supporting measurements (Columns 8-24 and 31-44).

			Spectral	Integral	TSI		Eppley	PSP	Eppley	TUVR
λ_1	λ_2	Comment	Col.	Units	Col.	Units	Col.	Units	Col.	Units
290.0 nm	315.0 nm	UV-B	8	µW / cm²	31	V				
290.0 nm	320.0 nm	UV-B	9	µW / cm²	32	V	41	mW /cm²	43	mW /cm²
320.0 nm	360.0 nm	UV-A	10	µW / cm²	33	V				
360.0 nm	400.0 nm	UV-A	11	µW / cm²	34	V				
400.0 nm	600.0 nm	Visible	12	µW / cm²	35	V	42	mW /cm²	44	mW /cm²
289.855 nm	294.118 nm		13	µW / cm²						
294.118 nm	298.507 nm		14	µW / cm²						
298.507 nm	303.03 nm		15	µW / cm²	36	V				
303.03 nm	307.692 nm		16	µW / cm²	37	V				
307.692 nm	312.5 nm		17	µW / cm²	38	V				
312.5 nm	317.5 nm		18	µW / cm²						
317.5 nm	322.5 nm		19	µW / cm²						
322.5 nm	327.5 nm		20	µW / cm²	39	V				
327.5 nm	332.5 nm		21	µW / cm²						
332.5 nm	337.5 nm		22	µW / cm²						
337.5 nm	342.5 nm		23	µW / cm²	40	V				
342.5 nm	347.5 nm		24	µW / cm²						

Note: This means, for example, that the UV-B (290-320 nm) irradiance is in column 9. The complementing TSI value is in column 32 and is the average of instantaneous TSI measurements of the period when the spectroradiometer was scanning from 290 – 320 nm. The PSP value for the same period can be found in column 41, and the TUVR value in column 43.

In columns 25-30 of Database 3 are dose-rates calculated by analyzing the integral $\int_{290}^{400} E(\lambda)W(\lambda)d\lambda$ for the six different weighting functions $W(\lambda)$ listed in Table 6.6. Note that the units of weighted and non-weighted integral units are identical, since weighting functions $W(\lambda)$ are dimensionless. All weighting functions are defined in Section 4.2.3. Spectral and dose-weighted integrals are numerically calculated by using the extended Trapezoidal Rule, utilizing solar data from various items.

Table 6.6. Database 3 structure of Volume 12. Dose weightings (Columns 25-30 and 45).

Col.	Field Name	Units
25	Dose1	µW / cm²
26	Dose2	µW / cm²
27	Dose3_CIE_Erythema	µW / cm²
28	Setlow	µW / cm²
29	Hunter	µW / cm²
30	Caldwell	µW / cm²
45	W_TSI	µW / cm²

Note: W_TSI is an abbreviation of Weighted TSI.

Items used for calculation of spectral integrals:
With the Volume 1 – 5 data scan format, columns 13 through 17 from Table 6.5 were calculated from Item 1 of the data scan. Parameters 8, 9, and 18 through 24 were calculated from Item 2, and the rest (parameters 10, 11, 12) from Item 3. For the data scan format of Volume 6 through 11, Item 3 is used only to evaluate the visible integral 400-600 nm, and Item 2 is employed in determination of the UV-A and 342.5-347.5 nm integrals. The two contributions to UV-A (parameters 10 and 11) are calculated from Items 1 and 2. For all other calculations, the high-resolution Item 1 is sufficient.

Items used for calculation of dose-rates:
To calculate dose-rates from Volume 1 – 5 data scans, data between 290 and 310 nm is from Item 1; data between 310 and 345 nm data is from Item 2; and data between 345 and 400 nm data is from Item 3. For Volumes 6 – 11, low-resolution Item 3 is no longer needed in dose-rate calculations, data between 290 and 340 nm are available from Item 1, and data between 340 and 400 nm from Item 2.

6.2.4. Database 4: General Interest (Short Form)

Database 4 is a compact database combining several quantities from the other databases. The contents of Database 4 were revised several times. Table 6.7 shows the structure used in Volumes 1 – 6. The database was modified for Volume 8 -12 (see Table 6.8) to include the most common UV integrals and dose-rates, and the UV Index according to WMO (1994). The 298.507 – 303.03 and 400 – 600 integrals were additionally added from Volume 9 onward. The structure of the database is now identical to the structure of the databases updated weekly on the website www.biospherical.com/NSF.

Table 6.7. Database 4 structure of Volume 1 – 6.

Col.	Field Name	Units	Comment
1	DataScan		See Section 6.2.9. *Glossary of Database Notation*
2	TimeDateB		Start time of data scan Item 2. See Section 6.2.9. *Glossary of Database Notation*
3	Site		Site identifier. See Section 6.2.9. *Glossary of Database Notation*
4	ZenithA	Degrees (DDD.DD)	Sun position at the beginning of data scan
5	ZenithC	Degrees (DDD.DD)	Sun position at the end of data scan
6	AzimuthA	Degrees (DDD.DD)	Sun position at the beginning data scan
7	AzimuthC	Degrees (DDD.DD)	Sun position at the end of data scan
8	UVB_315	µW / cm²	280-315 nm spectral integral
9	UVB_320	µW / cm²	280-320 nm spectral integral
10	UVA	µW / cm²	320-400 nm spectral integral
11	E@300	µW / (nm cm²)	Solar irradiance at 300 nm
12	E@313.5	µW / (nm cm²)	Solar irradiance at 313.5nm
13	TSI	V	Averaged TSI reading
14	PSP	mW / cm²	Averaged Eppley PSP reading
15	TUVR	mW / cm²	Averaged Eppley TUVR reading
16	TSIcv		TSI coefficient of variation (cloud change indicator)

Table 6.8. Database 4 structure of Volume 7 and 8.

