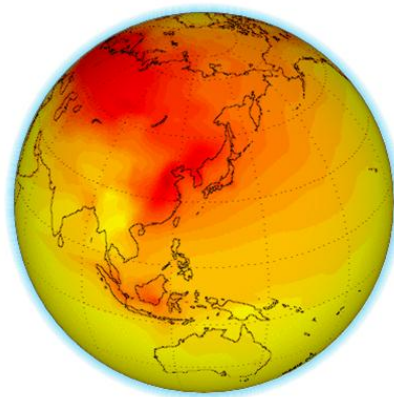
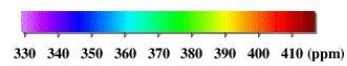
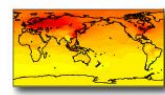




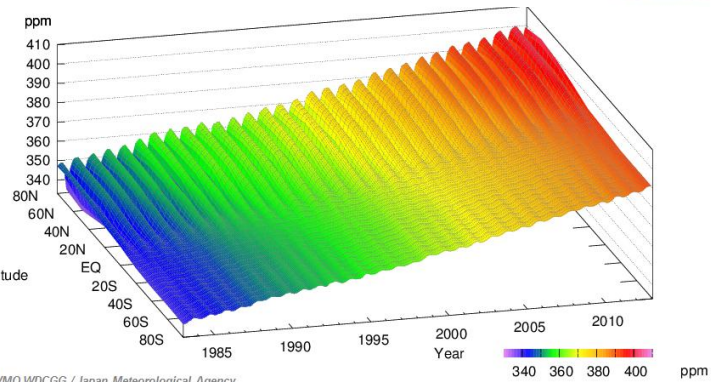
# Quality Control and Quality Assurance from WDCGG viewpoint



CO<sub>2</sub>  
DEC 2012



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WMO WDCGG / Japan Meteorological Agency



**Hiroshi Koide, with colleagues in  
ad-hoc data archive management team (GGMT-2013),  
RG-SAG and ET-WDC**



# Topics

- 1. How to maintain reliable historical time series**
- 2. How to ensure the propagation of correct metadata to users**
- 3. Discussion on Flagging**
- 4. A common software for Quality Assurance Workflow at each laboratory**



# World Meteorological Organization (WMO) Global Atmosphere Watch (GAW) World Data Centres



## WMO GREENHOUSE GAS BULLETIN

The State of Greenhouse Gases in the Atmosphere  
Based on Global Observations through 2013

Climate Summit Edition

No. 10 | 9 September 2014

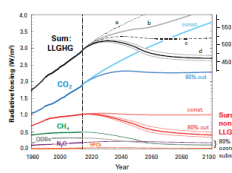
Long-lived GHGs (carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), substances that deplete stratospheric ozone), and remaining gases listed under the Kyoto Protocol) to the United Nations Framework Convention on Climate Change (sulfur hexafluoride (SF<sub>6</sub>), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs)) are the main drivers of climate change, and WMO GAW monitors them all. WMO GAW atmospheric measurements of these gases are used to inform climate policy in two ways: (1) The observations are compared with re-terminations of LLGHG atmospheric abundances from pre-industrial times, usually 1750, from ice cores to calculate IR<sub>0</sub> (defined as the change in Earth's net radiative flux). (2) For gases that do not exchange rapidly between the atmosphere and ocean or biosphere, the observations are combined with estimates of LLGHG lifetimes to

quantify their emissions. The figure shows use both pieces of information. It shows the increase in IR<sub>0</sub> above its pre-industrial level for the major LLGHGs from 1960 through 2013 (see plots of data and their descriptions in this bulletin) and their sum (in black), and (ii) illustrates the change in IR<sub>0</sub> that would occur from 2014-2100 based on emission reductions as follows: (a) emissions held constant at 2013 levels, (b) constant CO<sub>2</sub> emissions and 80% reduction in anthropogenic non-CO<sub>2</sub> GHG emissions, (c) 80% reduction in CO<sub>2</sub> emissions while non-CO<sub>2</sub> GHG emissions are held constant, and (d) 80% reductions in all LLGHG emissions. The projections are not based on multiple emissions scenarios; they merely illustrate that achieving reductions in IR<sub>0</sub> will require significant decreases in anthropogenic emissions of both non-CO<sub>2</sub> LLGHGs and CO<sub>2</sub>. The figure and description are based on an update of Montzka et al. (2011).

**Executive summary**

The latest analysis of observations from the WMO Global Atmosphere Watch Programme shows that the globally averaged mole fractions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O reached new highs in 2013, with CO<sub>2</sub> at 396.0±0.1 ppm<sup>1</sup>, CH<sub>4</sub> at 1824±2

ppb<sup>2</sup> and N<sub>2</sub>O at 325.9±0.1 ppb. These values constitute, respectively, 54%, 25% and 31% of pre-industrial (before 1750) levels. The atmospheric increase of CO<sub>2</sub> from 2012 to 2013 was 2.9 ppm, which is the largest year-to-year change from 1984 to 2013. For N<sub>2</sub>O the increase from 2012 to 2013 is smaller than the one observed from 2011 to



The WMO Global Atmosphere Watch (GAW) coordinates observations of the most important contributors to climate change: long-lived greenhouse gases (LLGHGs). In this figure, their radiative forcing (RF) is plotted along with a simple illustration of the impacts on future RF of different emission reduction scenarios. Analysis of GAW observations shows that a reduction in RF from its current level (1.22 W m<sup>-2</sup> in 2013) requires significant reductions in anthropogenic emissions of all major greenhouse gases (GHGs).

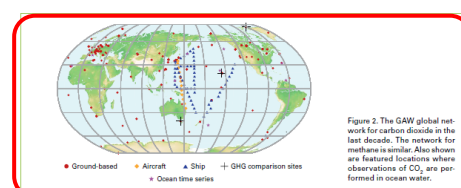


Figure 2. The GAW global network for carbon dioxide in the last decade. The network for methane is similar. Also shown are featured locations where observations of CO<sub>2</sub> are performed in ocean water.

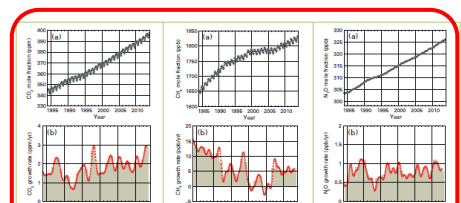


Figure 3. Globally averaged CO<sub>2</sub> mole fraction (a) and its growth rate (b) from 1984 to 2013. Differences in successive annual means are shown as shaded columns in (b).

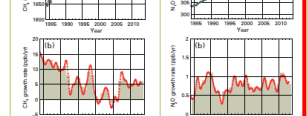


Figure 4. Globally averaged CH<sub>4</sub> mole fraction (a) and its growth rate (b) from 1984 to 2013. Differences in successive annual means are shown as shaded columns in (b).

