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1. TITLE

1.1 Data Set Identification

ISLSCP II GlobalView: Atmospheric Methane Concentrations

1.2 File Name(s)

The GLOBALVIEW methane (CH4) data contains data files and original documentation provided by NOAA's Climate Monitoring and Diagnostics Laboratory (CMDL).

There are 74 data files with this data set, which includes 71 compressed *.zip files and 3 additional files described below:

0_gv_table_ch4.csv: contains a table with site information for all sites used in this data set and measurement labs.

0_globalview_ch4_sites.dat: contains the full names of the sites with the abbreviations, latitude, longitude, and temporal coverage for all sites used in this data set.

0_ref_mbl_mtx_ch4.dat: a single reference marine boundary layer matrix file which contains CH_4 mixing ratios as a function of time and sine of latitude and is a by-product of the data extension procedure (see Masarie and Tans, 1995).

The user should check the following web site for the most up-to-date data and documentation: http://www.cmdl.noaa.gov/ccgg/globalview/

The 71 .zip files are named after the sampling site and the country or location of the site. For example:

hat-japan_ch4.zip
pfa-alaska_ch4.zip

When extrapolated, the file names in the 71 .zip files use the following format:

```
1           2            3     4                    5      6
[site/prog][data group]_[lab#][sampling strategy][plat]_[qualifier]_ch4.dat
```

1. [Sampling site/program]

- 3-character alphanumeric field specifying site or program code. See Section 6.2.1 below or **0_globalview_ch4_sites.dat** for a complete list of the site abbreviations.

2. [Grouping of data within the file]

- If not specified then the sampling site is at a single fixed position. [brw_, prs_]
- If an aircraft then identifier is a 3-character numeric field with units of 10^2 meters (hm) above sea level. [car040_, aia005_]
- If a tower then identifier is a 3-character numeric field with units of meters (m) above sea level. [lef051_, hun048_]
- If a ship and binned by longitude then identifier is a 3-character numeric with units of degrees (000-360). [npo140_, nao350_]
- If a ship and binned by latitude, identifier is a 3-character alphanumeric field with units of degrees. (00-90). Bins in the northern and southern hemispheres are denoted as n## and s## respectively. The equatorial bin is denoted as 000. [pocs25_, poc000_, scsn03_]
- Note: A binned file requires further explanation regarding the bin width, e.g., car050 is a 1000m bin centered on 5km.

3. [lab# (contributing laboratory)]

Two-character numeric field identifies the measurement laboratory (00-99).
Refer to file **0_gv_table_ch4.csv**

4. [Sampling strategy]

Single alphanumeric character (0-9,a-z,A-Z) indicates the sampling strategy.

_??D	Discrete
_??C	Continuous/Quasi-continuous
_??E	Event
_??I	Integrated

5. [Sampling platform]

Single alphanumeric character (0-9,a-z,A-Z) indicates the sampling platform.

_???0	Single Fixed Position
_???1	Ship
_???2	Aircraft
_???3	Tower
_???4	Kite
_???5	Balloon
_???6	Firn/Ice Core

6. [Qualifier]

Multiple alphanumeric character field (0-9,a-z,A-Z) identifies the file's contents.

_????_ext	Extended Record
_????_wts	Extension Weights
_????_var	Atmospheric Variability
	Statistics
_????_seas	Seasonal Cycle Statistics
_????_diu	Diurnal Cycle Statistics
_????_mtx	MBL Reference Matrix

There are 5 types of files that are included in GLOBALVIEW-CH_4. Each type is distinguished by its file name qualifier (see above):

- **ext** qualifier: files contain extended records, i.e., records that contain synchronized smoothed values, and interpolated and extrapolated values derived using the latitude reference data extension method.

- **wts** qualifier: files contain weights that were applied by CMDL when fitting smooth curves to weekly distributions of CH_4 mole fraction as a function of latitude.

- **var** qualifier: files contain a statistical summary of atmospheric variability by month.

- s**eas** qualifier: files contain a statistical summary of the average seasonal pattern by month.

- **diu** qualifier: files contain a statistical summary of average diurnal cycle patterns by month accumulated for all complete measurement years.

