Environment Canada — Environnement Canada

Meterological Service of Canada — Service météorologique du Canada

World Ozone and Ultraviolet Data Centre (WOUDC)

Contributor Guide

Version 1.0.2

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Canada

Foreword

This document describes the procedures for data submission and information about file format, structure, and content for both ozone data and ultraviolet data for the World Ozone and Ultraviolet Data Centre (WOUDC). This guide is intended for use by both data originators (for data submission) and clients (information about reading data files).

The current version of this guidebook is a combination of two separate documents; one for data submissions related to ozone data and one for data submissions related to ultraviolet data. This guidebook unifies them in order to provide more clear and consistent documentation.

The WOUDC website is used to update information and serves as a virtual "bulletin board". As this guide is further developed, use the website to retrieve the latest version.

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Chapter 1　Introduction

The World Ozone and Ultraviolet Data Centre (WOUDC) began as the World Ozone Data Centre (WODC) starting in 1960. In 1992, Environment Canada agreed to accept solar ultraviolet radiation data and the data centre was renamed to the WOUDC. The WOUDC is operated by the Meteorological Service of Canada, a branch of Environment and Climate Change Canada.

The WOUDC operates under the auspices of the Global Atmosphere Watch (GAW) programme of the World Meteorological Organization (WMO). The WOUDC gets guidance from the WMO Science Advisory Groups (SAGs) for issues related to both ozone and UV.

1.1　Intended Audience

This document is intended for use by data centre contributors. This guidebook can also be useful for data centre users and the WOUDC operator.

1.2　Purpose

The purpose of this document is to describe the procedures for data submissions to the WOUDC. This includes, but is not limited to:

- contributor registration
- station registration
- data submission
- supported contributor file formats and descriptions

As the WOUDC is further developed, this guide will be updated accordingly and will continue to be posted electronically on the WOUDC website. The WOUDC website is used to update information and serve as a virtual "bulletin board". As this guide is further developed, use the website to retrieve the latest version.

1.3　Document Location

The canonical location of this document is: http://woudc.org/archive/documentation/guidebooks/woudc-contributor-guide-en.pdf. In the event of discrepancy, the document location is to be considered normative.

1.4　Document History and Update

In the past, the contributor's guidebook had been split into two different guidebooks: one for ozone data submissions and one for ultraviolet data submissions. This guidebook unifies them in order to provide more clear and consistent documentation.

1.5   Website

The WOUDC website is located at http://woudc.org and provides a web-based application to disseminate ozone and ultraviolet radiation data, derived products and metadata.

1.6   Contributing to WOUDC

The WOUDC is the standard archive for ozone and ultraviolet data. By contributing data to the WOUDC, a contributor leverages the following benefits:

- No cost, authoritative, independent storage and backup of their data.
- 24/7 web-based public access to their data via numerous data access mechanisms providing enhanced user experience as well as multi-application machine access.
- Value added discovery, visualization and access capabilities for their data using international standards.
- Value added products created from their data, such as geospatial/GIS data formats, maps, and graphs.

In order for a contributor to be eligible to submit data, they must:

- Be registered with the WOUDC (as well as GAW which is strongly recommended);
- have their station registered with the WOUDC (and preferably GAW); and
- have the data types that the WOUDC processes (ozone data and ultraviolet data) in the extCSV file format.

If the data being submitted is not of ozone or ultraviolet, it may be eligible to be part of one of the other 5 world data centres:

- World Data Centre for Precipitation Chemistry (http://www.qasac-americas.org)
- World Data Centre for Aerosols (http://ebas.nilu.no)
- World Radiation Data Centre (http://wrdc.mgo.rssi.ru/wrdc_en_new.htm)
- World Data Centre for Remote Sensing of the Atmosphere (http://wdc.dlr.de)
- World Data Centre for Greenhouse Gases (http://ds.data.jma.go.jp/gmd/wdcgg)

Chapter 2   Data Submission Procedure

2.1   Contributor Registration

The application process consists of 4 steps:

1)   A new contributor sends a request to the WOUDC's operator at
        ec.woudc.ec@canada.ca stating their interest in being a contributor.

2)   The data centre operator will check the request and then send the
        "WOUDC_Contributor_Registration_Form.xls" form for the contributor to complete.

   a)   Note the "GAW ID" and "GAW Name" of the General Station Information portion
           of the registration form. The three-letter GAW ID (issued by GAW
           (http://www.wmo.int/pages/prog/arep/gaw/gaw_home_en.html) of the WMO
           (https://www.wmo.int)) assists in identification and cataloging of your data
           submissions. It is highly recommended that the contributor registers with
           GAWSIS (http://gaw.empa.ch/gawsis/default.asp) to receive a GAW ID for
           collection sites.

3)   The contributor returns their completed from to the data centre operator for validation.

4)   Once validated, the data centre operator will send a new, private, FTP login credential
        to the contributor for use to upload data.

A flow chart highlighting the contributor registration procedure can be found in Figure 1.
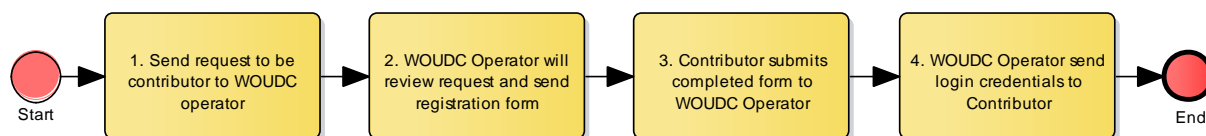
Figure 1 – Contributor registration procedure

2.2   Station Registration

Once a contributor has registered with the WOUDC as indicated in section 2.1, additional
stations or amendments to existing station information can be registered by submitting a
new or amended contributor registration form:

1)   Contact the WOUDC operator at ec.woudc.ec@canada.ca with the change request.

2)   Contributor receives a "WOUDC_Contributor_Registration_Form.xls" file from the
        operator.

3)   Contributor enters new or amended station information into the
        "WOUDC_Contributor_Registration_Form.xls" file.

4)   Contributor returns completed form to the operator who has changes implemented in
        the WOUDC system.

2.3   Data Submission

The WOUDC provides a File Transfer Protocol (FTP) capability for contributors to submit data. The WOUDC FTP site is located at ftp://ftp.woudc.org. The site requires username and password credentials in order to transfer data to the WOUDC

Note: the FTP site does not provide data access capabilities (see Data Access http://woudc.org/about/data-access.php).

Once a contributor has been registered:
1)   The contributor uploads data in extCSV format to the FTP site.
2)   The WOUDC collects data from the FTP.
3)   There is a 72 hour waiting period before processing to allow for submission of revised data by the contributor.
4)   The WOUDC processes data – validates contributor and site information.
5)   If issues are discovered during validation, the WOUDC operator will inform the contributor.
6)   If no issues are found, data will be published on the website and available for download from the website, geospatial web services or Web Accessible Folder (WAF).

A flow chart highlighting the data submission procedure can be found in Figure 2.
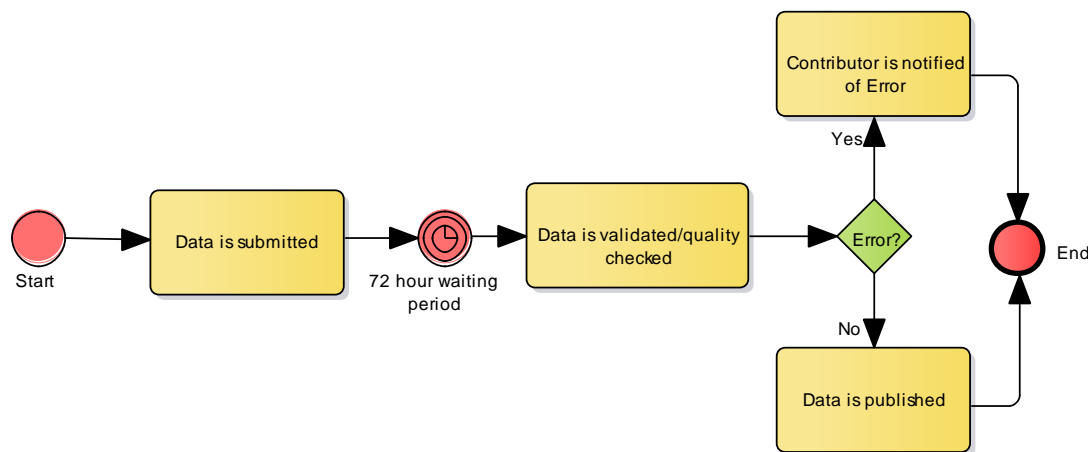

Figure 2 – Data submission procedure

Note: The details of transferring files with FTP depend on your computer's operating system and FTP client software.

2.4   Data Types

Presently, the following data categories are defined:

Ozone

- Lidar
- Microwave
- Ozonesonde
- TotalOzone
- Umkehr

Ultraviolet

- Spectral
- Multiband
- Broadband
- Pyranometer

Chapter 3   Standard Data Format

3.1   The WOUDC Data Format Standard

The WOUDC uses an ASCII text format for data submissions that leverages the Comma Separated Values (CSV) format. The WOUDC "extended" CSV (or extCSV) format provides the ability to specify multiple tables, multiple fields, table comments, file level comments, and table groupings (grouping tables into sets) within a single CSV. The extCSV file format supports both metadata information and high resolution (temporal and spatial) data. The WOUDC requires originators of data to submit their data using this standard format to assist in the efficient processing of data sets.

ExtCSV files are divided into two main parts: a metadata section and a data content section. The metadata section can be considered a data file "header" as this portion is common to all files within the WOUDC in terms of table format and content. The data portion will be unique to the individual data categories (or types) such as total ozone or ozonesonde.

3.1.1   Extended CSV syntax Rules

The main file format used by the WOUDC is an extended Comma Separated Value (extendedCSV or extCSV for short) which extends the standard CSV syntax rules to support comments and multiple data content (tables) within individual files. Since the extCSV formats in plain text (ASCII), they are platform/OS neutral and thus can be imported easily into many analytical tools.

An extCSV file consists of two sections: a metadata header and data tables. The metadata header has rigid format and content rules, but the data tables are designed to be more flexible, specific to a given data type.

The following are the extended CSV syntax rules:
- Fields are separated by comma characters (,) and the field width is variable.
- If a field name or its value contains either comma (,) or double-quote (") characters, then the entire field must be enclosed within double-quote (") characters when written.
- NULL values are represented as empty fields (,,) and blank lines are ignored.
- Lines beginning with an asterisk (*) are comments.
- Lines beginning with a pound (#) symbol are table names.
- The first record following the `#TABLENAME` record specifies column (field) names. Each data column (field) requires a name separated by a comma.

Example:

```
* The following data are simulated...
#TABLENAME
Field1, Field2, Comment
12,35.6,Clear sky.
12.5,,Thunderstorm (can't measure Y).
13,55.5,"It's raining, it's pouring!"
13.5,70,"Better start ""The Ark""."
```

The following are the WOUDC content rules:

- Table names are written in UPPERCASE and denoted by the pound (#) symbol as the first character. Field names are case-sensitive.
- A table is comprised of three sections: a table name, column (field) names, and one or more data records. Tables can also contain optional table comments.
- Trailing nulls are assumed for unspecified data attributes.
- Each file must contain only one (single) instance of the static metadata tables (`#CONTENT`, `#DATA_GENERATION`, `#INSTRUMENT`, and `#PLATFORM`) and apply to all data within the file.
- Each file must contain at least one instance of the dynamic metadata tables (`#LOCATION`, and `#TIMESTAMP`) and are applied until they are re-stated. Class content that use the fields of these tables can modify the attributes (i.e., time can be updated by individual samples).
- Further information about site conditions, meteorology, sky images, etc. may be included as comments or by other tables generated at the discretion of the data originator. For example, if a data originator wishes to indicate an occurrence of a special note ("instrument was bumped while sampling") then a comment is reasonable. Dynamic variations occurring instantaneously such as meteorology (e.g. sky or wind conditions) or the reporting of calibration data would be represented in a table.