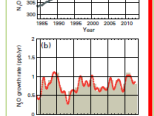


Figure 5. Globally averaged N<sub>2</sub>O mole fraction (a) and its growth rate (b) from 1984 to 2013. Differences in successive annual means are shown as shaded columns in (b).

Table 1 provides globally averaged atmospheric abundances of the three major LLGHGs in 2013 and changes in their abundances since 2012 and 1750. The results are obtained from an analysis of datasets (WMO, 2009) that are traceable to WMO World Reference Standards. Data from mobile stations, with the exception of NOAA sampling onboard ships transiting the Pacific Ocean, are not used for this global analysis.

The three greenhouse gases shown in Table 1 are closely linked to anthropogenic activities and they also interact strongly with the biosphere and the oceans. Predicting the evolution of the atmospheric content of greenhouse gases requires quantitative understanding of their many sources, sinks and chemical transformations in the atmosphere. Observations from GAW provide invaluable constraints on the budgets of these and other LLGHGs, and they are used to verify emission inventories and evaluate satellite retrievals of LLGHG column averages.

The NOAA Annual Greenhouse Gas Index in 2013 was 1.34, representing a 34% increase in total radiative forcing relative to 1750 by all LLGHGs since 1980 and a 1.6% increase from 2012 to 2013 (Figure 1). The total radiative forcing by all LLGHGs in 2013 corresponds to a CO<sub>2</sub>-equivalent mole fraction of 478 ppm. (<http://www.esrl.noaa.gov/gmd/aggl>).

**Carbon dioxide (CO<sub>2</sub>)**

Carbon dioxide is the single most important anthropogenic greenhouse gas in the atmosphere, contributing ~60% of the radiative forcing by LLGHGs. It is responsible for ~48% of the increase in radiative forcing over the past decade and ~80% over the past five years. The pre-industrial level of ~28 ppm represented a balance of relatively large annual two-way

fluxes between the atmosphere and oceans (~80 PgC yr<sup>-1</sup>) and the atmosphere and terrestrial biosphere (~120 PgC yr<sup>-1</sup>). Atmospheric CO<sub>2</sub> reached 142% of the pre-industrial level in 2013, primarily because of emissions from combustion of fossil fuels and cement production (CO<sub>2</sub> emissions were 9.7±0.5 PgC yr<sup>-1</sup> in 2012, according to <http://www.globalcarbonproject.org>). This conclusion is consistent with GAW measurements of the spatial distribution of CO<sub>2</sub> at the Earth's surface and its rate of increase, a decrease in the carbon isotope ratio, <sup>13</sup>C/<sup>12</sup>C, in atmospheric CO<sub>2</sub>. Minor contributions to increased CO<sub>2</sub> come from deforestation and other land-use change (1.6±0.5 PgC in 2012), although the net effect of terrestrial biosphere fluxes is as a sink. The average increase in atmospheric CO<sub>2</sub> from 2003 to 2013 corresponds to ~45% of the CO<sub>2</sub> emitted by human activity with the remaining ~55% removed by the oceans and the terrestrial biosphere. The main sinks for CO<sub>2</sub> emissions from fossil fuel combustion are the oceans and terrestrial biosphere. Knowledge of partitioning between these sinks is based on GAW observations of atmospheric CO<sub>2</sub> and <sup>13</sup>C. Uptake of atmospheric CO<sub>2</sub> by the oceans results in ocean acidification (see next page).

Globally averaged CO<sub>2</sub> in 2013 was 396.0±0.1 ppm (Figure 3 (a)). The increase in global annual mean CO<sub>2</sub> from 2012 to 2013 of 2.9 ppm is greater than the increase from 2011 to 2012 (2.7 ppm) and the average growth rate for the 1990s (1.5 ppm yr<sup>-1</sup>), and the average growth rate for the past decade (~2.1 ppm yr<sup>-1</sup>). Recent increases in emissions of CO<sub>2</sub> from fossil fuel combustion (~2.9 yr<sup>-1</sup> or ~0.2 PgC yr<sup>-1</sup>) cannot explain the interannual variability in CO<sub>2</sub> growth rate nor the greater-than-average increase in annual means from 2012 to 2013. Measurements of <sup>13</sup>C/<sup>12</sup>C in atmospheric CO<sub>2</sub> by GAW participants indicate that changes in CO<sub>2</sub> growth rate result

from small changes in fluxes between the atmosphere and terrestrial biosphere. Typically, ~120 PgC is exchanged between the atmosphere and terrestrial biosphere each year. This accounts for the observed seasonal cycle in atmospheric CO<sub>2</sub> abundance in the northern hemisphere. Small interannual variability (1–2%) in these fluxes, either from a change in the balance between photosynthesis and respiration or the amount of biomass burned, have a large impact on the growth rate of CO<sub>2</sub> (~4 PgC yr<sup>-1</sup>). It is too early to say which factors are responsible for the larger-than-average increase in annual means from 2012 to 2013, but this active area of research relies on measurements by GAW participants.

**Methane (CH<sub>4</sub>)**

Methane contributes ~17% to radiative forcing by LLGHGs. Approximately 40% of methane is emitted into the atmosphere by natural sources (e.g. wetlands and termites), and about 60% comes from anthropogenic sources (e.g. ruminants, rice agriculture, fossil fuel exploitation, landfills and biomass burning). As a result of increased anthropogenic emissions, atmospheric CH<sub>4</sub> reached 253% of its pre-industrial level (~722 ppb) in 2013. Atmospheric CH<sub>4</sub> increased from ~1650 ppb in the early 1980s to a new high of 1824±2 ppb in 2013 (Figure 4 (a)). Its growth rate (Figure 4 (b)) decreased from ~13 ppb yr<sup>-1</sup> during the early 1980s to near zero during 1999–2008. Superimposed on top of the long-term change in growth rate is significant interannual variability (IAV). Studies of IAV help understand the processes that contribute to CH<sub>4</sub> emissions and losses. Since 2007, atmospheric CH<sub>4</sub> has been increasing again: its global annual mean increased by 6 ppb from 2012 to 2013. Studies using GAW CH<sub>4</sub> measurements indicate that increased CH<sub>4</sub> emissions from wetlands in the tropics and from anthropogenic sources at mid-latitudes of the northern hemisphere are likely causes. As shown in WMO Greenhouse Gas Bulletin No. 9, increased emissions from the Arctic did not contribute to the continued increase in atmospheric CH<sub>4</sub> since 2007.