Files with the "ext", "wts", "var", and "seas" qualifier exist for all sites described in GLOBALVIEW-CH_4. Files with the "diu" qualifier accompany a subset of extended records derived from high-resolution measurement records where the diurnal cycle is a dominant feature of the observations.

File Name Examples:

cgo_02D0_ext_ch4.dat	Extended CH_4 record derived from CSIRO discrete measurements at Cape Grim.
mlo_00D0_ext_ch4.dat	Extended CH_4 record derived from CMDL discrete measurements at Mauna Loa.
poc000_00D1_wts_ch4.dat	Extension CH_4 weight file derived from CMDL discrete measurements from POC centered at the equator.
orl035_11D2_seas_ch4.dat	Average seasonal cycle of CH_4 derived from the LSCE discrete measurements from aircraft. Altitude bin is centered at 3.5 km.
car040_00D2_seas_ch4.dat	Average seasonal cycle of CH_4 derived from the CMDL discrete measurements from aircraft. Altitude bin is centered at 4.0 km.
car040_00D2_var_ch4.dat	Average atmospheric variability of CH_4 derived from the CMDL discrete measurements from aircraft. Altitude bin is centered at 4.0 km.
lef011_00C3_diu_ch4.dat	Average diurnal cycle of CH_4 derived from CMDL continuous measurements from a tower. Sampling height is 11 m.

1.3 Revision Date of this Document

July 19, 2012

2. INVESTIGATOR(S)

2.1 Investigator(s) Name and Title

Dr. Kenneth A. Masarie, Project Manager, GLOBALVIEW- CH_4, 2001, NOAA/CMDL.

.

2.2 Title of Investigation

GLOBALVIEW- CH_4, 2001, Cooperative Atmospheric Data Integration Project

2.3 Contacts (For Data Production Information)

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2.4 Data Set Citation

ISLSCP II GlobalView: Atmospheric Methane Concentrations. 2012. In Hall, Forrest G., G. Collatz, B. Meeson, S. Los, E. Brown de Colstoun, and D. Landis (eds.). ISLSCP Initiative II Collection. Data set. Available on-line [http://daac.ornl.gov/] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. doi:10.3334/ORNLDAAC/

2.5 Requested Form of Acknowledgment

Users of the International Satellite Land Surface Climatology (ISLSCP) Initiative II data collection are requested to cite the collection as a whole (Hall et al,. 2006) as well as the individual data sets. Please cite the following publications when these data are used:

Hall, F.G., E. Brown de Colstoun, G. J. Collatz, D. Landis, P. Dirmeyer, A. Betts, G. Huffman, L. Bounoua, and B. Meeson, The ISLSCP Initiative II Global Data sets: Surface Boundary Conditions and Atmospheric Forcings for Land-Atmosphere Studies, *J. Geophys. Res.*, 111, doi:10.1029/2006JD007366, 2006.

Anyone using GLOBALVIEW- CH_4 agrees to acknowledge its authors. The list of cooperating scientists and their organizations and institutions is large and would be cumbersome to include as a reference, thus GLOBALVIEW- CH_4 and its contributors should be referenced as [GLOBALVIEW-CH_4, 2001], and in a list of references as:

GLOBALVIEW- CH_4: Cooperative Atmospheric Data Integration Project - Carbon Dioxide. CD-ROM, NOAA CMDL, Boulder, Colorado [Also available on Internet via anonymous FTP to ftp.cmdl.noaa.gov, Path: ccg/ch4/GLOBALVIEW], 2001.

Note that GLOBALVIEW- CH_4 data and documents are updated once every two years and the most up-to-date references are available at http://www.cmdl.noaa.gov/ccgg/globalview/.

3. INTRODUCTION

3.1 Objective/Purpose

The objective of GLOBALVIEW- CH_4 is to acquire and archive atmospheric measurements of trace gas species that will facilitate a better understanding of the processes controlling their abundance. These and other measurements have been widely used to constrain atmospheric models that derive plausible source/sink scenarios. Serious obstacles to this approach are the paucity of sampling sites and the lack of temporal continuity among observations from different locations. Consequently, there is the potential for models to misinterpret these spatial and temporal gaps resulting in derived source/sink scenarios that are unduly influenced by the sampling distribution. GLOBALVIEW- CH_4 is an attempt to address these issues of temporal discontinuity and data sparseness and is a tool intended for use in carbon cycle modeling. GLOBALVIEW is a product of the Cooperative Atmospheric Data Integration Project and is coordinated and maintained by the NOAA CMDL Carbon Cycle Greenhouse Gases (CCGG) Group.