Example:

```
#TABLENAME
Field1,Field2,Field3
Datum1,Datum2,Datum3
*Table comment
```

Example:

```
#SITE_METEOROLOGY
Date,Time,Temperature,Pressure,WindDirection,WindSpeed
```

3.2 The WOUDC extCSV Data File Metadata

3.2.1 Introduction

The WOUDC header includes the metadata information that is common in all of the WOUDC data files. The uniqueness of each field within the header is required such that if a duplicate data file is received, one or more of the header variables would have to have changed in order for this file to be accepted into the data archive.

Table 3.2-1 and Table 3.2-2 outline the tables required in all the WOUDC data files (Table Name column) and their respective field names (Field Names column). In section 3.2.1.1 to section 3.2.1.6, there are more thorough descriptions of what each field name for a particular table entails.

Table 3.2-1 – Static Metadata (only one occurrence or instance per file)

Table Name	Field (Column) Names
#CONTENT	Class, Category, Level, Form
#DATA_GENERATION	Date, Agency, Version, ScientificAuthority
#PLATFORM	Type, ID, Name, Country, GAW_ID
#INSTRUMENT	Name, Model, Number

Table 3.2-2 – Dynamic Metadata (at least one required per file; multiple occurrences are permitted)

Table Name	Field (Column) Names
#LOCATION	Latitude, Longitude, Height
#TIMESTAMP	UTCOffset, Date, Time

Note: Contributors can optionally include revision history within an extCSV file by documenting within a comment block at the end of the file. Revision dates must be in descending order (latest date first).

3.2.1.1 Content

Class: The general type of data to follow; WOUDC would be used here.

Category: Sub group of data submitted (i.e., Ozonesonde or Lidar)

Level: The level refers to the data product.
Level 0: raw or primary data.
Level 1: processed data ready for publication.
Level 2: data interpolated or re-gridded Level 1 data.

Form: The version of the data format to follow. The initial specification for the `FORM` (value=1) refers to the basic table descriptions. If an existing table is altered **or** a new table added, the `FORM` index will be increased. For example, a data table already defined with form=1, with a specific number of columns, then the addition of one or more columns to that table would require the Form value to be incremented by one for each change. The `FORM` (index) value is intended as a file format reader indicator of the type of data tables to follow, to assist programmers with reading the file. Changes to this index will be made through the WOUDC only.

3.2.1.2   Data Generation

Date: Date when the files was processed or generated. Date is represented in the ISO 8160 format standard, i.e., YYYY-MM-DD. Example: 2015-12-31.

Agency: The acronym of the submitting Agency.

Version: Data version specified by the submitting Agency. These versions have the form "major.minor" (e.g., 3.2) where major values are incremented with changes to the processing algorithm and minor values are incremented when the characterisation or calibration values have changed. Note: minor values are reset to zero with changes to the processing algorithm.

ScientificAuthority: The person(s) responsible for the data quality at the submitting Agency.

3.2.1.3   Platform

Type: Type of observing platform: Stationary (STN) or Moving (e.g., Airborne (FLT), Ship borne (SHP), etc.). The default is STN. This field, for example, will accommodate the future inclusion of an onboard GPS on ozonesonde flights which records exact location throughout a flight. Thus, FLT would be selected instead of STN.

ID: Unique station or flight ID assigned by the WOUDC to each registered platform.

Name: Platform Name (requested that an ASCII character name be used)

Country: The country where the platform is located using the three-letter ISO-3166 code (e.g., Finland is FIN, Switzerland is CHE, etc.).

GAW_ID: three-letter GAW ID as issued by GAWSIS, if available (recommended).

3.2.1.4   Instrument

Name: Common name of instrument. For example, the Brewer spectrophotometer is called the "Brewer" wheras the Brewer-Mast ozonesonde is called the "Brewer-Mast". Refer to the WOUDC website for a listing: http://woudc.org/data/instruments.

Model: Model ID where applicable. Refer to the WOUDC instrument list:
http://woudc.org/data/instruments

Number: Serial number of the instrument as assigned by the manufacturer.

3.2.1.5   Location

Latitude: Latitude of the instrument. Typically an instrument is located at a fixed location and shares the platform latitude. The format is decimal degrees (deg.) to two significant decimals places with North positive and South negative.

Longitude: Longitude of the instrument. Typically an instrument is located at a fixed location and shares the platform longitude. The format is decimal degrees (deg.) to two significant decimals places with East positive and West negative.

Height: Height is defined as the altitude, elevation, or height of the defined platform + instrument above sea level. Typically an instrument is located at a fixed location and shares the platform elevation. The format is metres above sea level (m.a.s.l.).

3.2.1.6   Timestamp

UTCOffset: The UTCOffset is the amount of time to be **subtracted** from the local time in order to obtain UTC time (where East is positive and Local Time as defined by the data originator). UTCOffset is represented in the ISO-8601 standard of hh:mm:ss. The default is to report time in UTC, thus UTCOffset=+00:00:00. If Time is not given in UTC in the Data Content section, then Time represents local time and the UTCOffset must be specified by a non-zero value.

Note: This is equivalent to UTC = time – UTCOffset.

Date: Date is represented in the ISO 8160 format standard, i.e., YYYY-MM-DD, corresponding to the time code. Example: 2015-12-31.

Time: Time is represented in the ISO-8601 standard of hh:mm:ss.

3.2.1.7 Example

Below is an example of a header. This header includes all the required header tables and fields, as well as comments.

```
*SOFTWARE: SNDPRO 1.3
*TROPOPAUSE IN MB 320
*M.S.C.-O3 T1200

#CONTENT
Class,Category,Level,Form
WOUDC,OzoneSonde,1.0,1

#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
1999-05-07,MSC,1.0,Jonathan Davies

#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,315,Eureka,CAN,71917

#INSTRUMENT
Name,Model,Number
ECC,6a,6a2355

#LOCATION
Latitude,Longitude,Height
79.99,-85.94,10

#TIMESTAMP
UTCOffset,Date,Time
+00:00:00,1999-04-28,23:15:00
```

3.3   Ozone Specific Data Content

3.3.1   Introduction

This section discusses the data content of the various categories of Ozone data. Each category has a set of defined tables which includes the fields (columns) names, the order of the fields, and the required units.

3.3.1.1   Lidar

Lidar is an abbreviated term for Light Detection and Ranging. This is remotely sensed data where the temporal range per file is the duration of one observation period (usually one local or two days yielding a single profile).

3.3.1.2   Microwave

Microwave contains information on vertical ozone profile. This is remotely sensed data where the temporal range per file is the duration of one observation period (usually one local or two days yielding a single profile).

3.3.1.3   Ozonesonde

Ozonesonde is a balloon-borne ozone instrument used to vertically profile the ozone amount in the atmosphere. This is remotely sensed data where the temporal range per file is the duration of sonde flight (typically a single flight).

3.3.1.4   TotalOzoneObs

TotalOzoneObs (total ozone observations) is total column ozone measurements measured in the Dobson Units. This is remotely sensed data where the temporal range per file is usually within one local day.

3.3.1.5   TotalOzone

TotalOzone (total ozone) is total column ozone measurements measured in the Dobson Units. This is remotely sensed data where the temporal range per file is one month of daily summaries.

3.3.1.6   UmkehrN14

UmkehrN14 is For Umkehr measurements using 14 N-values (representing 14 solar zenith angles). This is remotely sensed data where the temporal range per file is in one month of daily summaries.

3.3.2 Category: Lidar

There are two tables required for the Lidar Category: `#PROFILE_SUMMARY`, and `#OZONE_PROFILE`.

> **Note**: the Lidar tables have been directly extracted from the NASA-Ames 2160 formatted files [1, 2] used by Network for the Detection of Atmospheric Composition Change (NDACC) known formerly as NDSC.

Table 3.3-1 outlines the tables needed for the category Lidar (column Table Name) and their respective field names. In section 3.3.2.1 to section 3.3.2.2, there are more thorough descriptions of what each field name for a particular table entails.

Table 3.3-1 – Category Lidar data tables

Table Name	Field (Column) Names (in order)
`#PROFILE_SUMMARY`	`Altitudes, MinAltitude, MaxAltitude, StartDate, StartTime, EndDate, EndTime, PulsesAveraged`
`#OZONE_PROFILE`	`Altitude, OzoneDensity, StandardError, RangeResolution, AirDensity, Temperature`

3.3.2.1 PROFILE_SUMMARY

Altitudes: Number of retrieved levels (layers) reported.

MinAltitude: Minimum altitude of profile in meters (m).

MaxAltitude: Maximum altitude of profile in meters (m).

StartDate: Start date determined by the observation period. ISO 8601 format for date yyyy-mm-dd is used.

StartTime: Start time determined by the observation period. ISO 8601 format for time hh:mm:ss is used.

EndDate: End date determined by the observation period. ISO 8601 format for date yyyy-mm-dd is used.

EndTime: End time determined by the observation period. ISO 8601 format for time hh:mm:ss is used.

PulsesAveraged: Number of pulses used to integrate profile.

3.3.2.2 OZONE_PROFILE

Altitude: altitude (range) in metres (m).

OzoneDensity: Ozone density (concentration) (molecules*cm^{-3}).

StandardError: Estimated standard error of ozone concentration (molecules*cm^{-3}).

RangeResolution: Range resolution in metres (m).

AirDensity: Density of the air (molecules*cm^{-3}).

Temperature: Temperature (Kelvin).

3.3.2.3 Example
Example format for a Lidar data file can be found in Appendix A.1 as well as online at http://woudc.org/archive/Documentation/Examples-extCSV/Lidar.csv.

3.3.3 Category: Microwave

There are two tables required for the Microwave Category: `#PROFILE_SUMMARY`, and `#OZONE_PROFILE`.

Note: the Microwave tables are based on the data output from the Payerne, Switzerland meteorological station, operated by MeteoSwiss [3].

Table 3.3-2 outlines the tables needed for the category Microwave (column Table Name) and their respective field names. In section 3.3.3.1 to section 3.3.3.2, there are more thorough descriptions of what each field name for a particular table entails.

Table 3.3-2 – Category Microwave data tables

Table Name	Field (Column) Names (in order)
`#PROFILE_SUMMARY`	`Levels, AveragingTime, ZenithAngle, NoiseTemperature, TTF, CalculatedSpectrum`
`#OZONE_PROFILE`	`Altitude, OzoneVMR, VariableError, FixedError, SmoothingError, TotalError, A-priori, Temperature, Pressure`

3.3.3.1 PROFILE_SUMMARY

Levels: Number of levels (layers) reported

AveragingTime: Averaged time

ZenithAngle: Solar zenith angle (decimal degrees)

NoiseTemperature: Mean system noise temperature (K)

TTF: Tropospheric Transmission Factor (TTF)

CalculatedSpectrum: State of measure – calculated spectrum (K)

3.3.3.2 OZONE_PROFILE

Altitude: in metres above sea level (m.a.s.l.)