Col.	Field Name	Units	Comment
1	DataScan		See Section 6.2.9. *Glossary of Database Notation*
2	Volume		"8" for Volume 8
3	TimeB		Start time of data scan Item 2. See Section 6.2.9. *Glossary of Database Notation*
4	Site		Site identifier. See Section 6.2.9. *Glossary of Database Notation*
5	ZenithB	Degrees (DDD.DD)	Solar zenith angle at beginning of Item 2
6	E290to315	μW / cm²	290-315 nm spectral integral
7	E290to320	μW / cm²	290-320 nm spectral integral
8	E315to400	μW / cm²	315-400 nm spectral integral
9	E320to400	μW / cm²	320-400 nm spectral integral
10	Dose3_CIE_Erythema	μW / cm²	Erythemally weighted irradiance (CIE action spectrum)
11	Setlow	μW / cm²	DNA (Setlow) dose-rate, see Section 4.2.3.
12	Hunter	μW / cm²	Hunter dose-rate, see Section 4.2.3.
13	Caldwell	μW / cm²	Caldwell dose-rate, see Section 4.2.3.
14	Uvindex		UV index, (equals column 10 multiplied with 0.4)

Table 6.9. Database 4 structure of Volume 9 – 12.

Col.	Field Name	Units	Comment
1	DataScan		See Section 6.2.9. *Glossary of Database Notation*
2	Volume		"12" for Volume 12
3	TimeB		Start time Item 2. See Section 6.2.9. *Glossary of Database Notation*
4	Site		Site identifier. See Section 6.2.9. *Glossary of Database Notation*
5	ZenithB	Degrees (DDD.DD)	Solar zenith angle at beginning of Item 2
6	AzimuthB	Degrees (DDD.DD)	Solar azimuth angle at beginning of Item 2
7	298_507to303_03	μW / cm²	298.507-303.03 nm spectral integral
8	E290to315	μW / cm²	290-315 nm spectral integral
9	E290to320	μW / cm²	290-320 nm spectral integral
10	E315to400	μW / cm²	315-400 nm spectral integral
11	E320to400	μW / cm²	320-400 nm spectral integral
12	400to600	μW / cm²	400-600 nm spectral integral
13	Dose3_CIE_Erythema	μW / cm²	Erythemally weighted irradiance (CIE action spectrum)
14	Setlow	μW / cm²	DNA (Setlow) dose-rate, see Section 4.2.3.
15	Hunter	μW / cm²	Hunter dose-rate, see Section 4.2.3.
16	Caldwell	μW / cm²	Caldwell dose-rate, see Section 4.2.3.
17	Uvindex		UV index, (equals column 13 multiplied with 0.4)

6.2.5. Database 5: Instrument Parameters during Response Scans

Database 5 contains information sampled during response scans that can be used to assess the calibration stability of the instrument. The format of this database has evolved over the years. Table 6.10 shows the Database 5 structure of Volumes 7 – 12. See previous reports for earlier formats.

Entries in Database 5 correspond to the date/time of response scans performed with the internal irradiance reference lamp, as opposed to the date/time of the data scans (as in the other four databases). The current format of Database 5 contains information about system environmental stability as well as 45-Watt lamp irradiances for up to six different high voltages.

Table 6.10. Database 5 structure Volume 7 – 12.

Col.	Field Name	Units	Comment
1	RespScan		See Section 6.2.9. *Glossary of Database Notation*
2	Volume		"12" for Volume 12
3	ErrorCode		Should be 0 (otherwise error condition)
4	WlScan		See Section 6.2.9. *Glossary of Database Notation*
5	WlCorr		Identifies wavelength calibration source
6	AXSSCorr		Identifies AXSS calibration source
7	Time		Start time Item 1 of response scan. See Section 6.2.9. *Glossary of Database Notation*
8	Site		Site identifier. See Section 6.2.9. *Glossary of Database Notation*
9	WlOffset	nm	Wavelength offset before correction was applied
10, 21, 32, 43, 54, 65	HV_i	V	High voltage setting during Item i, where i = 1 – 6.
11, 22, 33, 44, 55, 66	MaxPMT_i	nA	Maximum PMT current from 45 W lamp during Item i
12, 23, 34, 45, 56, 67	PMT300_i	nA	PMT current from 45 W lamp at 300 nm during Item i
13, 24, 35, 46, 57, 68	PMT340_i	nA	PMT current from 45 W lamp at 340 nm during Item i
14, 25, 36, 47, 58, 69	PMT370_i	nA	PMT current from 45 W lamp at 370 nm during Item i
15, 26, 37, 48, 59, 70	PMT400_i	nA	PMT current from 45 W lamp at 400 nm during Item i
16, 27, 38, 49, 60, 71	PMT600_i	nA	PMT current from 45 W lamp at 600 nm during Item i
17, 28, 39, 50, 61, 72	MonoT_i	°C	Averaged monochromator temperature during Item i
18, 29, 40, 51, 62, 73	TSI_i	V	Averaged TSI reading during Item i
19, 30, 41, 52, 63, 74	WlPot_i	V	Averaged wavelength analog potentiometer reading during Item i
20, 31, 42, 53, 64, 75	LoBoxT_i	°C	Averaged lower enclosure temperature during Item i
76	UpBoxT	°C	Averaged upper enclosure temperature
77	Ground	V	AXSS ground reference
78	WlPeakHeight	nA	Height of 296.728 nm Hg peak (assessed from wavelength scan)
79	WlPeakWidth	nA	Width of 296.728 nm Hg peak (assessed from wavelength scan)
80, 81, 82, 83, 84, 85	DMM_i	V	45W lamp current monitor during Item i =1-6
86, 87, 88, 89, 90, 91	DMM2_i	V	Reference DMM reading during Item i=1-6 (site visit only)

Note: Items with smaller consecutive numbers are represented first, e.g., PMT current from the 45-Watt lamp during Item 1 is represented in Columns 12-16, PMT current during Item 2 is in Columns 23-27, etc.

6.2.6. Daily Dose Database

Starting with Volume 9, databases containing daily dose values were added to the suite of data products. The databases include spectral integrals and dose-rates from Database 3, integrated over 24 hour time periods. The method of calculating these integrals is explained in Section 4.2.4. Daily Dose Databases are much smaller in size compared to Databases 1 – 4 since there is only one value per day and site. Volume 12 data also include measurements from previous volumes. Table 6.11 shows for each site time periods and volumes included in the Volume 12 data set.

Table 6.11. Time Periods Included in Daily Dose Databases Published as Part of Volume 12.