3.2 Summary of Parameters

The data product includes synchronized smoothed time series derived from continuous and discrete land-surface, ship, aircraft, and tower observations; weight files; summaries of seasonal patterns, diurnal patterns (where relevant), and atmospheric variability; the derived marine boundary layer (MBL) reference matrix used in the data extension process; uncertainty estimates; and extensive documentation. The largest period of coverage is from 1984 to 1998 with other sites having less extended coverage.

3.3 Discussion

The GLOBALVIEW- CH_4 construct is derived from measurements but contains no actual data. To facilitate use with carbon cycle modeling studies, the measurements have been processed (smoothed, interpolated, and extrapolated) resulting in extended records that are evenly incremented in time. Be aware that information contained in the actual data may be lost in this process. Users are encouraged to review the actual data in the literature, in data archives (CDIAC, WDCGG), or by contacting the participating laboratories identified below. Smoothed, interpolated, and extrapolated values in the

extended records are determined with varying degrees of confidence. We strongly encourage users to consider the relative weights assigned to these values when using this product.

GLOBALVIEW- CH_4 is subject to change as members of the Cooperative Atmospheric Data Integration Project reserve the right to adjust individual measurement records based on recalibrations of standard gases and instruments. The GLOBALVIEW- CH_4 data product continues to evolve. Extended records and statistical summaries may change as techniques are refined and new data are added. This data set included in the International Satellite Land Surface Climatology Project (ISLSCP) Initiative II data collection is the GLOBALVIEW- CH_4, 2001 data set. However, the methane data set is updated every two years with the most up-to-date data and documentation available at http://www.cmdl.noaa.gov/ccgg/globalview/

Each measurement record used to derive GLOBALVIEW-CH_4 has been carefully edited and selected by the organization or institution contributing the observations. The measurement records are accumulated at NOAA CMDL along with documentation and references. Wherever possible, NOAA CMDL attempts to reproduce the selected data set based on descriptions in the literature. Details of methodology and standard scale can often be obtained from the documentation and literature. Selected measurements are then compared to other measurement records that are nearby in latitude as an additional assessment of potential calibration or sampling problems. Occasionally, two or more organizations make observations at the same location providing an opportunity to directly compare independent measurement programs (Masarie et al., 2001).

4. THEORY OF ALGORITHM/MEASUREMENTS

See Masarie and Tans (1995) and http://www.cmdl.noaa.gov/ccgg/globalview/.

5. EQUIPMENT

5.1 Instrument Description

5.1.1 Platform (Satellite, Aircraft, Ground, Person)

Land-surface, ship, aircraft, and tower observations.

5.1.2 Mission Objectives

To measure atmospheric trace gas concentrations.

5.1.3 Key Variables

Atmospheric trace gas concentrations.

5.1.4 Principles of Operation

Several instruments are used. See http://www.cmdl.noaa.gov/ccgg/globalview/ for more information.

5.1.5 Instrument Measurement Geometry

Several instruments are used. See http://www.cmdl.noaa.gov/ccgg/globalview/ for more information.

5.1.6 Manufacturer of Instrument

Several instruments are used. See http://www.cmdl.noaa.gov/ccgg/globalview/ for more information.

5.2 Calibration

At present, there is no internationally accepted CH_4 scale. Based on informal inter-calibrations among several participating laboratories, relative differences of up to a few percent may exist among CH_4 standard scales. For measurements to be useful, it is necessary that observed gradients can be interpreted as CH_4 sources and sinks. To achieve this, the measurements integrated into GLOBALVIEW-CH_4 have been adjusted to a common scale.