OzoneVMR: Ozone VMR in ppm

VariableError: Variable (stochastic) error for ozone VMR (ppm)

FixedError: Fixed (systematic) error for ozone VMR (ppm)

SmoothingError: Smoothing error (ppm)

TotalError: Total error (ppm)

A-priori: A-priori data contribution (%)

Temperature: Temperature profile used for retrieval (K)

Pressure: Pressure profile used for retrieval (Pa)

3.3.3.3   Example

Example format for a Microwave data file can be found in Appendix A.2.

3.3.4   Category: Ozonesonde

There are 12 tables required for the Ozonesonde Category: `#PREFLIGHT_SUMMARY`, `#RADIOSONDE`, `#INTERFACE_CARD`, `#SAMPLING_METHOD`, `#PUMP_SETTINGS`, `#PUMP_CORRECTION`, `#FLIGHT_SUMMARY`, `#OZONE_REFERENCE`, `#PROFILE`, `#PROFILE_UNCERTAINTY`, `#PRELAUNCH`, and `#DESELECTED_DATA`.

Note: There is an alternation to the header metadata where table name `#CONTENT` in the `FORM` field name shall be equal to two. The reason this change is occurring: `FORM` (index) is the version of the data format. If an existing table is altered **or** a new table added, the `FORM` index will be increased by one for each change. The form (index) value is intended as a file format reader indicator of the type of data tables to follow, to assist programmers with reading the file. Changes to this index will be made through the WOUDC only. Consequently the additional and altering of the original tables in the ozonesonde format the `FORM` index value needs to change, in this case it shall be equal to two as of "Month Day, 2013". For details, please refer to Section 3.2.1.1.

Table 3.3-3 outlines the tables needed for the category Ozonesonde (column Table Name) and their respective field names. In section 3.3.4.1 to section 3.3.4.12, there are more thorough descriptions of what each field name for a particular table entails. Section 3.3.4.13 includes two code tables: Table 3.3-4 – Residual Ozone (Correction) Algorithm Codes and Table 3.3-5 – Level Codes.

Table 3.3-3 – Category Ozonesonde data tables

Table Name	Field (Column) Names (in order)
#PREFLIGHT_SUMMARY	Ib0, ib1, ib2, SolutionType, SolutionVolume, PumpFlowRate, OzoneSondeResponseTime
#RADIOSONDE	Manufacturer, Model, Number
#INTERFACE_CARD	Manufacturer, Model, Number
#SAMPLING_METHOD	TypeOzoneFreeAir, CorrectionWettingFlow, SurfaceOzone, DurationSurfaceOzoneExposure, LengthBG, WMOTropopausePressure, BurstOzonePressure, GroundEquipment, ProcessingSoftware
#PUMP_SETTINGS	MotorCurrent, HeadPressure, VacuumPressure
#PUMP_CORRECTION	Pressure, PumpCorrectionFactor
#FLIGHT_SUMMARY	IntegratedO3, CorrectionCode, SondeTotalO3, NormalizationFactor, BackgroundCorrection, SampleTemperatureType
#OZONE_REFERENCE	Name, Model, Number, Version, TotalO3, WLCode, ObsType, UTC_Mean
#PROFILE	Duration, Pressure, O3PartialPressure, Temperature, WindSpeed, WindDirection, LevelCode, GPHeight, RelativeHumidity, SampleTemperature, SondeCurrent, PumpMotorCurrent, PumpMotorVoltage, Latitude, Longitude, Height
#PROFILE_UNCERTAINTY	As in #PROFILE
#PRELAUNCH	As in #PROFILE
#DESELECTED_DATA	As in #PROFILE

3.3.4.1 PREFLIGHT_SUMMARY

Ib0: Background current of ozonesonde measured in the laboratory before sonde is exposed to ozone (μA).

Ib1: Background current of ozonesonde measured in the laboratory after sonde is exposed to defined dose of ozone (μA).

Ib2: Background current of ozonesonde measured at the field site just prior to launch (μA).

SolutionType: Chemical composition of sensing solution of ozonesonde.

SolutionVolume: Volume of sensing solution in ozonesonde cell (ml).

PumpFlowRate: Pump flow rate measured in the laboratory at surface conditions (corrected for moistening when possible: see section 3.2.4 of GAW Report #201 – http://www.wmo.int/pages/prog/arep/gaw/documents/GAW_201.pdf) (cm^3/min).

OzonesondeResponseTime: Response time 1/e (in minutes) measured during the laboratory decay test.

3.3.4.2 RADIOSONDE

Manufacturer: Manufacturer of radiosonde flown with the ozone sensor.

Note: In the in the January 2013, GAW Report #201, *Quality Assurance and Quality Control for Ozonesonde Measurements in GAW*, Section 4.8.2, page 45; this field name "Manufacturer" is known as "Name".

Model: Radiosonde model.

Number: Radiosonde serial number.

3.3.4.3 INTERFACE_CARD

Manufacturer: Manufacturer of interface card between radiosonde and ozone sensor.

Note: In the in the January 2013, GAW Report #201, *Quality Assurance and Quality Control for Ozonesonde Measurements in GAW*, Section 4.8.2, page 45; this field name "Manufacturer" is known as "Name".

Model: Interface card model.

Number: Interface card serial number.

3.3.4.4 SAMPLING_METHOD

TypeOzoneFreeAir: Technique used to obtain ozone free air at the launch site just prior to launch (example would be "activated charcoal filter").

CorrectionWettingFlow: Factor applied to pump flow rate to compensate for using non-saturated air during pre-flight calibration.

SurfaceOzone: Surface ozone measured by independent method (ppbv).

DurationSurfaceOzoneExposure: Length of time ozonesonde was measuring (i.e. exposed to) surface ozone (min).

LengthBG: Distance (length) between the bottom of the balloon and the sonde payload or gondola (m).

WMOTropopausePressure: Ambient air pressure at the tropopause which is determined after WMO-definition (hPa).

BurstOzonePressure: Ozone partial pressure at balloon burst altitude (hPa).

GroundEquipment: Basic ground equipment in use.

ProcessingSoftware: Post flight processing software.

3.3.4.5   PUMP_SETTINGS

MotorCurrent: Electrical current through pump motor (mA).

HeadPressure: Maximum pressure when outlet of pump is stopped (hPa).

VacuumPressure: Minimum pressure when inlet of pump is stopped (hPa).

3.3.4.6   PUMP_CORRECTION

Pressure: Level Pressure in hecto-Pascals (hPa).

PumpCorrectionFactor: Correction applied to pump flow rate at corresponding pressure level.

3.3.4.7   FLIGHT_SUMMARY

IntegratedO3: Integrated ozone amount from launch platform to burst altitude (DU).

CorrectionCode: Code for the algorithm used to estimate the remaining ozone (calculated residual) above burst height to the top of atmosphere. (Refer to Table 3.3-4 in Section 3.3.4.13).

SondeTotalO3: Integrated + calculated residual (DU).

NormalizationFactor: The factor that the apparent ozone partial pressure measured by the sonde was multiplied by in order to make the `SondeTotalO3` value agree with the `TotalO3` given in the `#OZONE_REFERENCE` table. A negative factor indicates a value that was calculated but not applied.

BackgroundCorrection: The method used to account for the background current produced by the ozonesonde when no ozone is present.

SampleTemperatureType: The method used to calculate the temperature of the air being sampled by the ozonesonde. This can be an estimated value, a constant, or a measurement from a thermistor located in the box, pump or inlet tube.

3.3.4.8   OZONE_REFERENCE

Name: Common name of the total ozone reference instrument, for example "Brewer" or "TOMS". Refer to the WOUDC website for a listing: http://woudc.org/data/instruments

Model: Model ID where applicable. Refer to the WOUDC Instrument list: http://woudc.org/data/instruments.

Number: Serial number of the instrument as assigned by the manufacturer.

Version: Data version specified by the submitting Agency. These versions have the form "major.minor" (eg. 3.2) where major values are incremented with changes to the processing algorithm and minor values are incremented when the characterisation or calibration values have changed.

Note: minor values are reset to zero with changes to the processing algorithm.

TotalO3: Daily value of total column ozone amount (in Dobson Units, i.e., milli atm-cm) defined as the "best representative value" (typically in the order of DS, ZS and FM).

WLCode: Code to designate the wavelength pair(s) used for total ozone measurement. (Refer to Table 3.3-5 in Section 3.3.4.13).

ObsType: Code to designate the type of total ozone measurement. (Refer to Table 3.3-5 in Section 3.3.4.13).

UTC_Mean: The mean time of observations (in decimal hours, UTC).

3.3.4.9   PROFILE

Duration: Elapsed flight time since released as primary variable (s).

Pressure: Atmospheric pressure of each level in hecto-Pascals (hPa).

O3PartialPressure: Level partial pressure of ozone in milli-Pascals (mPa).

Temperature: Level Temperature in degrees Celsius (C).

WindSpeed: Wind speed in meters per second (m/s).

WindDirection: Wind direction in degrees.

LevelCode: Code for the level type. (Refer to Table 3.3-5 in Section 3.3.4.13).

GPHeight: Geopotential height in meters (m).

RelativeHumidity: Relative Humidity in percent (%).

SampleTemperature: Temperature where sample is measured in degrees Celsius (C).

SondeCurrent: Measured ozonesonde cell current (µA) with no corrections applied.

PumpMotorCurrent: Electrical current (mA) measured through the pump motor (if available).

PumpMotorVoltage: Applied voltage (V) measured across the pump motor (if available).

Latitude: Geographical latitude (for example from GPS) (-90 to +90 decimal degrees).

Longitude: Geographical longitude (for example from GPS) (-180 to +180 decimal degrees).

Height: Geographical height (for example from GPS) (meter above sea level - masl).

3.3.4.10 PROFILE_UNCERTAINTY

Have estimated uncertainty (if available) for each of the measured profile parameter in `#PROFILE` as a function of duration.

Duration: Elapsed flight time as primary variable (s).

Pressure: Atmospheric pressure of each level in hecto-Pascals (hPa).

O3PartialPressure: Level partial pressure of ozone in milli-Pascals (mPa).

Temperature: Level Temperature in degrees Celsius (C).

WindSpeed: Wind speed in meters per second (m/s).

WindDirection: Wind direction in degrees.

LevelCode: Placeholder for future use, leave as blank.

GPHeight: Geopotential height in meters (m).

RelativeHumidity: Relative Humidity in percent (%).

SampleTemperature: Temperature where sample is measured in degrees Celsius (C).

SondeCurrent: Measured ozonesonde current (no corrections applied).

PumpMotorCurrent: Electrical current (mA) measured through the pump motor (if available).

PumpMotorVoltage: Applied voltage (V) measured across the pump motor (if available).

Latitude: Geographical latitude (for example from GPS) (-90 to +90 degrees).

Longitude: Geographical longitude (for example from GPS) (-180 to +180 degrees).

Height: Geographical height (for example from GPS) (meters above sea level - masl).

3.3.4.11 PRELAUNCH

Any data recorded by telemetry (i.e. data acquisition) system prior to sonde release including pre-launch checks and surface measurements.

Duration is relative to launch time (time before launch in seconds) and is therefore a negative value. All the other table parameters are consistent with `#PROFILE_UNCERTAINTY` table (section 3.3.4.10).