Site	Volumes	Time Period
McMurdo	1 – 12	12/15/89 – 01/23/03
Palmer	1 – 12	03/19/90 – 03/17/03
South Pole	2 – 12	02/18/91 – 01/11/03
Ushuaia	1 – 12	09/13/90 – 12/31/03
San Diego	3 – 12	10/30/92 – 08/19/03
Barrow	2 – 11	01/30/91 – 11/11/02

Table 6.12 shows the structure of the Daily Dose Databases. Some fields need further explanation:

- **"Date"** hold date and time assigned to the daily dose values. Date and time refer to Greenwich Mean Time (GMT) and are encoded into a single number where the integer part is the day number relative to January 1, 1900 (day 1 corresponds to 1/1/1900). The fractional part is the time of day (see Section 6.2.7 *Glossary of Database Notation* for further explanation). The encoded time stamp refers to approximate local solar noon (01:00z for McMurdo Station; 16:00z for Palmer

Station; 12:00z for South Pole Station; 17:00z for Ushuaia; 20:00z for San Diego, and 21:00z for Barrow). Integration boundaries for daily dose calculations are the given time ±12 hours. For example: The daily dose for McMurdo assigned to the Date/Time stamp 36826.04167 (i.e. 10/27/00 01:00 GMT) is the integral of spectral irradiance between 10/26/00 13:00 GMT and 10/27/00 13:00 GMT.

- **"Maximum_time_gap"** is the maximum time-gap in solar measurements during the integration period between sunrise and sunset in seconds. If the time-gap is larger than 15000 seconds, no doses are published. Gaps smaller than this limit are filled by spline interpolation, see Section 4.2.4 for details.

Table 6.12. Daily Dose Database Structure Volume 12.

Col.	Field Name	Units	Comment
1	Date		Date assigned to the daily dose value. See text for detailed explanation.
2	Site		Site identifier. See Section 6.2.9. *Glossary of Database Notation*
3	Volume		"12" for Volume 12
4	Minimum_Zenith	Degrees (DDD.DD)	Minimum solar zenith angle occurring during solar scans performed during the integration period.
5	Maximum_Time_Gap	Seconds	Maximum time gap. See text for detailed explanation.
6	E290to315	kJ / m^2	Daily dose 290 – 315 nm integral
7	E290to320	kJ / m^2	Daily dose 290 – 320 nm integral
8	E320to360	kJ / m^2	Daily dose 320 – 360 nm integral
9	E360to400	kJ / m^2	Daily dose 360 – 400 nm integral
10	E400to600	kJ / m^2	Daily dose 400 – 600 nm integral
11	E289_855to294_118	kJ / m^2	Daily dose 289.855 – 294.118 nm integral
12	E294_118to298_507	kJ / m^2	Daily dose 294.118 – 298.507 nm integral
13	E298_507to303_03	kJ / m^2	Daily dose 298.507 – 303.03 nm integral
14	E303_03to307_692	kJ / m^2	Daily dose 303.03 – 307.692 nm integral
15	E307_692to312_5	kJ / m^2	Daily dose 307.692 – 312.5 nm integral
16	E312_5to317_5	kJ / m^2	Daily dose 312.5 – 317.5 nm integral
17	E317_5to322_5	kJ / m^2	Daily dose 317.5 – 322.5 nm integral
18	E322_5to327_5	kJ / m^2	Daily dose 322.5 – 327.5 nm integral
19	E327_5to332_5	kJ / m^2	Daily dose 327.5 – 332.5 nm integral
20	E332_5to337_5	kJ / m^2	Daily dose 332.5 – 337.5 nm integral
21	E337_5to342_5	kJ / m^2	Daily dose 337.5 – 342.5 nm integral
22	E342_5to347_5	kJ / m^2	Daily dose 342.5 – 347.5 nm integral
23	Dose1	kJ / m^2	Daily dose calculated from "Dose1," see Section 4.2.3
24	Dose2	kJ / m^2	Daily dose calculated from "Dose2," see Section 4.2.3
25	Dose3_CIE_Erythema	kJ / m^2	Daily erythemal (CIE) dose, see Section 4.2.3
26	Setlow	kJ / m^2	Daily "Setlow" dose, see Section 4.2.3
27	Hunter	kJ / m^2	Daily "Hunter" dose, see Section 4.2.3
28	Caldwell	kJ / m^2	Daily "Caldwell" dose, see Section 4.2.3

6.2.7. GUV Database 1

This database contains data from the GUV multi-filter radiometers recorded concurrently with measurements of the SUV-100 spectroradiometer. For example, data of the GUV's 305 nm channel were selected for times when the SUV was scanning at 305 nm. Due the finite scan time of the SUV, GUV data from different channels have a different time stamp. This database was first published in Volume 12.

GUV measurements were calibrated against SUV data (Section 4.3). GUV product labels have either the suffix "U" or "C." The suffix "C" implies that SUV measurements were corrected for the SUV's cosine error before they were correlated against GUV data for establishing the GUV's calibration. The suffix "U" implies that SUV measurements were not corrected for the cosine error. The "C"-dataset is more accurate, but the "U"-dataset is better suited for comparison with "Version 0" SUV data described in this report, which have not been corrected for the cosine error. The structure of GUV Database 1 is provided in Table 6.13. The suffix "X" may either be "U" or "C."

Table 6.13. Structure of GUV Database 1.