The Cooperative Atmospheric Data Integration Project for Methane has agreed to adopt the CMDL scale for the purpose of constructing GLOBALVIEW-CH_4. While the CMDL scale may not be the best choice based on accuracy, it is a suitable choice for this application for two important reasons. First, the CMDL scale has been inter-calibrated with the scales used by MSC, NIWA, CSIRO, IUP-HD (indirectly through MSC), and SAWS/IFU (inter-comparisons of CMDL data with Cape Point data). Second, the majority of measurements used to derive GLOBALVIEW-CH_4 are from CMDL (70%) and CSIRO (21%). Based on results from the NOAA/CSIRO ongoing flask-air inter-comparison program at Cape Grim, Tasmania, these laboratories have established and maintained consistency to within 0.7 ppb (0.04% compared to the average mole fraction at Cape Grim) since 1992 (Masarie et al., 2001).

5.2.1 Specifications

5.2.1.1 Tolerance

Each participating laboratory has provided a multiplicative adjustment factor based on inter-calibrations with the CMDL scale. These adjustment factors used to derive the GLOBALVIEW-CH_4 product are listed below.

Table 1. *GLOBALVIEW-CH_4 Adjustment Factors*

Measurement Program	Standard Scale	Multiplier factor (1 Std. Error)
CSIRO, Australia [02]	CSIRO94	0.99979 (0.00010)
MSC, Canada [06]	MSC	0.985 (0.001)
CAMS, China [33]	MSC	0.985 (0.001)
IFU, Germany [39]	CMDL	1.0
ENEA, Italy [28]	CMDL	1.0
NIES, Japan [20]	NIES Gravimetric	0.9850 (0.0001)
NIWA, New Zealand [15]	NIWA	0.986 (0.001)
SAWS/IFU, South Africa [37]	CMDL	1.0
CMDL, United States [00]	CMDL	1.0

PLEASE NOTE: The GLOBALVIEW-CH_4 data product includes these adjustments; **no adjustments by the user are required**.

Some laboratories have not yet inter-calibrated their scale with the CMDL scale. Data from these programs will be included in a future release of this product once an adjustment factor can be determined

5.2.2 Frequency of Calibration

See http://www.cmdl.noaa.gov/ccgg/globalview/ for more information.

5.2.3 Other Calibration Information

See http://www.cmdl.noaa.gov/ccgg/globalview/ or **2_gv_ch4_2001_doc.pdf** document for more calibration information.

6. PROCEDURE

6.1 Data Acquisition Methods

Each measurement record used to derive GLOBALVIEW-CH_4 has been carefully edited and selected by the organization or institution contributing the observations. The measurement records are accumulated at NOAA CMDL along with documentation and references. Wherever possible, NOAA CMDL attempts to reproduce the selected data set based on descriptions in the literature. Details of methodology and standard scale can often be obtained from the documentation and literature. Selected measurements are then compared to other measurement records that are nearby in latitude as an additional assessment of potential calibration or sampling problems. Occasionally, two or more organizations make observations at the same location, providing an opportunity to directly compare independent measurement programs (Masarie et al., 2001).

6.2 Spatial Characteristics

6.2.1 Spatial Coverage

The GLOBALVIEW- CH_4 data set is made up of data acquired at sites throughout the world. The files **0_globalview_ch4_sites.dat** and **0_gv_table_ch4.csv** provide general information on sampling locations for measurement records used to derive GLOBALVIEW-CH_4.

6.2.2 Spatial Resolution

This is point data at various sites all around the world.

6.3 Temporal Characteristics

6.3.1 Temporal Coverage

See **0_globalview_ch4_sites.dat** for each station. Note that the span of the measurements may extend beyond the synchronization period (1984-1998) defined for this release of GLOBALVIEW- CH_4. These more recent measurements have been used to better define the smooth curve, S(t), and will be included in a future release of GLOBALVIEW- CH_4.

6.3.2 Temporal Resolution

Varies with file types. Can be weekly, monthly or average seasonal/diurnal cycles. See Section 8.2 for more information.

7. OBSERVATIONS

7.1 Field Notes

None given.

8. DATA DESCRIPTION

8.1 Table Definition with Comments

Not applicable to this data set.