3.3.4.12 DESELECTED_DATA

Any data recorded from the Ozonesonde but **not** reported in the `#PROFILE` table.

This can include data that was rejected due to suspected telemetry or instrument problems; and data recorded after balloon termination (a descent profile). The table parameters are the same as in `#PROFILE_UNCERTAINTY` table ([section 3.3.4.10](#)). `O3PartialPressure` may be calculated but is not mandatory.

3.3.4.13 Code Tables

Table 3.3-4 – Residual Ozone (Correction) Algorithm Codes

Correction Code	Algorithm
None (blank)	Unknown
0	None
1	Satellite derived climatology from SBUV. (after (McPeters, R.D., Labow, G.J., and Johnson, B.J. 1997 in JGR)
2	Constant mixing ratio extrapolated from value at burst height. The Residual Ozone (D.U.) = 7.892 * ozone partial pressure (mPa) at burst level.
3	Constant mixing ratio extrapolated from average of last 3 significant levels above 17 mbar (MSC method). The Residual Ozone (D.U.) = 7.892 * Total atmospheric pressure * (Average mixing ratio of last three levels) (mPa)
4	Constant mixing ratio extrapolated from value at burst height. The Residual Ozone (D.U.) = 7.892 * ozone partial pressure (mPa) at burst level. However, the height of the extrapolation is limited to 7 hPa. If the balloon reaches a height beyond 7 hPa, the profile is integrated up to 7 hPa and then the ozone partial pressure, at that point (if it is a good datum), is multiplied by 7.892. If the balloon bursts below 7 hPa then the profile is extrapolated from the burst point.
5	Monthly mean vertical ozone profile climatology is calculated specifically for Lauder using Lauder ozone microwave radiometer data from 1992 to 1998. The climatology is similar to the McPeters/Labow climatology in that it is listed in 1 hPa increments from 30 to 1 hPa.

Correction Code	Algorithm
6	Climatology 2011: An MLS and sonde derived ozone climatology for satellite retrieval algorithms. (After McPeters, R.D., and Labow G.J., in JGR 2012).
7-98	To be defined by WOUDC
99	Other (not yet defined) Supplied by data originator.

Table 3.3-5 – Level Codes

Level Code	Description
None (blank)	Unknown
0	Regular level (point value/datum)
1	**Standard level** The 15 standard WOUDC levels are: 1000, 700, 500, 300, 200, 150, 100, 70, 50, 30, 20, 10, 7, 5, 3, 2 and 1 (hPa).
2	**Significant level** Surface, tropopause or other significant inflection point for ozone, temperature etc.
3	Standard and Significant Level.
4	Level average
Other codes	Further codes will be generated as required using the following simple model: **Level Code – Description** 8 – significant for temperature 16 – significant for ozone 32 – significant for RH E.g. a standard level which is significant for temperature and ozone would be 1+2+8+16 = 27

3.3.4.14 Example

Example format for an Ozonesonde data file can be found in Appendix A.3 as well as online at http://woudc.org/archive/Documentation/Examples-extCSV/Ozonesonde.csv.

3.3.5 Category: TotalOzoneObs

There are two tables required for the TotalOzoneObs Category: `#OBSERVATIONS`, and `#DAILY_SUMMARY`.

Table 3.3-6 outlines the tables needed for the category TotalOzoneObs (column Table Name) and their respective field names. In [section 3.3.5.1](#) to [section 3.3.5.2](#), there are more thorough descriptions of what each field name for a particular table entails. [Section 3.3.5.3](#) includes two code tables: Table 3.3-7 – Wavelength Codes and Table 3.3-8 – Observation Codes.

Table 3.3-6 – Category TotalOzoneObs data tables

Table Name	Field (Column) Names (in order)
`#OBERVATIONS`	`Time, WLCode, ObsCode, Airmass, ColumnO3, StdDevO3, ColumnSO2, StdDevSO2`
`#DAILY_SUMMARY`	`WLCode, ObsCode, nObs, MeanO3, StdDevO3`

3.3.5.1 OBSERVATIONS

Time: hh:mm:ss

WLCode: Code to designate the wavelength pair(s) used for total ozone measurement. Codes 0-7 are used for Dobson instruments only, 8 for Filter instruments only and 9 for Brewer instruments only. Refer to Table 3.3-7 in [section 3.3.5.3](#).

ObsCode: Code to designate the type of total ozone measurement. Refer to Table 3.3-8 in [section 3.3.5.3](#).

Airmass: Relative slant path through atmosphere.

ColumnO3: Discrete total column ozone (O_3) amount (in Dobson Units, i.e., milli atm-cm) measured at the time of observation.

StdDevO3: Standard Deviation of total column ozone measurement (where applicable).

ColumnSO2: Discrete total column sulphur dioxide (SO_2) amount (in Dobson units, i.e., milli atm-cm) measured at the time of observation.

StdDevSO2: Standard Deviation of total column SO_2 measurement (where applicable).

3.3.5.2 DAILY_SUMMARY

WLCode: Code to designate the wavelength pair(s) used for total ozone measurement. Codes 0-7 are used for Dobson instruments only, 8 for Filter instruments only and 9 for Brewer instruments only. Refer to Table 3.3-7 in [Section 3.3.5.3](#).

ObsCode: Code to designate the type of total ozone measurement. Refer to Table 3.3-8 in section 3.3.5.3.

nObs: Number of observations used to calculate the total column ozone value

MeanO3: Mean value of total column ozone (O_3) amount (in Dobson Units, i.e., milli atm-cm).

StdDevO3: Standard Deviation of total column ozone measurement (where applicable)

3.3.5.3   Code Tables

Table 3.3-7 – Wavelength Codes

WLCode	Description
0	AD wavelengths, ordinary setting
1	BD wavelengths, ordinary setting
2	CD wavelengths, ordinary setting
3	CC' wavelengths, ordinary setting
4	AD wavelengths, focused image
5	BD wavelengths, focused image
6	CD wavelengths, focused image
7	CC' wavelengths, focused image
8	Used to denote filter ozonemeter instruments
9	Used to denote Brewer spectrophotometer instruments
10-n	To be defined

Table 3.3-8 – Observation Codes

ObsCode	Description
0 or DS	Direct Sun
1 or FM	Focused Moon
2 or ZB	Zenith Blue Sky
3 or ZS	Zenith Cloud (uniform stratified layer of small opacity)
4 or ZS	Zenith Cloud (uniform or moderately variable layer of medium opacity)
5 or ZS	Zenith Cloud (uniform or moderately variable layer of large opacity)
6 or ZS	Zenith Cloud (highly variable layer with or without precipitation)
7 or ZS	Zenith Cloud (fog)
8 or UV	Ozone derived from UV spectrum
9-n	To be assigned by the WOUDC. Data originators are encouraged to contact the WOUDC to register a new code when required.
GI	Total ozone value calculated from global irradiance (GI) type of measurement (specifically for Brewer instruments)

3.3.5.4 Example

Example format for a TotalOzoneObs data file can be found in Appendix A.4 as well as online at http://woudc.org/archive/Documentation/Examples-extCSV/TotalOzoneObs.csv.

3.3.6 Category: TotalOzone

There are two tables required for the TotalOzone Category: `#DAILY`, and `#MONTHLY`.

Table 3.3-9 outlines the tables needed for the category TotalOzone (column Table Name) and their respective field names. In section 3.3.6.1 to section 3.3.6.2, there are more thorough descriptions of what each field name for a particular table entails.

Table 3.3-9 – Category TotalOzone data tables

Table Name	Field (Column) Names (in order)
`#DAILY`	`Date, WLCode, ObsCode, ColumnO3, StdDevO3, UTC_Begin, UTC_End,UTC_Mean, nObs, mMu, ColumnSO2`
`#MONTHLY`	`Date, ColumnO3, StdDevO3, Npts`

3.3.6.1 DAILY

Date: yyyy-mm-dd

WLCode: Code to designate the wavelength pair(s) used for total ozone measurement. (Refer to Table 3.3-7 in section 3.3.5.3).

ObsCode: Code to designate the type of total ozone measurement. Refer to Table 3.3-8 in section 3.3.5.3.

ColumnO3: Daily value of total column ozone amount (in Dobson Units, i.e., milli atm-cm) defined as the "best representative value"; typically in the order of DS, ZS and FM.

StdDevO3: Is the estimated population standard deviation of the total column ozone measurements used for the daily value.

UTC_Begin: The starting time of observations (in decimal hours, UTC).

UTC_End: The ending time of observations (in decimal hours, UTC).

UTC_Mean: The mean time of observations (in decimal hours, UTC).

nObs: Number of observations used to calculate the total column ozone value.

mMu: The harmonic mean of the relative slant path through the ozone layer at 22Km ($\mu 1$) for each of the observations used to compute the daily value. It is a useful statistic in relation to the effects of uncertainties in the zero airmass extrapolations and in the generation of simulated data from independent data. mMu=NN/Σ (1/μi).

ColumnSO2: The daily total column sulphur dioxide (SO_2) amount calculated as the mean of the individual SO_2 amounts (in Dobson Units, i.e., milli-atm-cm) from the same observation used for the O_3 amount.

3.3.6.2 MONTHLY

Date: yyyy-mm-dd (The default value is the first day of the month).

ColumnO3: Daily value of total column ozone amount (in Dobson Units, i.e., milli atm-cm) defined as the "best representative value" in order of DS, ZS and FM.

StdDevO3: Standard Deviation of daily total column ozone measurement.

Npts: The number of points (typically this is the number of daily averages) used to estimate the monthly mean ozone value.

3.3.6.3 Example

Example format for a TotalOzone data file can be found in Appendix A.5 as well as online at http://woudc.org/archive/Documentation/Examples-extCSV/TotalOzone-Brewer.csv.

3.3.7   Category: UmkehrN14

There are two tables required for the UmkehrN14 Category: `#N14_VALUES`, and `#C_PROFILE`.

Table 3.3-10 outlines the tables needed for the category UmkehrN14 (column Table Name) and their respective field names. In section 3.3.7.1 to section 3.3.7.2, there are more thorough descriptions of what each field name for a particular table entails.

Table 3.3-10 – Category UmkehrN14 data tables

Table Name	Field (Column) Names (in order)
`#DAILY`	`Date, H, L, WLCode, ObsCode, ColumnO3, N600, N650, N700, N740, N750, N770, N800, N830, N840, N850, N865, N880, N890, N900`
`#MONTHLY`	`Date, H, L, ColumnO3Obs, ColumnO3Retr, Layer10, Layer9, Layer8, Layer7, Layer6, Layer5, Layer4, Layer3, Layer2, Layer1, ITER, SX, SZA_1, nSZA, DFMRS, FEPS, RMSRES`

3.3.7.1 N14_VALUES

Date: yyyy-mm-dd

H: Code for time of observation: 0=unkown, 1=AM and 2=PM.

L: Code for wavelength pair used for observation:

1=A wavelength pair

2=B wavelength pair

3=C wavelength pair

4=D wavelength pair

5=non sunobservation adjusted to DS observation

WLCode: Code to designate the wavelength pair(s) used for total ozone measurement. Refer to Table 3.3-7 in section 3.3.5.3.

ObsCode: Code to designate the type of total ozone measurement. Refer to Table 3.3-8 in section 3.3.5.3.

ColumnO3: Total amount of column ozone (in Dobson Units, i.e., milli atm-cm) applicable to the Umkehr observation.