**Nitrous oxide (N<sub>2</sub>O)**

Nitrous oxide contributes ~6% to radiative forcing by LLGHGs. It is the third most important contributor to LLGHG radiative forcing and has the largest emissions of substances that deplete stratospheric ozone (CFCs) when weighted by ozone-depleting potential. Prior to industrialization, the atmospheric N<sub>2</sub>O burden reflected a balance between emissions from soils and the ocean, and chemical losses in the stratosphere. In the industrial era, additional anthropogenic emissions are from synthetic nitrogen fertilizers (direct emissions from agricultural fields and indirect emissions from watersheds), synthetic nitrogen fertilizers (direct emissions from biomass burning and other minor processes. Currently, anthropogenic emissions are ~44% of total emissions, the total, determined from GAW measurements of globally averaged N<sub>2</sub>O (Figure 5 (a)) and its rate of increase in recent years (Figure 5 (b)). About 16 TgN yr<sup>-1</sup> of synthetic nitrogen fertilizers are the largest contributor to the increase in pre-industrial times. The globally averaged N<sub>2</sub>O mole fraction in 2013 reached 325.9±0.1 ppb, which is 0.8 ppb greater than the previous year and 121% of the pre-industrial level (275 ppb). The increase in annual means

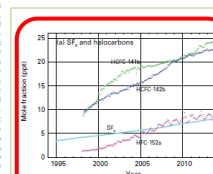


Figure 7. Monthly mean mole fractions of sulphur hexafluoride (SF<sub>6</sub>) and a suite of halocarbons (SF<sub>6</sub> and major halocarbons (a)) and major halocarbons (b) from 1975 to 2010. The numbers of stations used for the global analysis are as follows: SF<sub>6</sub> (12), CFC-11 (24), CFC-12 (12), CFC-113 (23), CFC-120 (2), CH<sub>3</sub>Cl (23), HFC-143a (18), HFC-142b (13), CFC-113 (23), HFC-134a (18) and HFC-125a (18).

# WMO Greenhouse Gas Bulletin No. 10 for UN Climate Summit on 15 Sep. 2014

6<sup>TH</sup> Asia-Pacific GAW Workshop on Greenhouse Gases, Daegu, Republic of Korea, 20-23/Oct/2014



# Future Perspectives

**WIS/WIGOS**, Other Scientific Community

GAW Data Policy  
GAW Strategic Plan

**GHG-SAG**

**RG-SAG**

Scientific Advisory

## for Data Providers

Monitoring: Data Registration Number

- Simplification of reporting procedure
- Preparation of the user Information for submitters
- Feedback Information on Characteristics of Data
- Enhance the relationship between submitters and the data centre

**WDCGG**



- Commit to align the needs of users and submitters alike.
- Permanent maintenance of **DATA archives**
- **Quality assurance and control for scientific accountability**
- **Better notification and compliance of the data policy**
- **Enhance interoperability**

Contribution to  
the International Science Community

## for Data Users

Monitoring:

Download Number

**Google Scholar Hit Number**

- Improved interface
- Consolidated flagging
- Tools for better data use
- Preparation of ISO compliant metadata
- Provision of reliable products (Data assimilation)

IPCC  
UNFCCC







# Future Perspectives

WIS/WIGOS, Other Scientific Community

GHG-SAG

RG-SAG

*for Data*

Monitoring: Data

- Simplification procedure
- Preparation Information
- Feedback Information Characteristic
- Enhance the between sub and the data centre

## Why reform?

- Financial pressure to GHG & RG measurements
- Model and Assimilation
- Cyber Infrastructure
- Stabilize the WDCGG services

## Our ultimate goal

- To serve better to users and contributors alike

interoperability

IPCC  
UNFCCC



ion to  
ence Community

**Users**

number  
lar Hit Number

erface  
flagging  
er data use  
of ISO  
tadata  
reliable  
ta



# A Tiny Group for Data Archive Management







# A Tiny Group for Data Archive Management



Lynn Hazan, ICOS/ATC



Ken Masarie, NOAA/ESRL



Ludwig Ries, UBA Germany





# A Tiny Group for Data Archive Management



**Lynn Hazan, ICOS/ATC**



**Table 2 - WMO GAW members who have offered to share expertise**

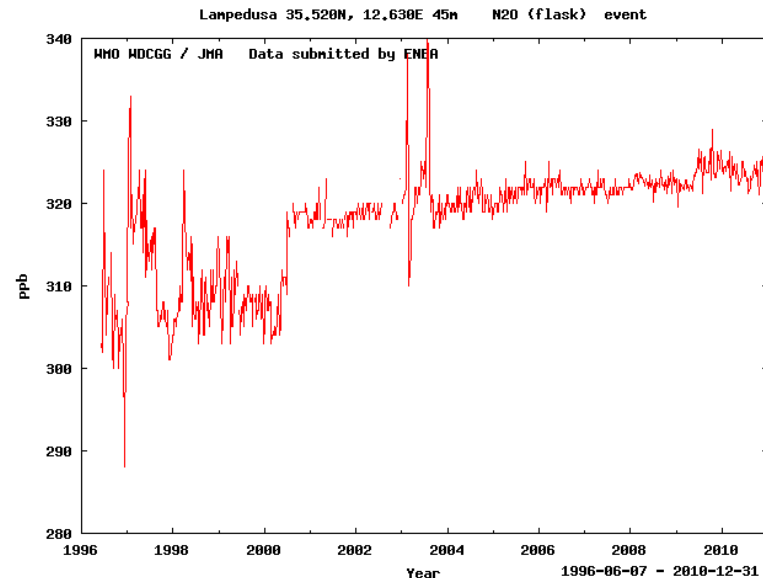
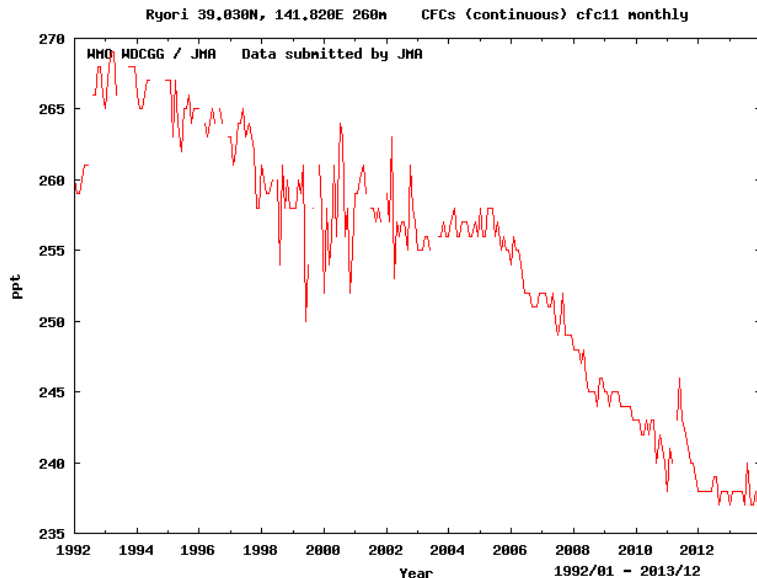
Name	Contact Email	Lab	Location	Area of Expertise
WDCGG	<a href="mailto:hkoide@met.kishou.go.jp">hkoide@met.kishou.go.jp</a>	JMA	Japan	Data management in WDCGG
Lynn Hazan	<a href="mailto:lynn.hazan@lsce.insl.fr">lynn.hazan@lsce.insl.fr</a>	LSCE	France	Data management
Paul Krummel	<a href="mailto:paul.krummel@csiro.au">paul.krummel@csiro.au</a>	CSIRO	Australia	Quality control, non-CO2 scale conversions, inter-comparisons
NOAA data team	<a href="mailto:kenneth.masarie@noaa.gov">kenneth.masarie@noaa.gov</a>	NOAA	United States	Data management, quality control, scale conversion
Ludwig Ries	<a href="mailto:ludwig.ries@uba.de">ludwig.ries@uba.de</a>	UBA	Germany	Data acquisition, management and quality control. Software solutions available for data acquisition, instrument control, calibration processing, interactive data preparation and validation.
Martin Steinbacher	<a href="mailto:martin.steinbacher@empa.ch">martin.steinbacher@empa.ch</a>	EMPA	Switzerland	Data acquisition and processing with commercially available and custom-built software
Doug Worthy	<a href="mailto:Doug.worthy@ec.gc.ca">Doug.worthy@ec.gc.ca</a>	EC	Canada	Near real-time data processing via GC, NDIR, and CRDS technologies