8.2 Type of Data

All file types (except for reference MBL matrix) have 16 lines of descriptive information that include

+ Extended record name
+ Measurement organization or institution
+ Type of measurement program
+ Type of sampling site
+ Name of organization collecting air
+ Position of sampling site
+ Conversion from Universal Coordinated Time (UTC) to Local Standard Time (LST)
+ Creation date of the file
+ Number of rows in the file following the column description
+ Column descriptions

There are no blank fields in any column. Missing values are denoted with a standard default value, -999.999. All units are in μmol mol^{-1} CH_4 unless otherwise specified.

Extended Record Files (ext)

Following the descriptive information detailed above, the four (4) columns in the extended record files are:

UTC: "Weekly" synchronized time steps in Universal Coordinated Time (UTC) as decimal dates, i.e., year plus fraction of the year. Each year has 48 "weekly" steps. "Synchronized" means that the synchronization period and the time steps are the same for all extended record files.

S(t): Smoothed values extracted from a curve fitted to measurement data that have been selected for conditions where the sampled air is thought to be representative of large well-mixed air parcels. Internal and external gaps in the measurement record are denoted as default values.

REF(t): The latitude reference time-series, based on marine boundary layer sites, constructed at the sine (latitude) of the measurement site. The latitude reference is defined at all time steps.

diff: The difference climatology describes how the site differs from marine boundary layer (MBL) sites that are nearby in latitude. The difference climatology is defined at all time steps.

Extension Weights Files (wts)

Any method used to fill spatial and temporal gaps in observational records is forced to make assumptions creating uncertainty in the resulting data product. Each extended record included in GLOBALVIEW-CH_4 has a corresponding weight file that suggests a relative significance for each value in the extended file. All smooth values (derived directly from the actual measurements) receive a relative weight (ranging from 2 to 10) that depends on sampling density and measurement variability. All filled values (interpolated and extrapolated) receive a fixed weight of 1. We strongly recommend that users of this data product consider the weight files, which provide an estimate of the relative significance of each value in the extended record. Following the descriptive information detailed above, the four (4) columns in the weight files are:

UTC: Synchronization year where the number of years is determined by the synchronization period.

rsd: Residual standard deviation (RSD) of the measurements about the smooth curve, S(t), with annual resolution. Years with fewer than six (6) measurements are assigned default values.

#: The number of residuals per year used in the RSD determination.

weight: Scaled weights determined using the relative weighting scheme described by Masarie and Tans, [1995]. Years where weights cannot be determined are assigned a default minimum weight of one (1).

The first row past the descriptive information specifies the residual standard deviation, number of residuals, and derived weight for all years, all observations.

Average Atmospheric Monthly Variability Files (var)

A statistical summary of average atmospheric variability is provided for each measurement record. A residual distribution is determined by fitting a smooth curve, S(t), to the observations, C(t), and computing residuals C(t)-S(t). The residuals for all Januarys, Februarys, etc are aggregated and statistics are determined with monthly resolution. The aggregated monthly statistics include within month and year-to-year variability. Information pertaining to the diurnal cycle is not considered here. Following the descriptive information detailed above, the six (6) columns in the "var" files are:

mo: Month (1-12) specification.
stdev: Standard deviation of the residual distribution computed monthly for all years.
50%ile: The 50th percentile or median of the residual distribution.
16%ile: The 16th percentile of the residual distribution.
84%ile: The 84th percentile of the residual distribution.
#: The number of aggregated monthly residual values used to compute the monthly statistics.

Average Seasonal Cycle Files (seas)

A statistical summary of the average seasonal cycle is provided for each measurement record. Monthly means are computed from a detrended smooth fit, S(t)–T(t), to the observations. The monthly means for all Januarys, Februarys, etc. are aggregated and statistics are determined with monthly resolution. The standard deviation of each aggregated monthly mean value is a measure of the year-to-year variability in the monthly mean values. The standard error of the aggregated monthly mean value is an estimate of the uncertainty in the aggregated monthly mean value. Following the descriptive information detailed above, the five (5) columns in the "seas" files are:

mo: Month (1-12) specification.
mean: Mean of the aggregated detrended monthly means for all years.
stdev: Standard deviation of the aggregated monthly mean distribution.
std err: Standard error of the aggregated monthly mean distribution.
#: The number of monthly mean values used to compute the aggregated monthly statistics.