N600 to N900: Log(I'/I + constant) to three decimal places (nnn) for the Solar Zenith Angle (_###). The SZA is given to the nearest tenth of a degree with the decimal point omitted. When Log(I'/I + constant) exceeds unity, the integer is omitted. For example: if Log(I'/I + constant)=1.231 then nnn is coded as 231. Missing data are indicated as -1.

Note: The Log(I'/I) + constant} mantissa only to three decimal places. The characteristic of the logarithm is inferred. The n values are given for the corresponding Solar Zenith Angles: 60, 65, 70, 74, 75, 77, 80, 83, 84, 86.5, 88, 89 and 90 degrees.

3.3.7.2 C_PROFILE

Date: yyyy-mm-dd

H: Code for time of observation: 1=AM and 2=PM.

L: Clear zenith=3, Cloudy zenith=5 (used at Station 035, Arosa only)

ColumnO3Obs: Observed total column ozone analogous to TotalOzone (where Dobson Unit is milli-atm-cm).

ColumnO3Retr: Retrieved value for total ozone in Dobson Units. (Sum of retrieved individual layer amounts)

Layer10 - Layer1: Computed layer ozone amount in Dobson Units. The sum of Layers 10-1 = ColumnO3Retr value.

ITER: Number of iterations (2, 3, 4 or 5).

SX: A priori profile error covariance matrix used for processing. Where:
U = Uniform covariance matrix
C = Climatological covariance matrix.

SZA_1: Code used to indicate the first SZA where: 1=60, 2=65 and 3=70 degrees.

NSZA: Number of solar zenith angles: 9, 10, 11 or 12.

DFMRS: RMS fractional retrieval change from last iteration.

FEPS: RMS change in forcing vector from last iteration.

RMSRES: RMS fit residual.

3.3.7.3 Example

Example format for an Umkehr14 data file can be found in Appendix A.6 as well as online at http://woudc.org/archive/Documentation/Examples-extCSV/Umkehr-N_values-Dobson.csv for level 1 and http://woudc.org/archive/Documentation/Examples-extCSV/Umkehr_UMK92Retrieval-Dobson.csv for level 2.

3.4 Ultraviolet Specific Data Content

3.4.1 Introduction

This section discusses the data content of the various categories of ultraviolet data. Each category has a set of defined tables which includes the fields (columns) names, the order of the fields, and the required units.

The originator of the data is encouraged to submit any ancillary and/or auxiliary data that he or she may consider relevant. Ancillary data are data describing atmospheric variables and variable site characteristics such as temperature, ozone, pressure, cloud conditions for example by a cloud index or by a sky image, albedo, pyranometer data (information on permanent characteristics of the measuring site). Auxiliary data are characteristics/properties of the instrument that made the measurements, the way in which the instrument was operated, the algorithms that were used to compute the measured values from the instrument signals, etc.. Auxiliary data may be potentially of value to the user or absolutely necessary as when the basic data is raw (Level 0).

3.4.1.1 Spectral

Spectral is radiation that is measured in a continuous spectral band, with a resolution of less than or equal to 2 nm.

3.4.1.2 Multiband

Multiband is measured with several discrete, pass-band filters with nominal spectral resolution of 2-10 nm at FWHM.

3.4.1.3 Broadband

Broadband is the measurement of UV-A, UV-B, or erythemally weighted UV radiation.

3.4.1.4 Pyranometer

Pyranometer is a measurement of broadband solar irradiance.

3.4.2 Category: Spectral

There are four tables required for the Spectral Category: `#GLOBAL`, `#DIRECT`, `#DIFFUSE`, and `#ACTINOMETRIC`.

Table 3.4-1 outlines the tables needed for the category Spectral (column Table Name) and their respective field names. In [section 3.4.2.1](#) to [section 3.4.2.4](#), there are more thorough descriptions of what each field name for a particular table entails.

Table 3.4-1 – Category Spectral data tables

Table Name	Field (Column) Names (in order)
#GLOBAL	Wavelength,S-Irradiance,*Time*
#DIRECT	Wavelength,S-Irradiance,*Time*
#DIFFUSE	Wavelength,S-Irradiance,*Time*
#ACTINOMETRIC	Wavelength,S-Irradiance,*Time*

Note: The *Time* field is in italics to indicate that field position is reserved but not required.

3.4.2.1 GLOBAL

Wavelength: Measured in Nanometres (nm).

S-Irradiance: Is the spectral irradiance measured in $Wm^{-2}nm^{-1}$

Time: hh:mm:ss in ISO-8601 standard.

3.4.2.2 DIRECT

Refer to #GLOBAL in section 3.4.2.1 for descriptors of the field names for table #DIRECT.

3.4.2.3 DIFFUSE

Refer to #GLOBAL in section 3.4.2.1 for descriptors of the field names for table #DIFFUSE.

3.4.2.4 ACTINOMETRIC

Refer to #GLOBAL in section 3.4.2.1 for descriptors of the field names for table #ACTINOMETRIC.

3.4.2.5 Example

Example format for a Spectral data file can be found in Appendix A.7 as well as online at http://woudc.org/archive/Documentation/Examples-extCSV/Spectral.csv.

3.4.3 Category: Multiband

There are five tables required for the Multiband Category: #GLOBAL, #DIRECT, #DIFFUSE, #ACTINOMETRIC, and #SIMULTANEOUS.

Table 3.4-2 outlines the tables needed for the category Multiband (column Table Name) and their respective field names. In section 3.4.3.1 to section 3.4.3.5, there are more thorough descriptions of what each field name for a particular table entails.

Table 3.4-2 – Category Multiband data tables

Table Name	Field (Column) Names (in order)
#GLOBAL	Wavelength,S-Irradiance,*Time*
#DIRECT	Wavelength,S-Irradiance,*Time*
#DIFFUSE	Wavelength,S-Irradiance,*Time*
#ACTINOMETRIC	Wavelength,S-Irradiance,*Time*
#SIMULTANEOUS	Wavelength,GLS-Irradiance,*DFS-Irradiance,* *DRS-Irradiance,Time*

Note: The *Time*, *DFS-Irradiance*, and *DRS-Irradiance* fields are in italics to indicate that field position is reserved but not required.

3.4.3.1 GLOBAL

Wavelength: Measured in Nanometres (nm).

S-Irradiance: Is the spectral irradiance measured in $Wm^{-2}nm^{-1}$

Time: hh:mm:ss in ISO-8601 standard.

3.4.3.2 DIRECT

Refer to #GLOBAL in section 3.4.3.1 for descriptors of the field names for table #DIRECT.

3.4.3.3 DIFFUSE

Refer to #GLOBAL in section 3.4.3.1 for descriptors of the field names for table #DIFFUSE.

3.4.3.4 ACTINOMETRIC

Refer to #GLOBAL in section 3.4.3.1 for descriptors of the field names for table #ACTINOMETRIC.

3.4.3.5 SIMULTANEOUS

Wavelength: Measured in Nanometres (nm).

GLS-Irradiance: Is the global spectral irradiance measured in $Wm^{-2}nm^{-1}$.

DFS-Irradiance: Is the diffuse spectral irradiance measured in $Wm^{-2}nm^{-1}$.

DRS-Irradiance: Is the direct spectral irradiance measured in $Wm^{-2}nm^{-1}$.

Time: hh:mm:ss in ISO-8601 standard.

Note: The table `#SIMULTANEOUS` refers to a single detector whereby the measurements are made in a near-simultaneous mode, but reported on the same time scale. For example, measurements are recorded in 15 second intervals, first for global then for diffuse and an integrated value is reported every 15 minutes. This integrated value is considered "simultaneous" for inclusion in this table. Simultaneous measurements made using two or more independent detectors, requires a data file for each detector.

3.4.3.6 Example

Example format for a Multiband data file can be found in Appendix A.8 as well as online at http://woudc.org/archive/Documentation/Examples-extCSV/Multi-band.csv.

3.4.4   Category: Broadband

There are five tables required for the Broadband Category: `#GLOBAL`, `#DIRECT`, `#DIFFUSE`, `#ACTINOMETRIC`, and `#SIMULTANEOUS`.

Table 3.4-3 outlines the tables needed for the category Broadband (column Table Name) and their respective field names. In section 3.4.4.1 to section 3.4.4.5, there are more thorough descriptions of what each field name for a particular table entails.

Table 3.4-3 – Category Broadband data tables

Table Name	Field (Column) Names (in order)
`#GLOBAL`	`Time,Irradiance`
`#DIRECT`	`Time,Irradiance`
`#DIFFUSE`	`Time,Irradiance`
`#ACTINOMETRIC`	`Time,Irradiance`
`#SIMULTANEOUS`	`Time,GL-Irradiance,`*`DF-Irradiance,DR-Irradiance`*

Note: The *DF-Irradiance* and *DR-Irradiance* fields are in italics to indicate that field position is reserved but not required.

3.4.4.1 GLOBAL

Time: hh:mm:ss in ISO-8601 standard.

S-Irradiance: Measured in Wm^{-2}.

3.4.4.2 DIRECT
Refer to `#GLOBAL` in section 3.4.4.1 for descriptors of the field names for table `#DIRECT`.

3.4.4.3 3DIFFUSE
Refer to `#GLOBAL` in section 3.4.4.1 for descriptors of the field names for table `#DIFFUSE`.

3.4.4.4 ACTINOMETRIC

Refer to `#GLOBAL` in [section 3.4.4.1](#) for descriptors of the field names for table `#ACTINOMETRIC`.

3.4.4.5 SIMULTANEOUS

Time: hh:mm:ss in ISO-8601 standard.

GL-Irradiance: Is the global irradiance measured in Wm^{-2}.

DF-Irradiance: Is the diffuse irradiance measured in Wm^{-2}.

DR-Irradiance: Is the direct irradiance measured in Wm^{-2}.

Note: The table `#SIMULTANEOUS` refers to a single detector whereby the measurements are made in a near-simultaneous mode, but reported on the same time scale. For example, measurements are recorded in 15 second intervals, first for global then for diffuse and an integrated value is reported every 15 minutes. This integrated value is considered "simultaneous" for inclusion in this table. Simultaneous measurements made using two or more independent detectors, requires a data file for each detector.

3.4.4.6 Example

Example format for a Broadband data file can be found in [Appendix A.9](#) as well as online at http://woudc.org/archive/Documentation/Examples-extCSV/Broad-band.csv.

3.4.5 Category: Pyranometer

There are four tables required for the Pyranometer Category: `#GLOBAL`, `#DIRECT`, `#DIFFUSE`, and `#ACTINOMETRIC`.

Table 3.4-4 outlines the tables needed for the category Pyranometer (column Table Name) and their respective field names. In [section 3.4.5.1](#) to [section 3.4.5.4](#), there are more thorough descriptions of what each field name for a particular table entails.

Table 3.4-4 – Category Pyranometer data tables

Table Name	Field (Column) Names (in order)
`#GLOBAL`	`Time,Irradiance`
`#DIRECT`	`Time,Irradiance`
`#DIFFUSE`	`Time,Irradiance`
`#SIMULTANEOUS`	`Time,GL-Irradiance,`*`DF-Irradiance,DR-Irradiance`*

Note: The *DF-Irradiance* and *DR-Irradiance* fields are in italics to indicate that field position is reserved but not required.

3.4.5.1 GLOBAL

Time: hh:mm:ss in ISO-8601 standard.

S-Irradiance: Measured in Wm^{-2}.