Column label	Description	Unit	Remark
Datascan	Filename of associated SUV scan, See Section 6.2.9.		
GUV S/N	Serial number GUV radiometer		
Time matching SZA	Time in UT matching solar zenith angle. See Section 6.2.9.	Days since 1-Jan-1900	
Site	Site identifier. See Section 6.2.9.		
SZA	Solar zenith angle	degree	
Calibration File	Filename of GUV calibration file		
Time305	Time in UT when SUV scanned at 305 nm	Days since 1-Jan-1900	
GUVraw305	Uncalibrated GUV signal of 305 nm channel	volts	
Time313	Time in UT when SUV scanned at 313 nm. See Section 6.2.9.	Days since 1-Jan-1900	
GUVraw313	Uncalibrated GUV signal of 313 nm channel	volts	
Time320	Time in UT when SUV scanned at 320 nm. See Section 6.2.9.	Days since 1-Jan-1900	
GUVraw320	Uncalibrated GUV signal of 320 nm channel	volts	
Time340	Time in UT when SUV scanned at 340 nm. See Section 6.2.9.	Days since 1-Jan-1900	
GUVraw340	Uncalibrated GUV signal of 340 nm channel	volts	
Time380	Time in UT when SUV scanned at 380 nm. See Section 6.2.9.	Days since 1-Jan-1900	
GUVraw380	Uncalibrated GUV signal of 380 nm channel	volts	
TimePAR	Time in UT when SUV scanned at 500 nm. See Section 6.2.9.	Days since 1-Jan-1900	
GUVrawPAR	Uncalibrated GUV signal of PAR channel	volts	
PAR_X	Photosynthetically Active Radiation (PAR)	µE/(cm2 s)	1
305nm_X	Spectral irradiance at 305 nm	µW/(cm² nm)	2
313nm_X	Spectral irradiance at 313 nm	µW/(cm² nm)	2
320nm_X	Spectral irradiance at 320 nm	µW/(cm² nm)	2
340nm_X	Spectral irradiance at 340 nm	µW/(cm² nm)	2
380nm_X	Spectral irradiance at 380 nm	µW/(cm² nm)	2
400nm_X	Spectral irradiance at 400 nm	µW/(cm² nm)	3
500nm_X	Spectral irradiance at 500 nm	µW/(cm² nm)	3
600nm_X	Spectral irradiance at 600 nm	µW/(cm² nm)	3
UVB315_X	Integral of spectral irradiance between 290 and 315 nm	µW/cm²	
UVB320_X	Integral of spectral irradiance between 290 and 320 nm	µW/cm²	
UVA315-360_X	Integral of spectral irradiance between 315 and 360 nm	µW/cm²	
UVA320-360_X	Integral of spectral irradiance between 320 and 360 nm	µW/cm²	
UVA360-400_X	Integral of spectral irradiance between 360 and 400 nm	µW/cm²	
UVA315-400_X	Integral of spectral irradiance between 315 and 400 nm	µW/cm²	
UVA320-400_X	Integral of spectral irradiance between 320 and 400 nm	µW/cm²	
VIS_X	Integral of spectral irradiance between 400 and 600 nm	µW/cm²	4
Dose1_X	Spectral irradiance weighted with erythema action spectrum by Komhyr and Machta (1973)	µW/cm²	5
Dose2_X	Spectral irradiance weighted with erythema action spectrum by Diffey (1987)	µW/cm²	5
CIE_X	Spectral irradiance weighted with CIE erythema action spectrum	µW/cm²	5
UVIndex_X	UV Index according to WMO (1994)		
Erythema_Anders_X	Spectral irradiance weighted with erythema action spectrum by Anders (1995)	1/s	5
RBM501_X	Spectral irradiance weighted with RBM response function	µW/cm²	5
SetlowBSI_X	Spectral irradiance weighted with action spectrum for DNA damage by Setlow, 1974; BSI parameterization	µW/cm²	5
SetlowBSI_300_X	Spectral irradiance weighted with action spectrum for DNA damage by Setlow, 1974; BSI parameterization normalized at 300 nm	µW/cm²	5
SetlowTUV_X	Spectral irradiance weighted with action spectrum for DNA damage by Setlow, 1974; TUV parameterization	µW/cm²	5
SetlowNDSC_X	Spectral irradiance weighted with action spectrum for DNA damage by Setlow, 1974; NDSC parameterization	µW/cm²	5

SCUP-h_X	Spectral irradiance weighted with action spectrum for skin cancer in mice corrected for human skin by Gruijl et al. (1993)	µW/cm²	5
SCUP-m_X	Spectral irradiance weighted with action spectrum for skin cancer in mice by Gruijl et al. (1993)	µW/cm²	5
Caldwell_X	Spectral irradiance weighted with action spectrum for generalized plant response by Caldwell (1971)	µW/cm²	5
Flint_X	Spectral irradiance weighted with action spectrum for plant growth by Flint and Caldwell (2003)	µW/cm²	5
Hunter_X	Spectral irradiance weighted with action spectrum for northern anchovy by Hunter (1979)	µW/cm²	5
Boucher_X	Spectral irradiance weighted with action spectrum for inhibition of phytoplankton carbon fixation by Boucher et al. (1994)	(mg C) / (mg chl s)	5
Cullen_phaerodactylum.txt_X	Spectral irradiance weighted with action spectrum for inhibition of phytoplankton photosynthesis of phaeodactylum by Cullen et al. (1994)		5
Cullen_prorocentrum.txt_X	Spectral irradiance weighted with action spectrum for inhibition of phytoplankton photosynthesis of prorocentrum by Cullen et al. (1994)		5
Neale_Antarctic_X	Spectral irradiance weighted with action spectrum for inhibition of photosynthesis by Cullen and Neale. (1997)		5
TSI_X	Spectral irradiance weighted with TSI response function (Figure 2.6)	µW/cm²	
GUVSP_305_9_X	Spectral irradiance weighted with response function of GUV 305 channel		6
Ozone_short_X	Spectral irradiance weighted with an exponential function; sometimes used for ozone calculation		
Lookuptable	Filename of lookup table used for ozone calculation		
w_short	Short-wavelength data product used for ozone calculation		
w_long	Long-wavelength data product used for ozone calculation		
TotalOzone	Total column ozone	Dobson Unit	

Remarks to Table 6.13:

1. Units of PAR are $\mu E/(cm^2\ s)$ = microEinstein $/(cm^2 s) = 10^{-6}$ molphotons$/(cm^2 s)$
2. The "action spectra" for the calculation of spectral irradiances are triangular functions with a bandwidth of 1 nm FWHM centered at the specified wavelengths.
3. Spectral irradiances at 400, 500, and 600 nm were extrapolated from spectral irradiances measured at 340 and 380 nm. Values should be treated with caution due to uncertainties of this extrapolation.
4. The integral calculated from the 400 - 600 nm range was extrapolated from spectral irradiances measured at 340 and 380 nm. Values should be treated with caution due to uncertainties of this extrapolation.
5. For parameterization of action spectra see links in document http://www.biospherical.com/nsf/login/GUV/description-GUV-data-products.html
6. The definition of this data product is different for every GUV.

6.2.8. GUV Database 2

This database contains data from the GUV multi-filter radiometers recorded that were averaged over the period of one minute. Data products included in this file are the same as in GUV database 1, but have a 15-times better time resolution. This database was first published in Volume 12. GUV measurements were calibrated against cosine corrected measurements of the collocated SUV-100 spectroradiometer. GUV product labels have the suffix “C,” indicating that the cosine-corrected SUV data set was used. The structure of GUV Database 2 is provided in Table 6.14.