Average Diurnal Cycle Files (diu)

A statistical summary of average diurnal cycles by month compiled using data from complete years is provided for each measurement record with hour resolution and where the diurnal cycle is a dominant feature in the observations. The residual distribution is determined by subtracting the 24-hour average mixing ratio for each day from every observation for that day. Note that for tall tower measurements, the 24-hour average is determined from measurements at the highest level. Following the descriptive information detailed above, the six (6) columns in the "diu" files are

mo: Month (1-12) specification.
hr: Hour (0-23) specification in UTC.
50%ile: The 50th percentile or median of the residual distribution computed monthly for all complete years.
16%ile: The 16th percentile of the residual distribution.
84%ile: The 84th percentile of the residual distribution.
#: The number of residual values from complete years used to compute the monthly statistics.

Marine Boundary Layer (MBL) Reference Matrix Files (mtx)

The reference marine boundary layer matrix contains CH_4 mixing ratios as a function of time and sine of latitude and is a by-product of the data extension procedure (see Masarie and Tans, 1995) and Appendix A of the **2_gv_ch4_2001_doc.pdf** document for details). Be aware that significant information contained in the actual data may be lost in this matrix. In addition, the reference MBL matrix itself may give an unrealistic impression of the comprehensiveness of global atmospheric CH_4 measurements since it contains CH_4 values at locations and times when no measurements exist. There is a single header line in the matrix file that specifies the format of the reference matrix.

+ Matrix format: FORMAT="(F12.6, 41(1X,F12.4))"

Following the single header line above, the 42 columns are

UTC: "Weekly" synchronized time steps in Universal Coordinated Time (UTC) as decimal dates, i.e., year plus fraction of the year. Each year has 48 "weekly" steps. "Synchronized" means that the synchronization period and time steps in the matrix are identical to those in the extended record files.

sine of latitude: [columns 2-42] There are 41 even intervals of 0.05 sine of latitude from 90 degrees S to 90 degrees N, i.e., column 2 represents a reference MBL value at –1.00 (90 degrees S), column 3 at –0.95 (71.8 degrees S), column 4 at –0.90 (64.2 degrees S), and so on.

8.3 Sample Data Record

A sample of the file "**aia005_02D2_ext_ch4.dat**" is shown below:

```
   aia005_02D2

   Commonwealth Scientific and Industrial Research Organization (CSIRO),
Australia
   Discrete Sampling

   Aircraft site
   Bass Strait/Cape Grim, Australia
   CSIRO, Division of Atmospheric Research

          lat        long  elev(masl)     utc2lst
       -40.53      144.30         500          10

   Creation Date:  Wed Dec 26 11:00:14 2001
   # of rows after column header:  673

          UTC        S(t)      REF(t)        diff
 1984.000000   -999.9990   1564.2633     -0.2228
 1984.020833   -999.9990   1562.7849     -0.1369
 1984.041667   -999.9990   1561.3731     -0.1067
 1984.062500   -999.9990   1560.0603     -0.1409
 1984.083333   -999.9990   1558.9112     -0.2441
 1984.104167   -999.9990   1558.0327     -0.4167
 1984.125000   -999.9990   1557.5535     -0.6544
 1984.145833   -999.9990   1557.5623     -0.9486
 1984.166667   -999.9990   1558.1015     -1.2869
 1984.187500   -999.9990   1559.3683     -1.6535
 1984.208333   -999.9990   1560.8452     -2.0306
 1984.229167   -999.9990   1562.6494     -2.3991
```

8.4 Data Format

All of the files in the ISLSCP Initiative II data collection are in the ASCII, or text format. The data files in this data set contain multiple header lines which contain the site name, the location, and the date of the data collection (see above). The actual data follows in a series of columns with fixed width. Following the header information detailed above, the format (width) of each type of file is as follows:

Extended	"ext"	F12.6, 3(F12.4)
Weight	"wts"	F12.6, 3(F12.4)
Atmospheric Variability	"var"	I5, 4(F12.4), I6
Seasonal Cycle	"seas"	I5, 3(F12.4), I6

Diurnal Cycle	"diu"	2(I5), 3(F9.4), I6
Reference Matrix	"mtx"	F12.6, 41(1X,F12.4)

8.5 Related Data Sets

ISLSCP II project information and related data sets can be found at the Oak Ridge National Laboratory Distributed Active Archive Center (ORNL DAAC) http://daac.ornl.gov/ISLSCP.islscpii.html
.