3.4.5.2 DIRECT

Refer to `#GLOBAL` in [section 3.4.5.1](#) for descriptors of the field names for table `#DIRECT`.

3.4.5.3 DIFFUSE

Refer to `#GLOBAL` in [section 3.4.5.1](#) for descriptors of the field names for table `#DIFFUSE`.

3.4.5.4 SIMULTANEOUS

Time: hh:mm:ss in ISO-8601 standard.

GL-Irradiance: Is the global irradiance measured in Wm^{-2}.

DF-Irradiance: Is the diffuse irradiance measured in Wm^{-2}.

DR-Irradiance: Is the direct irradiance measured in Wm^{-2}.

Note: The table `#SIMULTANEOUS` refers to a single detector whereby the measurements are made in a near-simultaneous mode, but reported on the same time scale. For example, measurements are recorded in 15 second intervals, first for global then for diffuse and an integrated value is reported every 15 minutes. This integrated value is considered "simultaneous" for inclusion in this table. Simultaneous measurements made using two or more independent detectors, requires a data file for each detector.

3.4.5.5 Example

Example format for Pyranometer data file can be found in [Appendix A.10](#).

3.4.6   Ancillary and Auxiliary Data

The originator of the data is encouraged to submit any ancillary and/or auxiliary data that he or she may consider relevant.

Note: Ancillary and Auxiliary data are best submitted as separate files.

Table 3.4-5 outlines the general table names for ancillary and auxiliary data.

Note: The tables are shown with sample fields which may be included in any of the UV categories.

Table 3.4-5 – Sample Ancillary and Auxiliary data

TABLENAME	Suggested field names
#CALIBRATION	Specified by the data originator (Scientific Authority)
#METEOROLOGY	Temperature, Pressure, Relative Humidity
#METEOROLOGY_SUMMARY	Time, Temperature, Pressure, Relative Humidity
#SURFACE_CONDITIONS	Albedo, Comments about Surface cover (Example: "Snow" or "Shrubland" or "Grassland")
#IMAGE	Filename, Comments (Example: sky97001.gif)

Table 3.4-6 lists all the required and optional field names for the WOUDC data submissions along with comments and their physical units [4].

Table 3.4-6 – Field Names

Field Name	Physical Units	Comments
Albedo	Dimensionless	No comments
Cloud Amount	No units	special codes
Date	yyyy-mm-dd	ISO-8601 standard
DF-Irradiance	Wm^{-2}	Diffuse Irradiance
DFS-Irradiance	$Wm^{-2}nm^{-1}$	Diffuse Spectral Irradiance
DR-Irradiance	Wm^{-2}	Direct Irradiance
DRS-Irradiance	$Wm^{-2}nm^{-1}$	Direct Spectral Irradiance
GL-Irradiance	Wm^{-2}	Global Irradiance
GLS-Irradiance	$Wm^{-2}nm^{-1}$	Global Spectral Irradiance
Height	Metres (m)	Above sea level
Image filename and -path	No units	*.bmp, *.gif, *.jpeg etc.
Irradiance	Wm^{-2}	No comments
Irradiation	$KJ\ m^{-2}\ nm^{-1}$	Daily integrated irradiance
Latitude	Decimal degrees	North is positive
Longitude	Decimal degrees	East is positive
Pressure	Hecto-Pascal (hPa)	No comments
RelativeHumidity	Dimensionless (%)	No comments
S-Irradiance	$Wm^{-2}nm^{-1}$	Spectral Irradiance
S-Irradiation	KJm^{-2}	Spectral Irradiation
Time	hh:mm:ss	ISO-8601 standard
Temperature	Degrees Celsius (°C)	No comments
Wavelength	Nanometres (nm)	No comments
WindSpeed	ms^{-1}	No comments
WindDirection	Decimal degrees	No comments

Chapter 4   Data Handling

4.1   Data Policy

Use of the WOUDC data are governed by the WMO data policy (https://www.wmo.int/pages/about/exchangingdata_en.html) and WMO GAW data use policy (http://gaw.empa.ch/gawsis/faqs.asp). More information about WOUDC's data policy can be found online at http://woudc.org/about/data-policy.php.

4.2   Data Flow and Processing

Section 2.3 provides detailed procedures regarding data processing. Successfully ingested data submissions are made available to the WAF, geospatial web services and search.

Essentially, data from contributors is received, processed, and archived. Once file is inputted into the system, the backend process is instantiated where the incoming file type is identified and validated to make sure it is in the standard WOUDC file format (extCSV). Once the file has been identified as valid extCSV, the system tries to create and validate the taxonomy and URI for the file. Next the file will undergo a rigorous set of validations called File Level Validation (FLV). FLV is used to ensure:

- extCSV conforms syntactically to GAW-WOUDC specifications;
- metadata validation which makes sure the values contained in the headers (`#TIMESTAMP`, `#PLATFORM`, `#INSTRUMENT`, `#CONTENT`, `#DATA_GENERATION`, `#LOCATION`) are accurate and consistent;
- unique table validation which are sets of tests used to validate dataset specific tables; and
- values are modified in accordance with "no-touch" policy (i.e., minimal syntactical updates).

The extCSV that emerges once it has gone through FLV is a clean version of the original form. Once the extCSV has successfully passed the taxonomy validation, URI validation, and FLV, the files is ready to be ingested into the database. Any errors compiled throughout the process are provided to the contributor in order to help remediate the errors for an easier ingestion of their data.

Chapter 5   Data Quality

Once a file has been submitted to the WOUDC, data quality is monitored at various stages during data processing. Quality control consists of checking for file format and metadata content, inspection of data value ranges, and data redundancy checks.

At a high level, the following is a summary of QA checks performed:

Structural Validation

- Checks if the incoming extCSV file conforms to the extCSV specification
    - Checks the format of the file
    - Checks all tables and fields in the file, etc.

Metadata Validation

- Checks that all metadata (agency, station, instrument, etc.) is correct
- Corrects any missing of incorrect metadata wherever possible

Data Validation

- Checks that all dates in the file are consistent (e.g. the generation date of the file does not precede the observation date, etc.)
- Checks the derived values in the file (e.g. TotalOzone `#MONTHLY` values)
    - Corrects if the values are wrong; fills in if missing

Initially, a file will be tested for adherence to the file format specifications, but later, higher level statistical summaries may be generated, which identify anomalous values, calibration problems, etc.. Although the later examples involve more detailed knowledge of the data, the archive already includes enough data to make some critical judgments and general assessments about the data. As the volume and statistical knowledge increase, the scope of these assessments will be broadened.

Chapter 6   Access and Data Retrieval

Data access and retrieval are core capabilities of the WOUDC. The WOUDC data is freely available for public use. Information on how to access the data can be found at http://woudc.org/about/data-access.php.

Chapter 7   Contact

The primary means of contacting the WOUDC is by email, which is monitored on a daily basis by data centre operations. WOUDC operates with a service standard to response to all email inquiries within 2 business days.

7.1   E-mail

ec.woudc.ec@canada.ca

7.2   Address

World Ozone and Ultraviolet Radiation Data Centre

Meteorological Service of Canada

Environment and Climate Change Canada

4905 Dufferin Street

Toronto, ON   M3H 5T4

Canada

Chapter 8   References

[1] Gaines, S.E. and R.S. Hipskind, *Format Specification for Data Exchange Version 1.0*, NASA Ames Research Center publication, 1990.

[2] Gaines, S.E. and R.S. Hipskind, *Format Specification for Data Exchange Version 3.1*, NASA Ames Research Center publication, 1998.

[3] Ruffieux, D., Personal communication, 2006

[4] R. Dogniaux, et al., "*Solar Meteorology: Units and Symbols*": Int. J. Solar Energy, 1984, volume 2 number 3, pages 249-255.

Appendix A   Examples

A.1 Lidar Example

Below is an example of a Lidar data submission. An example can also be found online at
http://woudc.org/archive/Documentation/Examples-extCSV/Lidar.csv.

```
*NOTE:One Event per file
* This file was generated by NA2110LI - version 1.0.
* Originating NASA-Ames file: NDSC\EUREKA\euo39302.cal
* --- NASA-Ames MNAME ---
* NDSC
#CONTENT
Class,Category,Level,Form
WOUDC,Lidar,1.0,1
#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
1993-12-14,CRESTech,0.0,"(Carswell, A. I.),
(carswell@lidar.ists.ca) 416-665-5418"
#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,315,Eureka,CAN
#INSTRUMENT
Name,Model,Number
DIAL,Lotard,1
* --- NASA-Ames SCOM ---
* Data processed using version 2.0 software
* --- NASA-Ames NCOM ---
* Temperature and Density data above about 25 Km
* is lidar derivied. Temperature and density below
* 15-25 Km (maximum sonde height) is that given
* by the nearest in time Eureka radiosonde.
* Between the maximum sonde height up to
* around 25 Km the temperature and denisty is
* estimated by interpolationg between the sonde
* and lidar values.
#LOCATION
Latitude,Longitude,Height
80,-85.9,607
```

```
#TIMESTAMP
UTCOffset,Date,Time
+00:00:00,1993-02-10,13:11:00
#OZONE_SUMMARY
Altitudes,MinAltitude,MaxAltitude,StartDate,StartTime,EndDate,En
dTime,PulsesAveraged
112,12150,45430,1993-02-10,13:11:00,,,1.26e+006
#OZONE_PROFILE
Altitude,OzoneDensity,StandardError,RangeResolution,AirDensity,T
emperature
12150.,2.428e+012,4.67e+010,1000
12450.,2.761e+012,4.82e+010,1000
12750.,2.996e+012,5.02e+010,1000
… etc
```

