

## Description of Version 2 Data Format NSF UV Monitoring Network: Model Parameters and Model Log

**Filename:** **SITE\_vX.2\_model\_log.csv**

where **SITE** is MCM for McMurdo Station, Antarctica  
 PAL for Palmer Station, Antarctica  
 SPO for South Pole, Antarctica  
 USH for Ushuaia, Argentina  
 SAN for San Diego, California  
 BAR for Barrow, Alaska  
 SUM for Summit, Greenland  
**X** is volume identifier (1, 2, 3, ...)  
**.2** is identifier for Version 2

All measured Version 2 spectra are accompanied by a clear-sky model spectrum and a model spectrum that also takes attenuation by clouds into account. Calculations were performed with the radiative transfer model UVSPEC/libRadtran, available at <http://www.libradtran.org/>. These calculations serve the following purposes:

- Retrieval of total column ozone
- Determination of the contribution of the Sun's direct beam to global irradiance, which is an important parameter for the cosine error correction
- Calculation of "flags"
- Quality control of Version 2 spectra
- Provision of spectra against which measured spectra can be compared

By comparing measured and modeled spectra, deficiencies in the description of the atmosphere by the model can be uncovered, leading to a better understanding of the processes affecting the transfer of radiation through the atmosphere.

Most parameters used for radiative transfer modeling and for the correction algorithms are logged in this file. The meaning of some of the parameters is very complex and has been described elsewhere. The right-most columns of the file include the ratio of measurement to the clear-sky model for 10-nm wide wavelength bands centered at 30 different wavelengths between 300 nm and 590 nm. These ratios offer an easy way for plotting the ratio of measurement and model at different wavelengths as a function of time.

### Column Assignment

Label	Description	Unit	Remark
Filename composited scan	Filename of original Version 0 "composite" spectrum		1
Filename result	Filename of corrected spectrum before normalization to a bandwidth of 1.0 nm full width at half maximum	mm/dd/yy hh:mm:ss	1
Modeling time	Time when scan was processed and a model spectrum was produced	mm/dd/yy hh:mm:ss	
SZA at start	Solar zenith angle at start of scan	degree	2
Ozone unscaled	Total ozone column	Dobson Unit DU	3
Ozone scaled	Total ozone column after scaling. This is the total ozone value used in model calculations	Dobson Unit DU	3
Ozone scale factor	Ozone scale factor. This factor is typically 1.0		3

Ozone difference	Difference between scaled and unscaled ozone value	Dobson Unit DU	3
Ozone source	Specification of total ozone data source. If "SUV", ozone values retrieved from measured SUV spectra were used for modeling		3
Ozone cross section	Specification of ozone cross section data (usually Bass_and_Paur)		3
Average ratio 300 - 315	Average ratio measurement/model between 300 and 315 nm		3
Average ratio 325 - 335	Average ratio measurement/model between 325 and 335 nm		3
Ratio E(short) / E(long)	Ratio of previous two fields		3
Minimum useable wavelength	Minimum useable wavelength for ozone calculation	nm	3
Irradiance at minimum wavelength	Irradiance at minimum wavelength for ozone calculation	mW/(m <sup>2</sup> nm)	3
SZA from scan?	"yes", if solar zenith angle at start of spectrum is taken from header of Version 0 composite scan; "no" if SZA is calculated during modeling using a simple algorithm by <i>Iqbal</i> , 1983 "Blanco" if SZA is calculated during modeling using the algorithm by Blanco-Muriel et al., 2001.		
Delta M?	"on", if delta-M scaling is turned on in the model		4
RT-Solver	Name of radiative transfer solver		4
Streams	Number of streams		4
Albedo	Surface albedo		4
Pressure	Surface pressure	hPa	4
Altitude	Altitude above sea level	km	4
Height over ground	Height over ground	km	4
Aerosol alpha	Angstroem parameter alpha		4
Aerosol beta	Angstroem parameter beta		4
Aerosol visibility	Aerosol visibility	km	4
Aerosol ssa	Aerosol single scattering albedo		4
Aerosol haze	Specification of aerosol type in the lower 2 km of the atmosphere		4
Aerosol Season	Aerosol season for selection of aerosol profile		4
Aerosol vulcan	Aerosol situation above 2 km		4
Aerosol asymmetry	Aerosol asymmetry parameter		4
Ex-spectrum	Name of extraterrestrial spectrum		4
Atmosphere profile file	Name of atmospheric data file		4
Slit function	Slit function used for modeling		4
Model version	Model version		4
Transmittance wavelengths file	Specification of wavelength grid for modeling		4
nscat	"2", indicating that model runs in full multiple scattering mode		4
Pause between item 1 and 2	Time lapse applied between wavelength-section 1 and 2 of Version 0 composite spectrum	seconds	5
Pause between item 2 and 3	Time lapse applied between wavelength-section 2 and 3 of Version 0 composite spectrum	seconds	5