9. DATA MANIPULATIONS

9.1 Formulas

9.1.1 Derivation Techniques/Algorithms

See Masarie and Tans (1995)

9.2 Data Processing Sequence

9.2.1 Processing Steps and Data Sets

See Masarie and Tans (1995)

9.2.2 Additional Processing by the ISLSCP Staff

None.

9.3 Calculations

Please Note: Improvements to the data extension procedure described below are in the context of GLOBALVIEW-CO_2. Efforts to stabilize the extended records for GLOBALVIEW- CO_2, equally improve the stability of extended records for GLOBALVIEW-CH_4.

9.3.1 Special Corrections/Adjustments

The data extension approach used to prepare the GLOBALVIEW CO_2 product extends measurement time series by filling periods of missing data for a specific site with values based on knowledge gained from measurements at the site itself and from measurements from marine boundary layer (MBL) sites at comparable latitude. This "latitude reference" method has been improved upon over that described in Masarie and Tans, (1995). In GLOBALVIEW- CO_2, 1999 we improved the technique used to construct reference MBL time series to reduce their sensitivity to changes in the distribution of sites and to minimize discontinuities in these reference curves resulting from periods of sporadic or interrupted sampling with existing MBL records. In GLOBALVIEW- CO_2, 2000, we have made a minor change to the construction of the difference climatology to minimize discontinuities between smooth values and interpolated and extrapolated values. See Masarie and Tans (1995). Please consult the latest GLOBALVIEW-CH_4 documentation at http://www.cmdl.noaa.gov/ccgg/globalview/ for the most up-to-date information.

9.4 Graphs and Plot

See Masarie and Tans (1995) and http://www.cmdl.noaa.gov/ccgg/globalview/ .

10. ERRORS

10.1 Sources of Error

Any method used to fill spatial and temporal gaps in observational records is forced to make assumptions creating uncertainty in the resulting data product. Each extended record included in GLOBALVIEW-CH_4 has a corresponding weight file that suggests a relative significance for each value in the extended file. All smooth values (derived directly from the actual measurements) receive a relative weight (ranging from 2 to 10) that depends on sampling density and measurement variability. All filled values (interpolated and extrapolated) receive a fixed weight of 1.

10.2 Quality Assessment

10.2.1 Data Validation by Source

Not available at this revision.

10.2.2 Confidence Level/Accuracy Judgment

Not available at this revision. See GLOBALVIEW-CH_4 documentation for information on carbon dioxide confidence levels.

10.2.3 Measurement Error for Parameters and Variables

See Section 3 of the **2_gv_ch4_2001_doc.pdf** document.

10.2.4 Additional Quality Assessment Applied

None given.

11. NOTES

11.1 Known Problems with the Data

Consult Appendix A of the **2_gv_ch4_2001_doc.pdf** document and GLOBALVIEW Release Notes at http://www.cmdl.noaa.gov/ccgg/globalview/ for the latest information.

11.2 Usage Guidance

The extended records (files with an "ext" qualifier) are comprised of smoothed values, and interpolated and extrapolated values defined at each time step of the synchronization period. Those who wish to use extended records in their modeling application must simply add the reference MBL vector (COLUMN 3) to the difference climatology (COLUMN 4), i.e., extended record = REF + diff. Users will notice that S(t) = REF + diff wherever smoothed values (COLUMN 2) exist. You may also choose to use only the smoothed values (COLUMN 2) from the sites that are synchronized which will have assigned default values where there are no measurements.

PLEASE NOTE: Discontinuities within periods of interpolated or extrapolated values may occur when MBL measurement records begin, end, or are interrupted for long periods of time (See Appendix A (RELEASE NOTES) for details). Some discontinuities may be significant in certain modeling applications. Serious discontinuities are identified below.