**Ludwig Ries, UBA Germany**



**Q : How you can properly merge the historical time series when you replace your instrument?**





# Parallel Data Streams



**Q : How you can utilize parallel data streams at the same site and for the same parameter, for example, by two different instruments or with both in situ measurement and flask sampling?**



## **Two Controversial Approach**

- 1. Somehow to merge the multi-streams into one consolidated representative time series per station per parameter**
- 2. The original information from different data streams is precious and useful.**

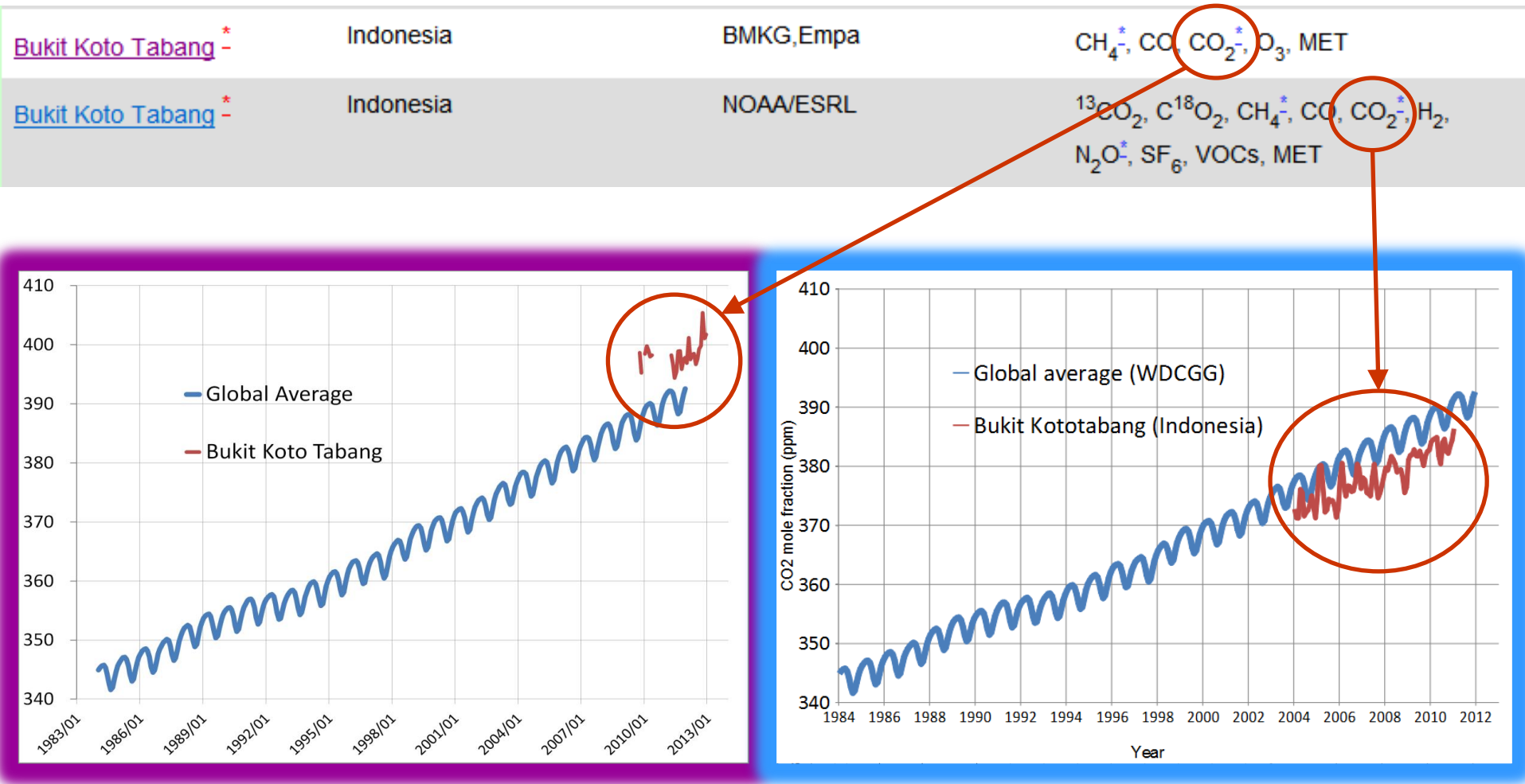




# Parallel Data Streams

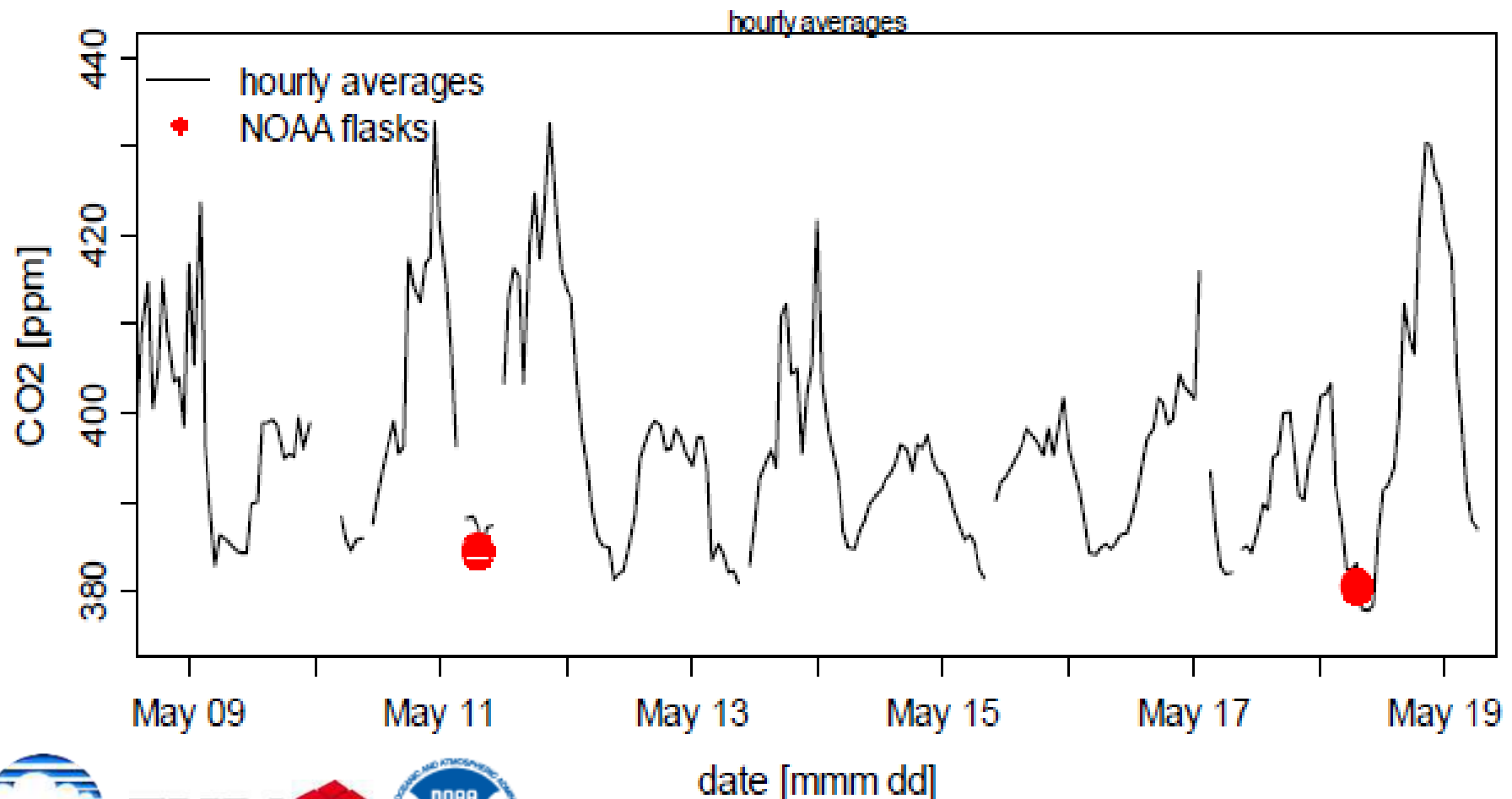


## From the WDCGG Archive



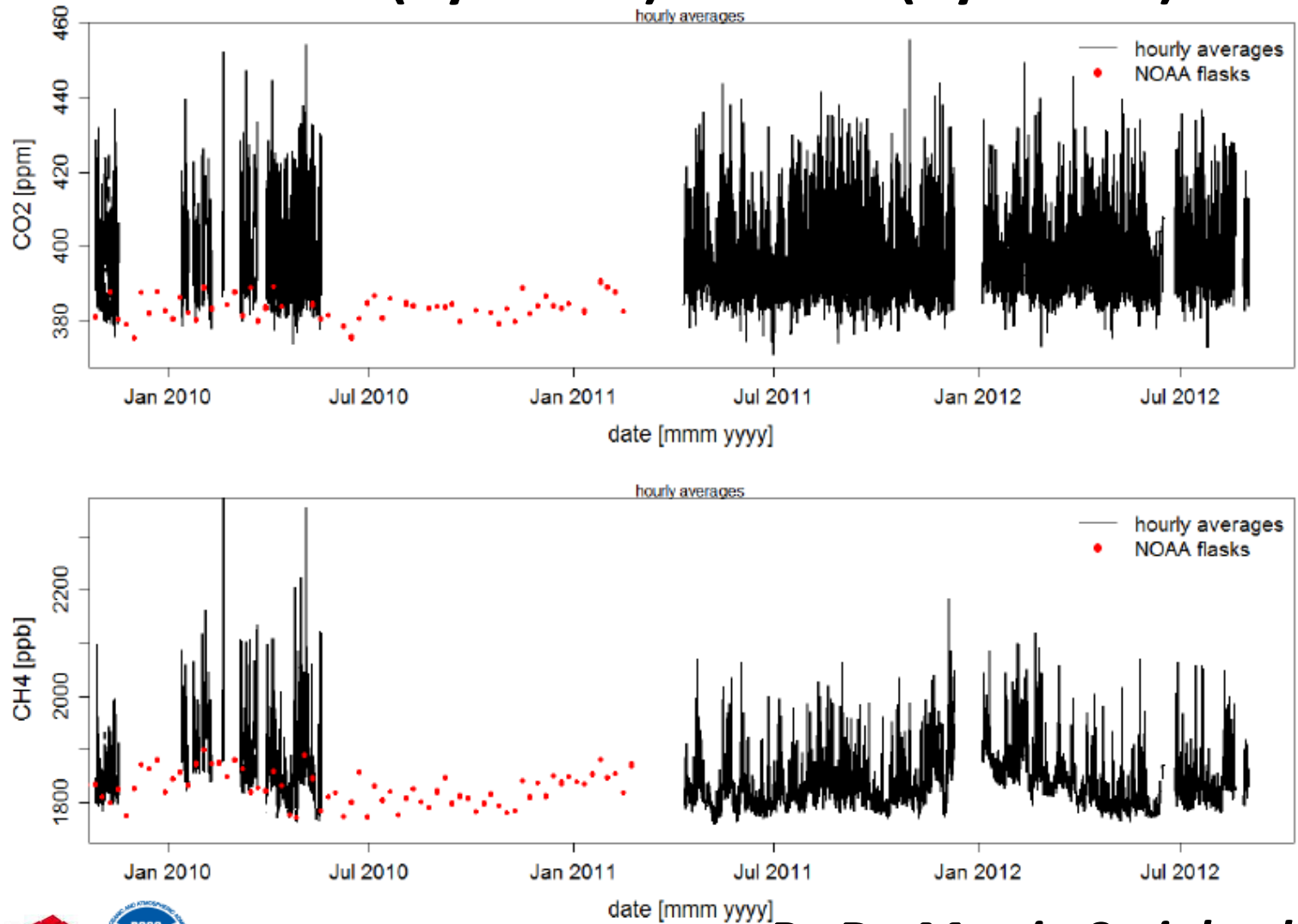
# Characteristics of GHG data in pristine rain forest