Table 6.14. Structure of GUV Database 2.

Column label	Description	Unit	Remark
GUV S/N	GUV serial number		
Site	Site identifier. See Section 6.2.9.		
Calibration File	Filename of GUV calibration file		
Time	Time in UT	Days since 1-Jan-1900	
SZA	Solar zenith angle	degree	
GUVraw305	Uncalibrated GUV signal of 305 nm channel after subtraction of offset	volts	
GUVraw313	Uncalibrated GUV signal of 313 nm channel after subtraction of offset	volts	
GUVraw320	Uncalibrated GUV signal of 320 nm channel after subtraction of offset	volts	
GUVraw340	Uncalibrated GUV signal of 340 nm channel after subtraction of offset	volts	
GUVraw380	Uncalibrated GUV signal of 380 nm channel after subtraction of offset	volts	
GUVrawPAR	Uncalibrated GUV signal of PAR channel after subtraction of offset	volts	
PAR_X	Phtosynthetically Active Radiation	$\mu E/(cm^2 s)$	
305nm_C	Spectral irradiance at 305 nm	$\mu W/(cm^2\ nm)$	
Structure between Columns 305nm_C and TotalOzone is identical with structure of GUV Database 1, see Table 6.13.			
TotalOzone	Total column ozone	Dobson Unit	

6.2.9. Glossary of Database Notation

- **Scan File Name:**

SFYYHHMM.DDD,

Where

- ***S*** is a site code letter from Table 6.13.
- ***F*** specifies the type of the scan (D stands for the data scan, R - for the response, M - for a multiple segment wavelength scan, W - for a two segment wavelength scan)

The remaining nine digits specify the scheduled date/time for the beginning of the scan

- ***YY*** - year (two digits)
- ***HH*** - hour (two digits)
- ***MM*** - minute (two digits)
- ***DDD*** - Julian Day (three digits)

Table 6.13. Site identifiers

Site Code Letter	Site ID Number	Site
A	1	McMurdo, Antarctica
B	2	Palmer, Antarctica
C	3	South Pole, Antarctica
D	4	Ushuaia, Argentina
E	5	San Diego, California
F	6	Barrow, Alaska

For Volume 7 data, the Site ID Number was mistakenly set in front of the scan file name, i.e. File Name is of the form NSFYYHHMM.DDD, where N is Site ID Number.

- **Date and Time:**
  The date/time recorded in the data files refers to Greenwich Mean Time (GMT) time. Time encoded in the filename is the time at the start of the scan. Date/time given in the fields “TimeA” (Database 1), TimeB (Databases 2 – 4), and “Time” (Database 5) are encoded into a single number where the integer part is the day number relative to January 1, 1900. Day 1 corresponds to 1/1/1900. The fractional part is the time of day. For example, the fractional part multiplied with 24 gives the hour of the measurement. (When the file is decoded by Microsoft Excel, the date value will automatically be translated into a correct date/time string, if the box "1904 date system" of the "Tools -> Options -> Calculation"-menu is unchecked). “TimeA” gives time at the start of Item 1 of a data scan; “TimeB” reflects time at start of Item 2 of a data scan. On some occasions, the time of the system control computer was set incorrectly. Unless otherwise noted, data were time-corrected during data analysis. In this case the times given in the Databases are correct but the time encoded in the filename was sometimes not changed and may still be in error. Affected periods are identified by “Readme” files on the CD-ROM.

- **Solar Angles:**
  Solar angles are calculated using a modification of the “Solar Ephemeris Program,” adapted from solar Ephemeris algorithms published in Wilson (1980). The zenith angle is 0 if the sun is directly overhead. For all sites except the South Pole, an azimuth angle of 0 refers to geographic north. At the South Pole an azimuth angle of 0 refers to the prime meridian, often denoted “Grid North.”

- **-999 / Missing or Defective data:**
  “-999” were used historically to mark data that are missing, obtained during an instrument overload, or defective for some other reason. From Volume 7 onward, such fields are empty.

- **Units of measure** are compiled in Table 6.14.

Table 6.14. Units of measure.

Quantity	Units
Wavelength	nm
Voltage	V
PMT Current	nA
Spectral irradiance	μW / (cm² nm)
Spectral integrals and dose-rates	μW / cm²
Daily Doses	kJ / m²
Auxiliary sensors non-calibrated (TSI) *	V
Auxiliary sensors calibrated (Eppley sensors) **	mW / cm²
Ozone	DU (Dobson Units) ***

Note: * TSI (UV-A region sensor) - see Section 2.1.2.
** Eppley Sensors - see Section 2.1.2.
*** A Dobson unit (DU) is defined as a milli-atmosphere-centimeter of ozone at standard pressure. A value of 292 DU would correspond to all the ozone in the atmosphere compressed into a layer 2.92 mm.

6.3. Format of Solar Irradiance Spectra Files

There are four types of spectral irradiance files: files containing high-resolution (wavelength increment = 0.2 nm), medium-resolution (wavelength increment = 0.5 nm), and low-resolution (wavelength increment = 1, 2.5 or 5 nm, depending on the time and site) spectral irradiance. The fourth file type contains “composite spectra”, which are assembled from high-, medium-, and low-resolution data. Wavelength increments correspond to the wavelength-steps of data scan items (see Section 4.1.1 for further explanation). All files contain calibrated data, not the original "raw" data. Spectral irradiance files have the following naming convention

STYYHHMM.DDD,

Where

- ***S*** is the site code letter from the Table 6.13
- ***T*** represents the type of data scan: **L**ow resolution, **M**edium resolution, **H**igh resolution, or **C**omposite scan
- ***HH*** - hour (two digits)
- ***MM*** - minute (two digits)
- ***DDD*** - Julian Day (three digits)

The contents and format of spectral irradiance files have evolved over the years. The exact contents of these files is given below separately for each Volume. Despite differences, there are also common features. All published spectral irradiance file are in CSV format. They all have two lines of header, followed by two or three columns, which include the spectrum. The first column is wavelength in nm, the second column is irradiance in µW / (cm² nm). From Format 1C onwards, there is also a third column with TSI measurements. Note that, although the original data were recorded on even wavelength increments (280.0, 280.2, etc.), the data here occur over somewhat irregular increments. This is due to corrections for monochromator drive offsets and non-linearities in the drive system, as described in Section 4.2.2. Negative irradiances are due to system noise. Entries showing "-999" should not be included in calculations because they are used to indicate missing data or data that occurred during overload conditions.