Time step	Latitude[a]	Cause
1984.208333	5°N	CMDL sampling program at Christmas Island, Kiribati begins
1985.354167	28°N	CMDL sampling program at Sand Island, Midway begins
1987.000000	25°S	CMDL shipboard sampling in Pacific Ocean begins
1989.125000	32°N	CMDL sampling program at Bermuda begins

[a]Specifies the 5° latitude band most strongly influenced by the change in the MBL measurement distribution

PLEASE NOTE: The data extension procedure requires at least 2 years of observations. Because the GLOBALVIEW-CH_4 version released to the general public is a subset of the version available to members of the Cooperative Atmospheric Data Integration Project for Methane, some extended records may have no smoothed values. This occurs when measurements commence later than the last year included in the subset.

Relative weighting of each value in an extended record can be important because some points are better determined than others. Confidence in the smoothed values depends on the density of the data, the relative occurrence of rejected data, the "scatter" in the data, the type and number of corrections applied, and the length of the measurement period. Masarie and Tans (1995) describe in detail the relative weighting scheme and provide an example of how extended records and relative weights have been used in a 2-D modeling application. Users may choose to ignore our weighting scheme; sufficient information is included in the weight files so that users may devise their own weighting scheme.

11.3 Other Relevant Information

See http://www.cmdl.noaa.gov/ccgg/globalview/ .

12. REFERENCES

12.1 Satellite/Instrument/Data Processing Documentation

See Section 10 of the **2_gv_ch4_2001_doc.pdf** for a comprehensive reference list.

12.2 Journal Articles and Study Reports

See Section 10 of the **2_gv_ch4_2001_doc.pdf** for a comprehensive reference list.

Masarie, K.A., R.L. Langenfelds, C.E. Allison, T.J. Conway, E.J. Dlugokencky, R.J. Francey, P.C. Novelli, L.P. Steele, P.P. Tans, B. Vaughn, and J.W.C. White, "The NOAA/CSIRO Flask-Air Intercomparison Program: A strategy for directly assessing consistency among atmospheric measurements derived from independent laboratories." *Journal of Geophysical Research*, Vol. 106, No. D17, p. 20445-20464, 2001.

Masarie, K.A. and P.P Tans, "Extension and Integration of Atmospheric Carbon Dioxide Data into a Globally Consistent Measurement Record." *Journal of Geophysical Research*, Vol. 100, No. D6, p. 11593-11610. June 1995.

13. DATA ACCESS

13.1 Contacts for Archive/Data Access Information

The ISLSCP Initiative II data are available are archived and distributed through the Oak Ridge National Laboratory (ORNL) DAAC for Biogeochemical Dynamics at http://daac.ornl.gov.

13.2 Contacts for Archive

E-mail: uso@daac.ornl.gov
Telephone: +1 (865) 241-3952

13.3 Archive/Status/Plans

The ISLSCP Initiative II data are archived at the ORNL DAAC. There are no plans to update these data.

14. GLOSSARY OF ACRONYMS

CCGG	Carbon Cycle Greenhouse Gases Group
CDIAC	Carbon Dioxide Information Analysis Center
CH_4	Methane
CMDL	Climate Monitoring and Diagnostics Laboratory
CO_2	Carbon Dioxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAAC	Distributed Active Archive Center
GAW	Global Atmospheric Watch
GSFC	Goddard Space Flight Center (NASA)
ISLSCP	International Satellite Land Surface Climatology Project
LSCE	Laboratoire des Sciences, du Climat et de l'Environnement (France)
LST	Local Standard Time
MASL	Meters Above Sea Level
MBL	Marine Boundary Layer
NASA	National Aeronautics and Space Administration
NDIR	Non-Dispersive Infrared
NOAA	National Oceanic and Atmospheric Administration
ORNL	Oak Ridge National Laboratory
PDF	Portable Document Format
RR	Round-Robin
RSD	Residual Standard Deviation
UTC	Universal Coordinated Time
WDCGG	World Data Centre for Greenhouse Gases
WMO	World Meteorological Organization