## Continuous (by EMPA) vs Flask (by NOAA)



# Characteristics of GHG data in pristine rain forest

## Continuous (by EMPA) vs Flask (by NOAA)







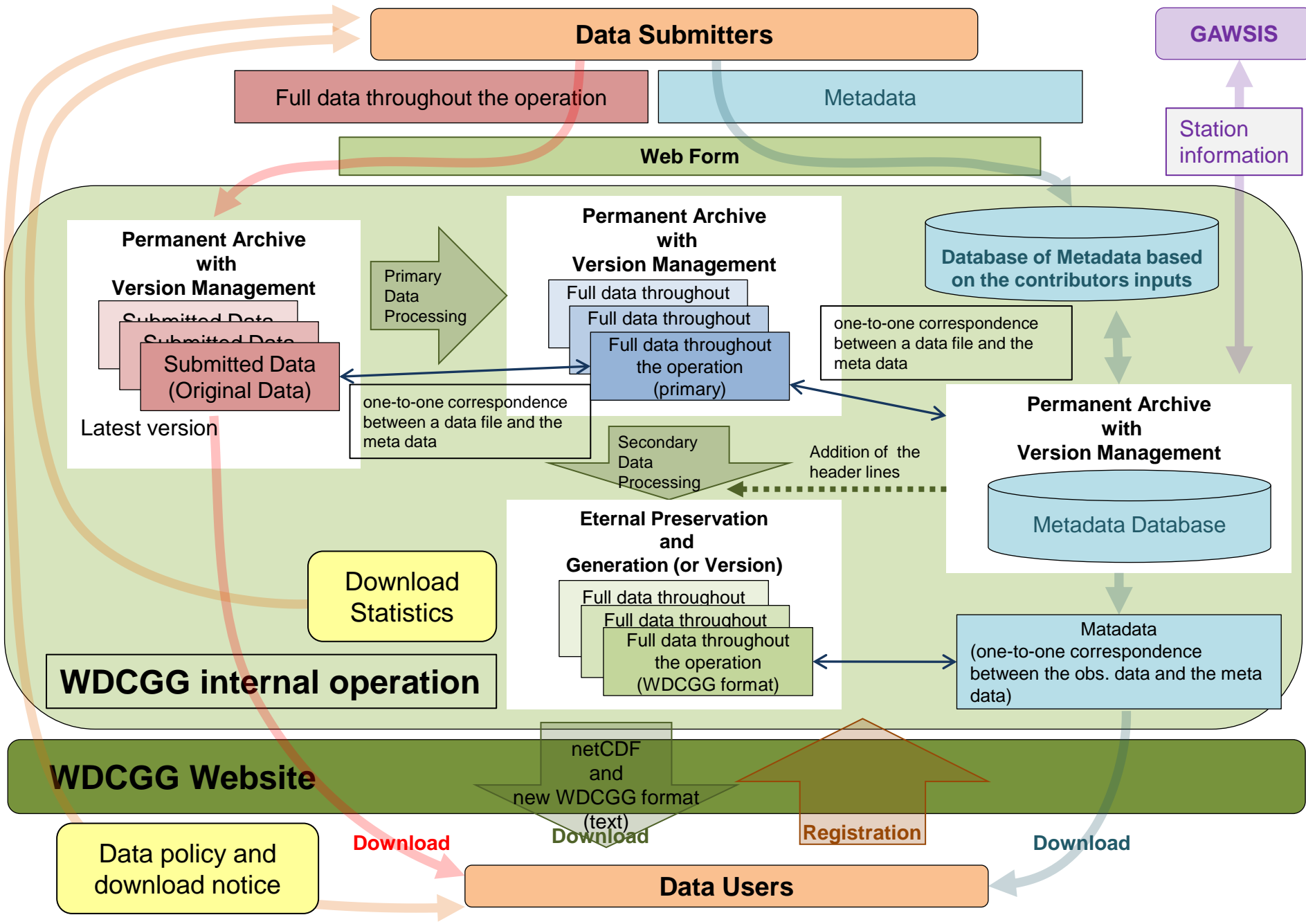
# Metadata is Crucial



**Q: How to ensure the propagation of necessary metadata information from data providers to data users?**

**A: Data submission interface for always one-to-one combined data and metadata**

# The concept of the new WDCGG





World Data Center  
for Greenhouse Gases

Login name: JMA

- [Home](#)
- [Contributor](#)
- [Contact Person](#)
- [WDCGG station](#)
- [WDCGG parameter](#)
- [Submission](#)
- [Access log](#)

What's new History

YYYY-MM-DD	***
YYYY-MM-DD	***

## Contributor's Page

**World Data Centre**  
for Environmental Science

---

**Login name:** JMA

- Home
- Contributor
- JRCOS status
- JRCOS status
- JRCOS parameter
- JRCOS user
- Account log

## JMA Contributor's information

<b>NO.</b>	19
<b>Name</b>	Japan Meteorological Agency
<b>Accession</b>	JMA
<b>Address_1</b>	Climate Environment and Marine Department
<b>Address_2</b>	Atsugi-shi, Chugoku Prefecture, Japan
<b>Address_3</b>	1-3-4 Ono-machi, Chugoku 100-8122
<b>Country/Territory</b>	JAPAN
<b>Website</b>	http://www.jma.go.jp/jma/index.html

[illegible][illegible]

Access Log and Statistics  
Coming soon

[illegible]

The screenshot shows a web browser window with a Japanese website. The website's header includes the text "World Data Centre" and "For Environmental Science". The main content area features the logo of the "Japan Meteorological Agency" (JMA) and the text "Japan Meteorological Agency". A large, semi-transparent overlay with the text "Upload Data files" is positioned in the center of the browser window. The overlay has a blue header bar with the text "Attachments" and a list of files on the left side. The list includes files such as "Shape1\_Sample data and parameter", "Shape2\_Sample data", "Shape3\_Sample data", "Shape4\_Sample data", "Shape5\_Sample data", "Shape6\_Sample data", "Shape7\_Sample data", "Shape8\_Sample data", "Shape9\_Sample data", "Shape10\_Sample data", "Shape11\_Sample data", "Shape12\_Sample data", "Shape13\_Sample data", "Shape14\_Sample data", "Shape15\_Sample data", "Shape16\_Sample data", "Shape17\_Sample data", "Shape18\_Sample data", "Shape19\_Sample data", "Shape20\_Sample data", "Shape21\_Sample data", "Shape22\_Sample data", "Shape23\_Sample data", "Shape24\_Sample data", "Shape25\_Sample data", "Shape26\_Sample data", "Shape27\_Sample data", "Shape28\_Sample data", "Shape29\_Sample data", "Shape30\_Sample data", "Shape31\_Sample data", "Shape32\_Sample data", "Shape33\_Sample data", "Shape34\_Sample data", "Shape35\_Sample data", "Shape36\_Sample data", "Shape37\_Sample data", "Shape38\_Sample data", "Shape39\_Sample data", "Shape40\_Sample data", "Shape41\_Sample data", "Shape42\_Sample data", "Shape43\_Sample data", "Shape44\_Sample data", "Shape45\_Sample data", "Shape46\_Sample data", "Shape47\_Sample data", "Shape48\_Sample data", "Shape49\_Sample data", "Shape50\_Sample data", "Shape51\_Sample data", "Shape52\_Sample data", "Shape53\_Sample data", "Shape54\_Sample data", "Shape55\_Sample data", "Shape56\_Sample data", "Shape57\_Sample data", "Shape58\_Sample data", "Shape59\_Sample data", "Shape60\_Sample data", "Shape61\_Sample data", "Shape62\_Sample data", "Shape63\_Sample data", "Shape64\_Sample data", "Shape65\_Sample data", "Shape66\_Sample data", "Shape67\_Sample data", "Shape68\_Sample data", "Shape69\_Sample data", "Shape70\_Sample data", "Shape71\_Sample data", "Shape72\_Sample data", "Shape73\_Sample data", "Shape74\_Sample data", "Shape75\_Sample data", "Shape76\_Sample data", "Shape77\_Sample data", "Shape78\_Sample data", "Shape79\_Sample data", "Shape80\_Sample data", "Shape81\_Sample data", "Shape82\_Sample data", "Shape83\_Sample data", "Shape84\_Sample data", "Shape85\_Sample data", "Shape86\_Sample data", "Shape87\_Sample data", "Shape88\_Sample data", "Shape89\_Sample data", "Shape90\_Sample data", "Shape91\_Sample data", "Shape92\_Sample data", "Shape93\_Sample data", "Shape94\_Sample data", "Shape95\_Sample data", "Shape96\_Sample data", "Shape97\_Sample data", "Shape98\_Sample data", "Shape99\_Sample data", "Shape100\_Sample data". The overlay also has a "Name" field, an "Email" field, and a "Submit" button. The website's footer includes the text "Data and Metadata Submission" and "Copyright © 1999-2000".