Format 1A (Volume 1, except Barrow):

This file structure occurs at all sites of the Volume 1.0 CD-ROM except Barrow. The time and date are expressed as ASCII strings as shown in the following example. The second line contains a single entry describing the number of points following. The following is an example of the first few lines of one of the files.

```
10/25/1990, 17:01:21
176
279.91 , 0.162E-03
280.10 , -.190E-03
280.30 , -.192E-03
280.50 , -.343E-03
280.70 , 0.198E-02
etc.
```

Format 1B (Volume 1, Barrow):

This file structure occurs only in the Barrow data of the Volume 1.0 CD-ROM. The time and date are expressed in the native Microsoft format, in which the fractional part of the date is the fractional part of the day and the integer part is the number of days since 1/1/1990. The format of the remaining lines is identical to Format 1A.

```
33416.8801
176
280.04 , -.165E-03
280.24 , -.290E-03
280.44 , 0.847E-04
280.64 , -.422E-03
etc.
```

Format 1C (Volumes 2 and 3):

Format 1C combines the Excel-style date/time long precision real number format (as in format 1B) with the more common text strings for date and time in the first line. In line two, in addition to listing the number of points in the remaining lines of data, solar zenith and azimuth angles (see Section 6.2.6) recorded at the start of the scan is added. In addition to wavelength and spectral irradiance columns there is a third column with TSI sensor measurements. The TSI reading normally appears with every fifth wavelength-irradiance pair. This reading can be helpful in determining cloud cover changes during the spectral scan.

```
04/01/91,00:01:06, 33329.0007638889
176 , 68.53796 , 204.1531
280.64 , -.456E-03,0.150E+01
280.84 , -.357E-03,
281.04 , -.271E-03,
281.24 , -.498E-03,
281.44 , -.264E-03,
281.64 , -.443E-03,0.150E+01
etc.
```

Format 1D (Volumes 4, 5, and part of Volume 6):

Format 1D expresses date/time as an ASCII string. The first line contains not only the start and end time of a segment, but also the duration. The format of the remaining lines is identical to Format 1C.

```
1/1/95 0:01, 1/1/95 0:04, 0:02:42
176, 66.95, 180.48
279.91, -0.00002, 3.50513
280.11, -0.00022,
280.31, -0.00048,
280.51, 0.00043,
280.71, -0.00047,
280.91, -0.00022, 3.50024
etc.
```

Format 2A (Part of Volume 6, and Volumes 7 – 12)

A part of the CD-ROM Volume 6 spectra and all spectra of Volume 7 – 12 are published in the "composite" Format 2A. Composite irradiance spectra include the high-, medium-, and low-resolution parts of a data scan, in a single file. Unlike Format 1D, Format 2A does not have equal steps in the wavelength domain. Composite scans consist of three sections – high-, medium-, and low-resolution – combined together at 344 nm and 404 nm, respectively. As shown below, there are irregularities in TSI reading frequencies around these points, normally every tenth wavelength-irradiance pair. The size of a typical composite scan does not exceed 12 KB. The header lines of Format 2A are the same as in Format 1D.

```
8/28/98 0:01:12,8/28/98 0:12:02,0:10:50
641,63.09,205.76
…………………..
342.33, 48.8242, 5.6923
342.53, 49.05429,
342.73, 49.48007,
342.93, 49.87489,
343.14, 50.15921,
343.34, 49.77986,
343.54, 48.30101,
343.74, 45.59745,
343.94, 42.40682,
344.14, 39.48264,
344.34, 37.98429, 5.68741
344.84, 41.22701,
345.34, 46.85482, 5.69718
345.84, 46.79203,
346.34, 45.38802,
346.85, 47.7859,
```

etc.

6.4. Ozone Data

Ozone data provided on the Volume 12 CD-ROM, were collected by NASA's Earth Probe TOMS satellite. These data cover NSF instrument sites for the Volume 12 period and were downloaded from the website toms.gsfc.nasa.gov. Data are courtesy of G.J. Labow, R.D. McPeters, and the TOMS Ozone Processing Team at NASA's Goddard Space Flight Center. Please see the TOMS website for more information on TOMS ozone observations.

Data format of Earth Probe / TOMS ozone data (excerpt of the TOMS website)

Each data set is recorded in a space separated values ASCII (*.TXT) file, which includes the main data and header information. The contents of Overpass Data Files contain the data derived from the best-matched TOMS field-of-view (FOV) to a site for every day the TOMS instrument was operational. Each overpass file contains four (4) header records: 1).Site name, ID, and location.; 2) Overpass program run information, 3) Column headings;.4) Marker record; followed by the data records, as in the example below.

MJD	Year	Day	sec-UT	SCN	LAT	LON	DIS	PT	SZA	OZONE	REF	A.I.	SOI
50280.8	1996	198	72911	19	71.4	-156.7	8	100	53.96	308.5	46.5	-0.6	2
50281.8	1996	199	66190	1	71.96	-155.5	80	100	61.27	288.2	50.6	0.3	0
50284.9	1996	202	74070	25	71.26	-156.1	19	100	53.52	312.2	18.1	-0.7	-5
50285.8	1996	203	72950	19	71.32	-156.7	3	100	54.78	312.1	39.6	-0.8	2
50289.9	1996	207	74081	25	71.17	-156.1	26	100	54.45	302.4	67.9	-0.7	1
50290.8	1996	208	72953	19	71.4	-156.8	11	100	55.9	323.4	16.3	-0.3	1
50291.8	1996	209	71818	14	71.21	-156.1	24	100	56.85	332.2	28.8	-0.3	4
50292.8	1996	210	70690	9	71.29	-156.5	6	100	58.33	337.1	36.1	0.3	11
50293.8	1996	211	69562	6	71.45	-156.1	22	100	59.75	319.1	4.9	-0.2	0
50294.9	1996	212	74059	24	71.47	-157.2	27	100	56.07	341	45.2	-0.2	4
50295.8	1996	213	72924	19	71.4	-156.7	8	100	57.06	319.5	8.3	-1.2	0
50296.8	1996	214	71788	13	71.14	-156.7	21	100	58.13	311.5	47	-0.7	-3

More specifically, the TOMS measurement Data Records contain fourteen (14) values. They are as follows:

MJD	Modified Julian Day. Astronomical Julian Day number*, less 2,400,000.5 The number is given to the nearest 1/10 day.
Year	The four-digit Gregorian year number of the TOMS measurement.
Day	The day number (day 1 through 366) of the TOMS measurement.
sec-UT	The number of seconds from midnight Universal Time, on the day specified by Year and Day.
SCN	TOMS instrument scan position (1--35 for N7 and EP; 1--37 for Adeos)
LAT	Latitude of the center of the IFOV.
LON	Longitude of the same.
DIS	Distance from site and IFOV center position, in km.
PT	Terrain pressure at IFOV center, in (atm x 100)
SZA	Solar zenith angle, in degrees, at time and location of IFOV
OZONE	TOMS Version-7 best total ozone, in Dobson Units (DU)
REF	TOMS Version-7 reflectivity at 380 nm (N7, M3) or 360 nm (EP, Adeos).
A.I.	TOMS Version-7 aerosol index.
SOI	TOMS Version-7 Sulfur dioxide index.

(*) The astronomical Julian day number (JD) is the number of Greenwich mean noons that have occurred since Greenwich noon on 1 January 4713 B.C.E., on the Julian proleptic calendar. This provides an unambiguous time index. The Modified Julian Date (MJD) is defined as MJD = JD - 2,400,000.5 . Using the MJD saves having to store the leading two digits, which, for the purpose of this data set are always `24', and makes integral values of MJD begin at Greenwich mean midnight. Additional information about these may be found in the Explanatory Supplement to the Astronomical Almanac.

6.5. CD-ROM Contents

In the following, the contents and directory structure of files published on CD-Rom are described for each Volume. Please see previous network operations reports for a more detailed file description of published data preceding Volume 12.

Volume 1.0 CD-ROM: 1990 Season

Two basic types of data appear on the Volume 1.0 UV Radiation Monitoring Network CD-ROM:

- Files with solar irradiance spectra in high, medium- and low resolution
- Databases with spectral integrals and biological dose-rates, presented in both ASCII CSV format and in Microsoft Excel Version 3.0 spreadsheet format.

Volume 2.0 and Volume 3.0 CD-ROM: 1991 and 1992 Season

Four basic types of data appear on the Volumes 2.0 and 3.0 UV Radiation Monitoring Network CD-ROM:

- Files with solar irradiance spectra in high, medium- and low resolution, including solar zenith and azimuth angles at the start of the scan and TSI voltages during the scan.
- Databases similar to those described in Section 6.2, presented in both ASCII CSV format and in Microsoft Excel-PC, Version 4.0 spreadsheet format.
- NASA TOMS Release 6.0 Ozone Data for network sites in ASCII CSV format and Microsoft Excel Version 4.0 spreadsheet format. Data date from 1978.
- Weather data from several sources including WBAN, airport observations, and site operators' observations. Some of the data start from 1973.

Volume 4.0 CD-ROM: 1993 Season

Four basic types of data appear on the Volume 4.0 UV Radiation Monitoring Network CD-ROM:

- Files with solar irradiance spectra in high, medium- and low resolution, including solar zenith and azimuth angles at the start of the scan and TSI voltages during the scan.
- Databases similar to those described in Section 6.2 in ASCII CSV format and in Microsoft Excel-PC, Version 4.0 spreadsheet format.
- NASA TOMS Ozone data for network sites and three additional sites of interest in ASCII CSV format. Data dates from September 1991.
- Weather data obtained from NCAR starting February 1993. Data available for the six network sites and six additional sites of interest.

Volume 5.0 CD-ROM: 1994-1995 Season

Four basic types of appear on the Volume 5.0 UV Radiation Monitoring Network CD-ROM:

- Files with solar irradiance spectra in high, medium- and low resolution, including solar zenith and azimuth angles at the start of the scan and TSI voltages during the scan.
- Databases similar to those described in Section 6.2 in ASCII CSV format
- Ozone data for Spectroradiometer sites and three additional sites of interest. NASA TOMS data available from 9/28/91 through 12/1/94. TOVS data presented by months of interest for 1994 and 1995.
- Weather data obtained from NCAR for time period 12/12/93 - 10/28/95. Data available for the six spectroradiometer sites and six additional sites of interest.

Volume 6.0.a and 6.0.b CD-ROMs: 1995-1997 Season

Four basic types of data appear on the Volumes 6.0.a-b UV Radiation Monitoring Network CD-ROMs:

- Files with solar irradiance spectra in high, medium- and low resolution, as well as composite spectra, including solar zenith and azimuth angles at the start of the scan and TSI voltage during the scan.
- Databases similar to those described in Section 6.2 in ASCII CSV format
- Ozone data for network sites and several additional sites of interest. NASA TOMS data and TOVS data are available from mid-1996 through mid -1997 (actual dates vary by sites).
- Weather data of the spectroradiometer sites for the periods of interest, purchased from National Climatic Data Center.

Dates and Sites covered on Volume 6.0.a:

McMurdo (2/3/95 - 1/12/97)
Palmer (3/12/95 - 4/12/97)
South Pole (1/17/95 - 1/17/97)
Ushuaia (4/11/95 - 3/25/97)

Dates and Sites covered on Volume 6.0.b:

Barrow (10/28/95 - 10/20/97)
San Diego (10/18/95 - 9/2/97)

Volume 7.0.a and 7.0.b CD-ROMs: 1997-1998 Season

Four basic types of data appear on the Volumes 7.0.a-b UV Radiation Monitoring Network CD-ROMs:

- Files with solar irradiance spectra (composite spectra), including solar zenith and azimuth angles at the start of the scan and TSI voltage during the scan.
- Databases as described in Section 6.2 in ASCII CSV format
- NASA TOMS Earth Probe ozone data for network sites.
- Weather data of the spectroradiometer sites for the periods of interest, purchased from National Climatic Data Center.