A.2 Microwave Example

Below is an example of a Microwave data submission.

```
*NOTE: One Event per file

* This file was originally received in NASA-Ames 2110 format and
has been
* translated into WOUDC extCSV format using converter software
XXX ver xx
*
* -----------------------------------------------------------------
* NOTE: Original file header information is appended at the end
of this file.
* -----------------------------------------------------------------
*

#CONTENT
Class,Category,Level,Form
WOUDC,Microwave,1.0,1

#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
2006-07-01,Meteoswiss,1.0,Dominique Ruffieux

#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,156,Payerne,CHE

#INSTRUMENT
Name,Model,Number
SOMORA,???,???

#LOCATION
Latitude,Longitude,Height
46.82,6.95,491

* Observing technique: total power
* Center frequency: 142.175 GHz
```

```
* Inversion method: Optimal Estimation
* Temp. and press. profiles : CIRA 86 + daily NCEP + Payerne
radiosondes
* A-priori profile: season standard atmosphere
* Measurement Error Cov.: variable, adjusted to wings BT
* A Priori Error Cov.: 0 - 1.5 ppm (correlation 3-5 km)


#TIMESTAMP
UTCOffset,Date,Time
+0:00:00,2005-10-09,00:18:00


*282.01 25 2005 10 9 0 18 30 46.82 6.95 491 52.0 2741 0.57 0.13
#PROFILE_SUMMARY
Levels,AveragingTime,ZenithAngle,NoiseTemperature,TTF,Calculated
Spectrum
25,30,52.0,2741,0.57,0.13


#OZONE_PROFILE
Altitude,OzoneVMR,VariableError,FixedError,SmoothingError,TotalE
rror,A-Priori,
Temperature,Pressure
13000,0.40,0.01,0.05,0.28,0.29,18,213.75,172.92
15000,0.69,0.03,0.12,0.43,0.45,18,214.17,125.88
17000,1.29,0.05,0.18,0.44,0.48,17,213.04,91.56
…
73500,0.56,0.03,0.02,0.11,0.12,64,216.68,,0.03
76500,0.54,0.02,0.01,0.10,0.10,73,214.20,,0.02


#TIMESTAMP
UTCOffset,Date,Time
+0:00:00,2005-10-09,00:48:00


*282.03 25 2005 10 9 0 48 30 46.82 6.95 491 52.0 2748 0.57 0.13
#PROFILE_SUMMARY
Levels,AveragingTime,ZenithAngle,NoiseTemperature,TTF,Calculated
Spectrum
25,30,52.0,2748,0.57,0.13
```

```
#OZONE_PROFILE
Altitude,OzoneVMR,VariableError,FixedError,SmoothingError,TotalE
rror,A-Priori,
Temperature,Pressure
13000,0.42,0.01,0.05,0.28,0.29,18,213.75,172.92
15000,0.74,0.03,0.11,0.43,0.45,17,214.17,125.88
17000,1.34,0.05,0.18,0.44,0.48,17,213.04, 91.56
…
70500,0.59,0.05,0.03,0.14,0.15,56,219.34,,0.04
73500,0.56,0.03,0.02,0.11,0.12,65,216.68,,0.03
76500,0.53,0.02,0.01,0.10,0.10,74,214.20,,0.02


etc ...


#TIMESTAMP
UTCOffset,Date,Time
+0:00:00,2005-10-09,23:47:00


*282.99 25 2005 10 9 23 47 25 46.82 6.95 491 52.0 2740 0.63 0.18
#PROFILE_SUMMARY
Levels,AveragingTime,ZenithAngle,NoiseTemperature,TTF,Calculated
Spectrum
25,25,52.0,2740,0.63,0.18


#OZONE_PROFILE
Altitude,OzoneVMR,VariableError,FixedError,SmoothingError,TotalE
rror,A-Priori,Temperature,Pressure
13000,0.34,0.01,0.04,0.28,0.29,24,211.78,174.52
15000,0.53,0.03,0.11,0.43,0.44,22,212.61,126.65
17000,1.01,0.05,0.16,0.43,0.46,21,211.64, 91.94
…
70500,0.55,0.06,0.03,0.14,0.15,56,219.34,,0.04
73500,0.53,0.03,0.02,0.11,0.12,66,216.68,,0.03
76500,0.52,0.02,0.01,0.10,0.10,76,214.20,,0.02


* RUFFIEUX D.,,,, MWAVE,,, PAYERNE,, OZONE,,, 09-Oct-2005
00:18:0009-Oct-2005 23:47:001001
* 47 2110
```

```
* RUFFIEUX, Dominique
* MeteoSwiss, Station Aerologique de Payerne, Switzerland
* Stratospheric Ozone Monitoring Radiometer (SOMORA) / Payerne
* NDSC / GAW
* 1 1
* 2005 10,9 2005 10 10
* 0.0 0.0
* Altitude (m)
* Fractional day (day of year)
* 8
* 1 1 1 1 1 1 1 100
* 99.99 99.99 99.99 99.99 99.99 999 999.99 9999.99
* Ozone VMR (ppm)
* Variable (stochastic) error for ozone VMR (ppm)
* Fixed (systematic) error for ozone VMR (ppm)
* Smoothing error (ppm)
* Total error (ppm)
* A-priori data contribution (%)
* Temperature profile used for retrieval (K)
* Pressure profile used for retrieval (Pa)
* 14
* 1 1 1 1 1 1 1 1 1 1 1 1 1 1
* 99 9999 99 99 99 99 999 99.99 99.99 999 99 9999 9.99 9.99
* Number of altitudes recorded in subsequent data records
* Year
* Month
* Day
* Hour (Time=UT)
* Minutes
* Averaging Time (Minutes)
* Latitude (Deg. north)
* Longitude (Deg. east)
* Altitude above sea level (m)
* Zenith angle (Deg.)
* Mean system noise temperature (K)
* Tropospheric Transmission Factor
* Std. of Meas. - Calc. Spectrum (K)
* 0
```

```
* 7
* Observing technique: total power
* Center frequency: 142.175 GHz
* Inversion method: Optimal Estimation
* Temp. and press. profiles : CIRA 86 + daily NCEP + Payerne
radiosondes
* A-priori profile: season standard atmosphere
* Measurement Error Cov.: variable, adjusted to wings BT
* A Priori Error Cov.: 0 - 1.5 ppm (correlation 3-5 km)
```

A.3 Ozonesonde Example

Below is an example of an Ozonesonde data submission. An example can also be found online at http://woudc.org/archive/Documentation/Examples-extCSV/Ozonesonde.csv.

```
#CONTENT
Class,Category,Level,Form
WOUDC,OzoneSonde,1.0,2

#DATA_GENERATION
Date, Agency, Version, ScientificAuthority
2013-02-11, Environment Canada,1.0,Jonathan Davies

#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,21,Stonyplain,CAN

#INSTRUMENT
Name,Model,Number
ECC,Z,Z14850

#LOCATION
Latitude,Longitude,Height
53.54,-114.1,766

#TIMESTAMP
UTCOffset,Date,Time
+00:00:00,2013-01-30,11:16:00

*EXAMPLE OF NEW OZONESONDE
*FILE FORMAT*
* ----- correction applied for 1% KI solution in ENSCI sonde ---
-------
* ----- correction applied for 2.5 cc of solution instead of 3.0
---
* ----- residual ozone interpolated from 2011 MLS climatology
(McPeters and Labow) ---

#PREFLIGHT_SUMMARY
```

```
ib0,ib1,1b2,SolutionType,SolutionVolume,PumpFlowRate,OzoneSondeR
esponseTime
0.1,0.04,0.04,1%KIFullBuffer,2.5,214.36,0.34

#RADIOSONDE
Manufacturer,Model,Number
Vaisala,RS92-SGP,H0513477

#INTERFACE_CARD
Manufacturer,Model,Number
Vaisala,RSA921,G14513056

#SAMPLING_METHOD
TypeOzoneFreeAir,CorrectionWettingFlow,SurfaceOzone,
LengthBG,WMOTropopausePressure,BurstOzonePressure,GroundEquipmen
t,ProcessingSoftware
activated charcoal filter,0.98,20,30,295,13.099,DigiCORA
III,SNDPRO 2.0

#PUMP_SETTINGS
MotorCurrent,HeadPressure,VacuumPressure
79.9,1600,200

#PUMP_CORRECTION
Pressure,Correction
2,1.16,
3,1.124
5,1.087,
10,1.054
20,1.033
30,1.024
50,1.015
100,1.01
200,1.007
300,1.005
500,1.002
1000,1.0
```

```
#FLIGHT_SUMMARY
IntegratedO3,CorrectionCode,SondeTotalO3,NormalizationFactor,Bac
kgroundCorrection,SampleTemeratureType
318.5,6,404.3,-0.984,Pressure_ib2,Pump_Intern

#OZONE_REFERENCE
Name,Model,Number,Version,TotalO3,WLCode,ObsType,UTC_Mean
Brewer,Single,55,1,398,9,0,19.6

#PROFILE
Duration,Pressure,O3PartialPressure,Temperature,WindSpeed,WindDi
rection,LevelCode,GPHeight,RelativeHumidity,SampleTemperature,So
ndeCurrent,PumpMotorCurrent,PumpMotorVoltage,Latitude,Longitude,
Height
0,924.59,1.973,-23.1,2.6,360,2,766,76,36.6,0.566924
2,924.13,1.973,-23.2,2.2,350,0,770,72,36.6,0.566904
4,923.46,1.992,-23.4,2.6,349,0,774,72,36.6,0.572229
6,922.56,1.992,-23.5,3,350,0,783,73,36.6,0.572192
8,921.21,1.982,-23.6,3.3,350,0,793,74,36.6,0.569459
10,919.86,1.981,-23.7,3.6,350,0,803,75,36.6,0.569403
...
7510,20.11,13.167,-61.2,13.2,64,0,26282,1,11.7,3.89304
7512,20.09,13.205,-61.1,13,64,0,26287,1,11.7,3.90423
7514,20.07,13.186,-61.1,12.8,64,0,26293,1,11.7,3.89851
7516,20.05,13.176,-61,12.6,65,0,26300,1,11.6,3.89697
7518,20.02,13.175,-60.9,12.4,65,0,26307,1,11.6,3.89685
7520,20,13.099,-61,12.2,65,2,26314,1,11.6,3.87421


#PROFILE_UNCERTAINTY
Duration,Pressure,O3PartialPressure,Temperature,WindSpeed,WindDi
rection,LevelCode,GPHeight,RelativeHumidity,SampleTemperature,So
ndeCurrent,PumpMotorCurrent,PumpMotorVoltage,Latitude,Longitude,
Height
```

Note: At present this is a placeholder for estimated uncertainty for each of the measured profile parameters listed here. Guidelines for this will be released probably first in 2014/2015

A.4 TotalOzoneObs Example

Below is an example of TotalOzoneObs data submission. An example can also be found online at http://woudc.org/archive/Documentation/Examples-extCSV/TotalOzoneObs.csv.

```
*Example of a single day of observations
*One observation day per file
#CONTENT
Class,Category,Level,Form
WOUDC,TotalOzoneObs,1.0,1
#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
1999-05-07,MSC,1.0,J. Kerr
#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,065,Toronto,CAN,71638
#INSTRUMENT
Name,Model,Number
Brewer,MKII,014
#LOCATION
Latitude,Longitude,Height
43.78,-79.47,198
#TIMESTAMP
UTCOffset,Date,Time
+00:00:00,1999-04-10
#OBSERVATIONS
Time,WLcode,ObsCode,Airmass,ColumnO3,StdDevO3,ColumnSO2,StdDevSO
2
10:03:01,9,DS,2.39,350.0,2.0,1.13,0.02
10:25:11,9,DS,2.35,351.2,1.9,0.98,0.02
11:13:01,9,DS,2.21,348.4,1.5
…
17:03:23,9,DS,2.89,350.0,2.0,1.13,0.08
17:25:01,9,DS,2.99,350.8,2.2
17:50:01,9,DS,3.09,355.0,2.3
18:09:51,9,DS,3.29,351.4,2.7,2.13,0.6
#DAILY_SUMMARY
WLcode,ObsCode,nObs,MeanO3,StdDevO3
9,DS,9,350.0,2.0
```

A.5 TotalOzone Example

Below is an example of TotalOzone data submission. An example can also be found online at http://woudc.org/archive/Documentation/Examples-extCSV/TotalOzone-Brewer.csv.

```
*Example of daily ozone values
*One month per file
#CONTENT
Class,Category,Level,Form
WOUDC,TotalOzone,1.0,1
#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
1999-06-07,MSC,1.0,J. Kerr
#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,065,Toronto,CAN,71638
#INSTRUMENT
Name,Model,Number
Brewer,MKII,014
#LOCATION
Latitude,Longitude,Height
43.78,-79.47,198
* NOTE: the date defaults to the first day of the month.
#TIMESTAMP
UTCOffset,Date,Time
+00:00:00,1999-04-01
* Precipitation on April 2, 28, 29
#DAILY
Date,WLCode,ObsCode,ColumnO3,StdDevO3,UTC_Begin,UTC_End,UTC_Mean
,nObs,mMu,ColumnS
O2
1999-04-01,9,0,350.0,5.0,,,13.75,27,1.28,5.13
1999-04-03,9,0,341.1,4.1,,,12.75,19,1.12
1999-04-04,9,0,353.8,3.0,,,13.01,35,1.2
…
1999-04-26,9,0,355.0,5.0,,,13.05,37,1.21,3.33
1999-04-27,9,0,355.0,5.0,,,12.66,37,1.19
1999-04-30,9,0,369.0,5.0,,,13.7,25,1.3
#TIMESTAMP
```

```
UTCOffset,Date,Time
+00:00:00,1999-04-30
* NOTE: the date of the MONTHLY table defaults to the first day
of the month.
#MONTHLY
Date,ColumnO3,StdDevO3,Npts
1999-04-01,350.0,5.0,13
```