## Interface design for data and metadata submission





# Flagging

WORLD METEOROLOGICAL ORGANIZATION

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Doc. 6.2  
(2013-12-26)

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MEETING OF THE  
Expert Team on WORLD DATA CENTRES  
(JMA, Tokyo, Japan, 21-23 January 2014)

## ***Harmonisation of data flagging?*** (submitted by M. Schultz and H. Koide)

*"The purpose of data flagging is to obtain, at the end of the processing of the measurements, a time series of mole fractions that represents ambient conditions and to clearly identify artefacts as such. No entries should ever be removed from the original (raw) data set. Samples designated as not representing atmospheric composition should be identified [...]. The periods of automatic and/or manual calibration or maintenance as well as instrument problems should be clearly flagged. Instrumental problems are sometimes not obvious and identifying them in the time series may require significant experience."* (from GAW report 209 – ozone measurement guidelines)

### **1. Motivation**

Currently, there is no standardized, GAW-wide data flagging scheme, and the amount and quality of data quality information varies widely between data centers and even within data






- 644 V Low instrument precision and/or calibration issues
- 641 I Aerosol filters installed incorrectly
- 640 V Instrument internal relative humidity above 40%
- 635 I Internal temperatures too far off target value, considered

#### Group 5: Chemical problem

- 599 I Unspecified contamination or local influence
- 593 I Industrial contamination, considered invalid
- 591 I Agricultural contamination, considered invalid
- 578 I Large sea salt contribution (ratio between marine and excess sulphate is larger than 2.0). Used for old data only. For newer data use 451/450.
- 568 I Dust contamination, considered invalid
- 567 I Insect contamination, considered invalid
- 566 I Bird droppings, considered invalid
- 565 I Pollen and/or leaf contamination, considered invalid
- 559 V Unspecified contamination or local influence, but considered valid
- 558 V Dust contamination, but considered valid
- 557 V Insect contamination, but considered valid
- 556 V Bird droppings, but considered valid
- 555 V Pollen and/or leaf contamination, but considered valid
- 549 I Impure chemicals

## Two Categories in Flag Sets

- **Internal Flagging (Providers)**
- **Universal (External) Flagging (Users)**

Color coding	Value	Meaning
	0	no quality control applied
	1	acceptable data
	2	questionable data
	3	erroneous data
	9	missing values



# Flagging



## ➤ Internal Flagging (Providers)



## ➤ Universal Flagging (Users)

### Other (separated) Information

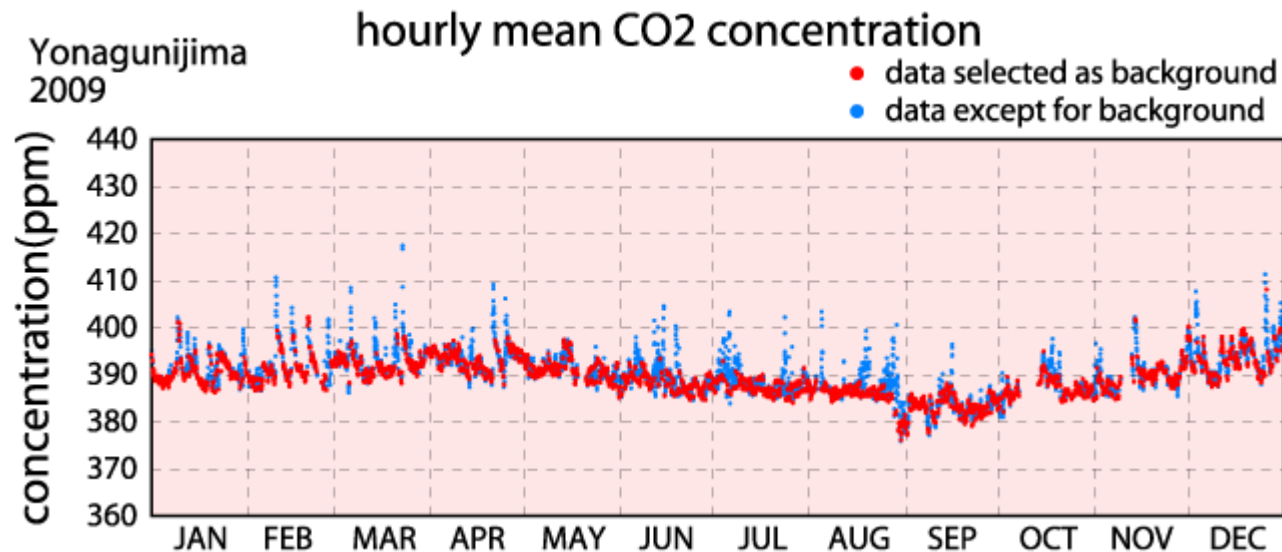
- Change history
- Status (Raw/Processed Data)