Dates and Sites covered on Volume 7.0.a:

McMurdo (1/16/97 - 1/13/98)
Palmer (4/19/97 - 3/25/98)
Ushuaia (4/2/97 - 4/10/98)

Dates and Sites covered on Volume 7.0.b:

Barrow (10/26/97 - 8/18/98)
San Diego (9/9/97 - 9/20/98)
South Pole (2/1/97 - 1/3/98)

Volume 8.0.a-c CD-ROMs: 1998-1999 Season

Four basic types of data appear on the Volumes 8.0.a-c UV Radiation Monitoring Network CD-ROMs:

- Files with solar irradiance spectra (composite spectra), including solar zenith and azimuth angles at the start of the scan and TSI voltage during the scan.
- Databases as described in Section 6.2 in ASCII CSV format
- NASA TOMS Earth Probe ozone data for network sites.
- Weather data of the network sites for the periods of interest, obtained from National Climatic Data Center.

Dates and Sites covered on Volume 8.0.a:
McMurdo (1/19/98 – 1/19/99)
South Pole (1/10/98 – 1/11/99)

Dates and Sites covered on Volume 8.0.b:
Palmer (4/6/98 – 5/2/99)
Ushuaia (4/20/98 – 8/24/99)

Dates and Sites covered on Volume 8.0.c:
San Diego (10/2/98 – 9/19/99)
Barrow (8/28/98 - 11/4/99)

Volume 9.0.a-c CD-ROMs: 1999-2000 Season

Four basic types of data appear on the Volumes 9.0.a-c UV Radiation Monitoring Network CD-ROMs:

- Files with solar irradiance spectra (composite spectra), including solar zenith and azimuth angles at the start of the scan and TSI voltage during the scan.
- Databases as described in Section 6.2 in ASCII CSV format.
- NASA TOMS Earth Probe ozone data for network sites.
- Weather data of the network sites for the periods of interest, obtained from National Climatic Data Center.

Dates and Sites covered on Volume 9.0.a:
McMurdo (1/28/99 – 1/30/00)
South Pole (1/20/99 – 1/16/00)

Dates and Sites covered on Volume 9.0.b:
Palmer (5/13/99 – 3/9/00)
Ushuaia (9/3/99 – 6/20/00)

Dates and Sites covered on Volume 9.0.c:
San Diego (9/25/99 – 8/29/00)
Barrow (11/10/99 - 11/27/00)

Volume 10.0 CD-ROMs: 2000-2001 Season

Three basic types of data appear on the Volumes 10.0 UV Radiation Monitoring Network CD-ROMs:

- Files with solar irradiance spectra (composite spectra), including solar zenith and azimuth angles at the start of the scan and TSI voltage during the scan.
- Databases as described in Section 6.2 in ASCII CSV format.
- NASA Earth Probe TOMS ozone data for network sites.

Dates and Sites covered on Volume 10.0:
McMurdo (2/6/00 – 1/22/01)
Palmer (3/19/00 – 5/17/01)
South Pole (1/26/00 – 1/12/01)
Ushuaia (6/28/00 – 1/1/02)
San Diego (9/9/00 – 8/14/01)
Barrow (1/13/01 – 10/18/01)

Volume 11.0 CD-ROMs: 2001-2002 Season

Three basic types of data appear on the Volumes 11.0 UV Radiation Monitoring Network CD-ROMs:

- Files with solar irradiance spectra (composite spectra), including solar zenith and azimuth angles at the start of the scan and TSI voltage during the scan.
- Databases as described in Section 6.2 in ASCII CSV format.
- NASA Earth Probe TOMS Version 7 ozone data for network sites.

Dates and Sites covered on Volume 11.0:
McMurdo (01/27/01 – 01/22/02)
Palmer (07/23/01 – 07/09/02)
South Pole (01/20/01 – 01/13/02)
San Diego (08/17/01 – 08/13/02)
Barrow (10/24/01 – 11/28/02)

Volume 12.0 CD-ROMs: 2002-2003 Season

Three basic types of data appear on the Volumes 12.0 UV Radiation Monitoring Network CD-ROMs:

- Files with solar irradiance spectra (composite spectra), including solar zenith and azimuth angles at the start of the scan and TSI voltage during the scan.
- Databases as described in Section 6.2 in ASCII CSV format.
- NASA Earth Probe TOMS Version 8 ozone data for network sites.

Dates and Sites covered on Volume 12.0:
McMurdo (01/26/02 – 01/23/03)
Palmer (07/17/02 – 03/17/03)
South Pole (01/18/02 – 01/11/03)
Ushuaia (03/16/02 – 12/31/03)
San Diego (08/16/02 – 08/19/03)

Directory Structure and Filename Convention

Volume 12 data published on CD-ROM and the website are organized hierarchically in a nested-tree directory (Figure 6.2). All data, individual files and databases, are grouped by year and then by site. Databases and composite spectra are stored separately in appropriate directories. The file names of databases are of the following form:

SSS_DBx.CSV

Where

- **SSS** is the site identifier (MCM – McMurdo Station; PAL – Palmer Station; SPO – South Pole; USH – Ushuaia; SAN – San Diego; BAR – Barrow)
- **x** is the databases identifier (1 – Database 1; 2 – Database 2; 3 – Database 3; 4 – Database 4; 5 – Database 5).

The filename convention for composite spectra can be found in Section 6.3. Composite scans on the Volume 12.0 CD-ROM are compressed in zip-format. Zip-files found in the “COMPOSIT” directories have the following filename convention:

VVSCYYMM.ZIP,

where

- **VV** is the identifier of data volume. For Volume 12, VV equals “12”,
- **S** is the site code letter from Table 6.13.,
- **C** is the identifier for composite scans,

- **YY** is the year identifier, e.g. “99” for the year 1999 and “00” for the year 2000,
- **MM** is a month identifier, i.e. 01 for January, 02 for February, …. 12 for December,
- **ZIP** is the filename extension for zip-files.

For example, the zip-file 12AC0112.ZIP contains composite scans measured at McMurdo during December 2001 that are part of Volume 12. Daily Dose databases, TOMS ozone data, and programs to decompress zip-files are located in separate directories and are accompanied by information text files.

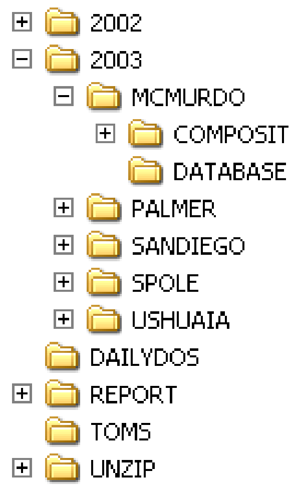

Figure 6.2. *Example Directory structure of CD-ROM Volume 12.0.*