A.6 UmkehrN14 Example

Below is an example of an UmkehrN14 data submission. An example can also be found online at http://woudc.org/archive/Documentation/Examples-extCSV/Umkehr-N_values-Dobson.csv for level 1.0 http://woudc.org/archive/Documentation/Examples-extCSV/Umkehr_UMK92Retrieval-Dobson.csv and for level 2.0.

```
*NOAA-CMDL is the Agency acronym for the National Oceanographic
and
*Atmospheric Administration-Climate Monitoring and Diagnostics
Laboratory

*One month per file

#CONTENT
Class,Category,Level,Form
WOUDC,UmkehrN14,1.0,1

#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
1996-07-02,NOAA_CMDL,1.0, Gloria Koenig

#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,067,Boulder,USA

#INSTRUMENT
Name,Model,Number
Dobson,Beck,082

#LOCATION
Latitude,Longitude,Height
40.03,-105.25,832

#TIMESTAMP
UTCOffset,Date,Time
-07:00:00,1992-10-07

#N14_VALUES
```

```
Date,H,L,WLCode,ObsCode,ColumnO3,N600,N650,N700,N740,N750,N770,N
800,N830,N840,N850,N865,N880,N890,N900
1992-10-07,1,1,0,0,268,-
1,145,356,572,627,746,913,957,942,916,844,763,705,630
1992-10-
07,1,3,0,0,268,467,538,645,768,800,877,44,231,295,343,363,344,31
6,271
1992-10-
07,1,4,0,0,268,208,244,292,254,371,416,504,629,681,734,817,893,9
20,917
1992-10-07,2,1,0,0,244,-
1,145,356,572,627,746,913,957,942,916,844,763,705,630
1992-10-
07,2,3,0,0,244,467,538,645,768,800,877,044,231,295,343,363,344,3
16,271
…
1992-10-28,1,1,0,0,268,-
1,145,356,572,627,746,913,957,942,916,844,763,705,630
1992-10-
28,1,3,0,0,268,467,538,645,768,800,877,44,231,295,343,363,344,31
6,271
1992-10-
28,1,4,0,0,268,208,244,292,254,371,416,504,629,681,734,817,893,9
20,917
1992-10-28,2,1,0,0,244,-
1,145,356,572,627,746,913,957,942,916,844,763,705,630
1992-10-
28,2,3,0,0,244,467,538,645,768,800,877,044,231,295,343,363,344,3
16,271


#TIMESTAMP
UTCOffset,Date,Time
-07:00:00,1992-10-28


#METEOROLOGY
Temperature,Pressure,Relative Humidity
,1642
```

A.7 Spectral Example

Below is an example of a Spectral data submission. An example can also be found online at
http://woudc.org/archive/Documentation/Examples-extCSV/Spectral.csv.

```
#CONTENT
Class,Category,Level,Form
WOUDC,Spectral,1.0,1

#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
2009-02-12,JMA,1.0,Head of Ozone Layer Monitoring Office

#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,014,Tsukuba(Tateno),JPN,47646

#INSTRUMENT
Name,Model,Number
Brewer,MKIII,173

#LOCATION
Latitude,Longitude,Height
36.06,140.13,31

* Provisional

* by UV routine; back and forth scan between 290nm and 325nm

#TIMESTAMP
UTCOffset,Date,Time
+09:00:00,2009-01-01,07:00:02

#GLOBAL_SUMMARY
Time,IntACGIH,IntCIE,ZenAngle,MuValue,AzimAngle,Flag,TempC
07:00:02,3.108E-05,1.737E-04,89.10,11.86,119.68,,13.2

#GLOBAL
Wavelength,S-Irradiance,Time
```

```
290.0,0.000E+00
290.5,0.000E+00
291.0,0.000E+00
291.5,0.000E+00
292.0,0.000E+00
292.5,0.000E+00
293.0,0.000E+00
293.5,0.000E+00
294.0,0.000E+00
294.5,0.000E+00
295.0,0.000E+00

#TIMESTAMP
UTCOffset,Date,Time
+09:00:00,2009-01-01,07:59:58

#GLOBAL_SUMMARY
Time,IntACGIH,IntCIE,ZenAngle,MuValue,AzimAngle,Flag,TempC
07:59:58,4.376E-04,2.565E-03,79.11,4.86,129.23,,14.0

#GLOBAL
Wavelength,S-Irradiance,Time
290.0,0.000E+00
290.5,0.000E+00
291.0,0.000E+00
291.5,0.000E+00
292.0,0.000E+00
292.5,0.000E+00
293.0,0.000E+00
293.5,0.000E+00
294.0,0.000E+00
294.5,0.000E+00
295.0,0.000E+00

#TIMESTAMP
UTCOffset,Date,Time
+09:00:00,2009-01-01,08:59:31
```

```
#GLOBAL_SUMMARY
Time,IntACGIH,IntCIE,ZenAngle,MuValue,AzimAngle,Flag,TempC
08:59:31,1.695E-03,9.518E-03,70.56,2.92,140.33,,14.4

#GLOBAL
Wavelength,S-Irradiance,Time
290.0,0.000E+00
290.5,0.000E+00
291.0,0.000E+00
291.5,0.000E+00
292.0,0.000E+00
292.5,0.000E+00
293.0,0.000E+00
293.5,0.000E+00
294.0,0.000E+00
294.5,0.000E+00
295.0,0.000E+00

#TIMESTAMP
UTCOffset,Date,Time
+09:00:00,2009-01-01,10:00:04

#GLOBAL_SUMMARY
Time,IntACGIH,IntCIE,ZenAngle,MuValue,AzimAngle,Flag,TempC
10:00:04,3.722E-03,1.982E-02,63.87,2.24,153.58,,14.9

#GLOBAL
Wavelength,S-Irradiance,Time
290.0,0.000E+00
290.5,0.000E+00
291.0,0.000E+00
291.5,0.000E+00
292.0,0.000E+00
292.5,0.000E+00
293.0,0.000E+00
293.5,0.000E+00
294.0,0.000E+00
294.5,0.000E+00
```

A.8 Multiband Example

Below is an example of a Multiband data submission. An example can also be found online at http://woudc.org/archive/Documentation/Examples-extCSV/Multi-band.csv.

```
#CONTENT
Class,Category,Level,Form
WOUDC,Multi-band,1.0,1

#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
2006-09-08,USDA_CSU,3.0,James R. Slusser

#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,256,Lauder,NZL

#INSTRUMENT
Name,Model,Number
Yankee,UVMFR-7,231

#LOCATION
Latitude,Longitude,Height
-45.038,169.684,370

#TIMESTAMP
UTCOffset,Date,Time
12:00:00,2006-01-01
* The direct normal, the diffuse horizontal and the total
horizontal
* radiation have been corrected for the measured angular
response of
* each channel of the detectors.  Diffuse horizontal corrections
were
* made assuming an isotropic distribution of sky radiance.

#SIMULTANEOUS
Wavelength,GLS-Irradiance,DFS-Irradiance,DRS-
Irradiance,Time,Airmass,SZA
```

```
299.96,,,,05:00:00,37.3375,89.96
305.36,,,,05:00:00,37.3375,89.96
311.53,,,,05:00:00,37.3375,89.96
317.63,,,,05:00:00,37.3375,89.96
325.34,,,,05:00:00,37.3375,89.96
332.46,,,,05:00:00,37.3375,89.96
367.92,,,,05:00:00,37.3375,89.96
299.96,,,,05:03:00,33.1052,89.65
305.36,,,,05:03:00,33.1052,89.65
311.53,,,,05:03:00,33.1052,89.65
317.63,,,,05:03:00,33.1052,89.65
325.34,,,,05:03:00,33.1052,89.65
332.46,,,,05:03:00,33.1052,89.65
367.92,,,,05:03:00,33.1052,89.65
299.96,0.000000,0.000000,0.000000,05:06:00,29.2088,89.30
305.36,0.000000,0.000000,0.000000,05:06:00,29.2088,89.30
311.53,0.000199,0.000199,0.000000,05:06:00,29.2088,89.30
317.63,0.000000,0.000000,0.000000,05:06:00,29.2088,89.30
325.34,0.002551,0.002551,0.000000,05:06:00,29.2088,89.30
…
```

A.9 Broadband Example

Below is an example of a Broadband data submission. An example can also be found online at http://woudc.org/archive/Documentation/Examples-extCSV/Broad-band.csv.

```
* UV dekodavimas ExtCSV formavimas, V 1.018 beta

#CONTENT
Class,Category,Level,Form
WOUDC,Broad-band,1.0,1

#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
2009-02-10,LHMS,1.0,Tomas Zumaras

#INSTRUMENT
Name,Model,Number
UV-Biometer,501A,4399

#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,312,Kaunas,LTU

#LOCATION
Latitude,Longitude,Height
54.53,23.50,76.1

#TIMESTAMP
UTCOffset,Date
+03:25:00,2009-01-01

#GLOBAL
Time,Irradiance
00:00:00,0.0000000
00:05:00,0.0000000
00:10:00,0.0000000
00:15:00,0.0000000
00:20:00,0.0000000
00:25:00,0.0000000
```

```
00:30:00,0.0000000
00:35:00,0.0000000
00:40:00,0.0000000
00:45:00,0.0000000
00:50:00,0.0001749
00:55:00,0.0000000
01:00:00,0.0000000
01:05:00,0.0000000
01:10:00,0.0000000
…
```

A.10 Pyranometer Example

Below is an example of a Pyranometer data submission.

```
* Data file 2 Pyranometer Data (Global)
#CONTENT
Name,Category,Level,Form
WOUDC,Pyranometer,1.0,1

#DATA_GENERATION
Date,Agency,Version,ScientificAuthority
1997-07-02,AES,1.0,Bruce McArthur

#INSTRUMENT
Name,Model,Number
Kipp and Zonen,CM21,920065

#PLATFORM
Type,ID,Name,Country,GAW_ID
STN,338,Regina,CAN,72863

#LOCATION
Latitude,Longitude,Height
50.21,-104.71,592

#TIMESTAMP
UTCOffset,Date,Time
-06:59:08,1997-06-08
* In this example, the pyranometer data are concatenated into
one table
*(#GLOBAL), with a single #TIMESTAMP table. The #METEOROLOGY and
*#INSTRUMENT_CONDITIONS_SUMMARY tables are a summary.

#GLOBAL
Time,Irradiance
06:45:00,201
07:00:00,212
07:15:00,243
…
```

```
22:00:00,244

#METEOROLOGY_SUMMARY
Time,Temperature,Pressure,RelativeHumidity
07:00:00,15,972
08:00:00,16,973
…

#INSTRUMENT_CONDITIONS_SUMMARY
Time,Temperature
06:45:00,15.8
07:00:00,16.0
…
```