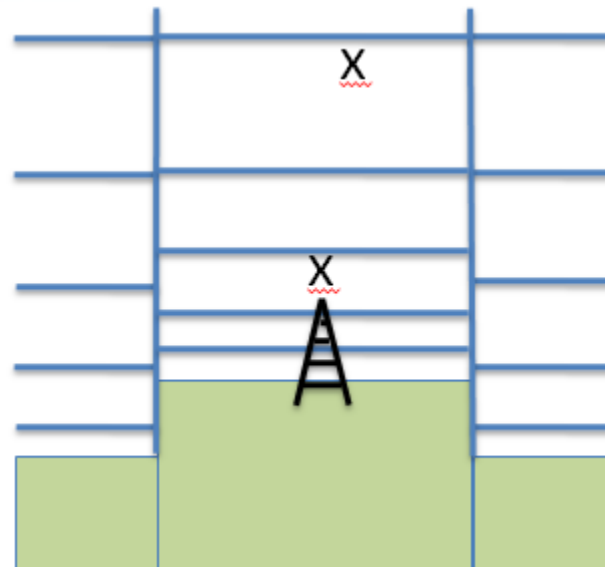
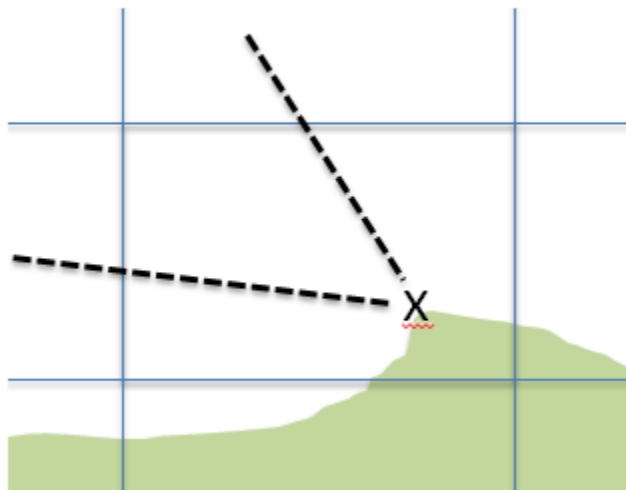
# JMA's data screening process



1. Hourly data contain half or more of the number of data that can be measured in the hour.
2. Standard deviation of hourly data doesn't exceed defined thresholds.
3. Differences from both of the adjacent hourly data don't exceed defined thresholds.







Figures by Sander Houweling, Netherland

**On a Cape: by Wind Direction**  
**On a Summit: by Diurnal Cycle**

**Q : How you can practically implement the GAW reports presenting recommendations on Quality Assurance into hundreds of GAW stations worldwide?!**

**A: Common Single Software for Workflow (from inlet to users)**



# Standardization Approach with an Interactive Software

**Dafit: Data acquisition  
files integration tool**



by Ludwig Ries, Germany ([l.ries@web.de](mailto:l.ries@web.de))

**For standardized Workflow on data  
preparation, flagging and validation**

on Windows 7 & 8.1, CSV output, conformable to DBMS  
*Internet download now in preparation on [gawstat.de](http://gawstat.de)*

check the detail with his paper in GGMT-2013, Beijing  
<http://ggmt-2013.cma.gov.cn/dct/page/70029>

# Thank you for your attention!

경청해 주셔서 감사합니다.

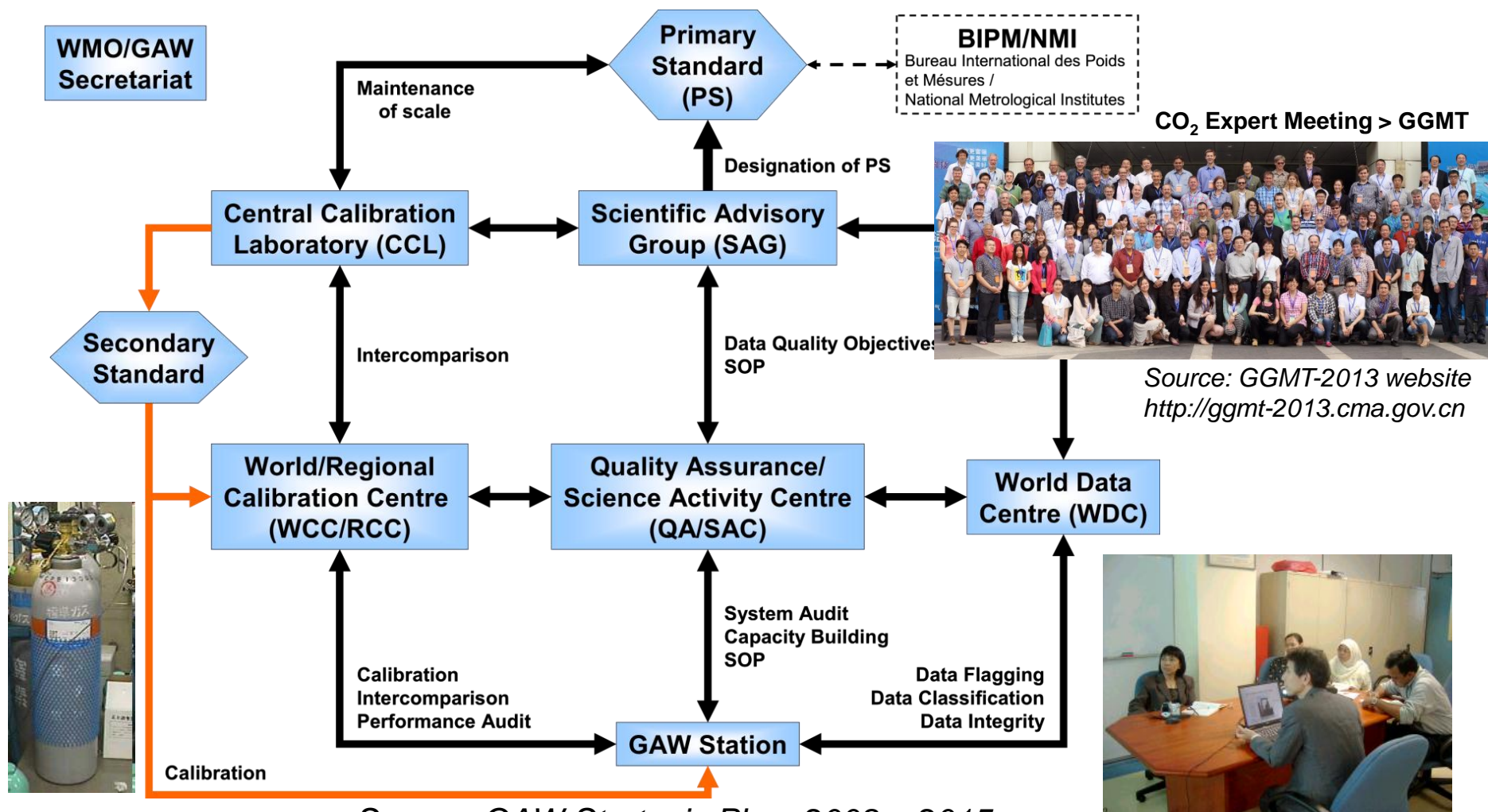




# Framework of the GAW Quality System



- GAW Quality System is supported by CCLs, QA/SACs and WCCs, as well as SAGs in ensuring data quality.



Source: GAW Strategic Plan: 2008 – 2015