Pause extra	Optional time lapse applied at "wavelength pause extra"	seconds	5
Wavelength pause extra	Wavelength at which optional time lapse is implemented	nm	5
Wavelength correction?	Either "yes" or "file" if Version2-style wavelength correction is applied		6
Filename wavelength correction	Filename of file containing information for Version2-style wavelength correction		6
Filename break-points bandwidth normalization	Filename of file used to normalize Version 2 spectra to a uniform bandwidth of 1.0 nm full width at half maximum		6
Cosine correction method	Either "standard" or "advanced". "Advanced" correction includes corrections for the azimuth and wavelength dependence of the SUV-100's angular response		6
Angular response file	Filename of file containing angular response of SUV-100. Used only in "standard" cosine correction.		6
Cosine correction coefficients file	Filename of file containing coefficients used in "advanced" cosine correction		6
Diffuse correction factor f <sub>D</sub>	Diffuse correction factor $f_D$ used in "advanced" cosine correction		6
Cloud spectra directory	Directory name of files containing pre-calculated cloud-model spectra		6
Table B and G vs. SZA and COD	Filename of file containing modeled global irradiance and ratio direct/global irradiance as a function of solar zenith angle and cloud optical depth. Used for cosine correction under cloudy conditions		6
Wavelength for COD retrieval	Wavelength at which cloud optical depth is determined.	nm	6
Cloud correction tweak file	Filename of file that contains the average ratio of measurement and model at 450 nm under clear sky conditions. This file is required to corrected for possible difference between measurement and model during clear skies to avoid that cloud optical becomes larger than zero under those conditions.		6
Sky condition	"CS", if spectrum was measured during clear skies		
Scan Time	Time in UT at start of scan	mm/dd/yy hh:mm:ss	
Numeric Scan Time	Time in UT at start of scan	Days since 1-Jan-1900	
R <sub>www</sub>	Ratio measurement/model at <b>www</b> nm		7

## Remarks

- 1 - Filename convention of spectral scans:  
snyyhhmm.jjj

where

- s = Site identifier (A=McMurdo; B=Palmer; C=South Pole; D=Ushuaia; E=San Diego; F=Barrow; J=Summit)
- n = C for composite scan; M for corrected (modeled) scan
- yy = Year
- hh = Hour (UT)
- mm = Minute
- jjj = Day of Year

- 2 - Solar zenith is the true solar zenith angle, i.e. the angle between the zenith and the Sun if the Earth had no atmosphere. Due to refraction of the Earth's atmosphere, the Sun appears to an observer, who is standing at the surface of the Earth, at a smaller angle.
- 3 - These parameters are used for the calculation of total ozone column.
- 4 - UVSPEC/libRadtran model input parameters. See manual of model, available at <http://www.libradtran.org/> for further explanation.
- 5 - Version 0 composite spectra of all sites but Summit do not include time at every measured wavelengths. These parameters are used to control the assignment of time versus wavelength. For Summit, the word "file" is printed.
- 6 - Parameters for corrections applied to Version 2 data. For details see technical appendix to the paper introducing Version 2 data:  
G. Bernhard, C. R. Booth, and J. C. Ehamjian. (2004). Version 2 data of the National Science Foundation's Ultraviolet Radiation Monitoring Network: South Pole, *J. Geophys. Res.*, 109, D21207, doi:10.1029/2004JD004937. The paper is available at: <http://www.biospherical.com/nsf/Version2/JGRpaper.asp>.
- 7 - Fields labeled R<sub>www</sub> include the ratio measurement/model averaged over the 10 nm wide wavelength interval [www - 5 nm, www + 5 nm] For example, R400 is the average ratio of the interval 395-405 nm.

## References

- Iqbal, M. (1983). *An introduction to solar radiation*, Academic Press, New York.
- Blanco-Muriel, M., D.C. Alarcón-Padilla, Teodoro López-Moratalla, and M. Lara-Coira. (2001). Computing the solar vector, *Solar Energy*, 70(5), 431-441.