WDCGG's Activity

Focus on topics of the new WDCGG Website

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ET-WDC meeting, 1 October 2019.

Timeline

Jan. 2018

Jan. 2019

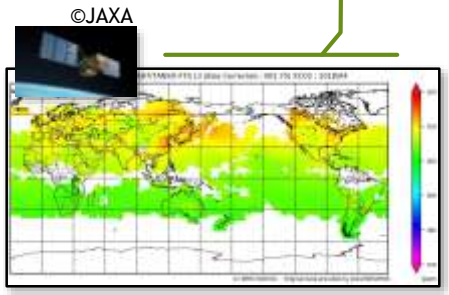
ET-WDC, 2-5, October 2017, Kjeller, Norway

ET-WDC, 1-3, October 2019, Hampton VA, USA

➢ Event

New updates,
attending of meeting,
announcement of activity,
etc...

Web site renewal

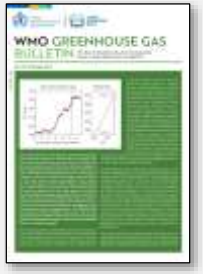


Start of Satellite data provision

IWGGMS

GGMT

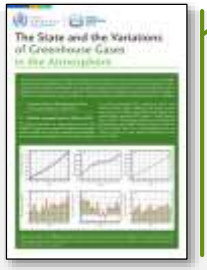
➢ WMO GHG Bulletin



No.13

This Bulletin is distributed at UNFCCC/COP, IPCC and so on.

No.14



The State and the Variations of GHGs in the Atmosphere (for UN Climate Summit 2019)

No.15

➢ WDCGG Data Summary

This Summary reports the results of global analyses of greenhouse and some related gas data

No.42

No.43

WDCGG Statistics (Data providers/Contributors)

Contributors
(Data providers)

Total 69

JMA	HMS	GERC
NOAA	IAFMS	NIES
AEMET	IGP	NILU
AGAGE	IMKIFU	METRI
AICH	INRNE	NIWA
AIST	INSTAAR	NMH
ANSTO	IOEP	ONM
ARSO	INPE	OSAKAU
BAS	ISAC	PolyU
BMKG	ITM	RIVM
CHMI	KMA	RSE
CMA	KMD	SAIPF
CSIRO	KSNU	SAWS
DMC	KUP	SHIZU
IAA	LA	TU
DWD	LAMP	UBAG
ECCC	LSCE	UBAA
EMA	MGO	UNIURB
Empa	MMD	UMLT
ENEA	MRI	UYRK
FMI	NAGOU	UNIVBRIS
FRA	NEDO	JAMSTEC
HKO	VNMHA	IIA

Station

Total 205

GAW Global	32
GAW Regional	112
GAW Contributing networks	1
GAW Other elements	27
Mobile	33

REGION I	12
REGION II	36
REGION III	7
REGION IV	35
REGION V	15
REGION VI	57
ANTARCTICA	10
MOBILE	33

Gas species

Total 56

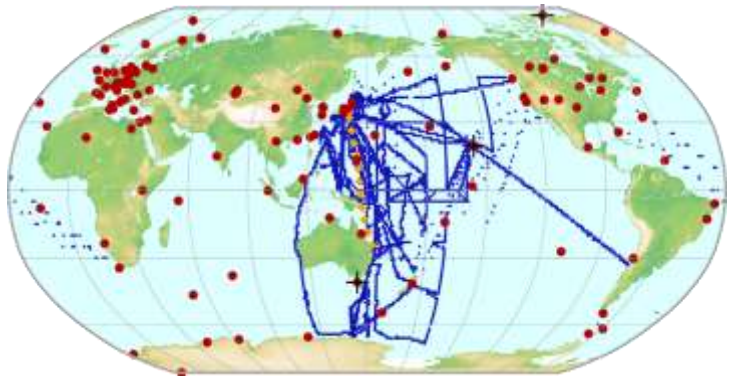
CO_2, CO_2[C-13], CO_2[O-18]	
CH_4, CH_4[C-13], CH_3D	
N_2O, SF_6, SO_2F_2, NF_3, COS	
Halocarbons	2
CFCs	6
HCFCs	4
HFCs	11
PFCs	4
Halon	3
Reactive Gas	10
Other Gas	1
Radionuclide	3
TIC	

Country/Territory

Total 56

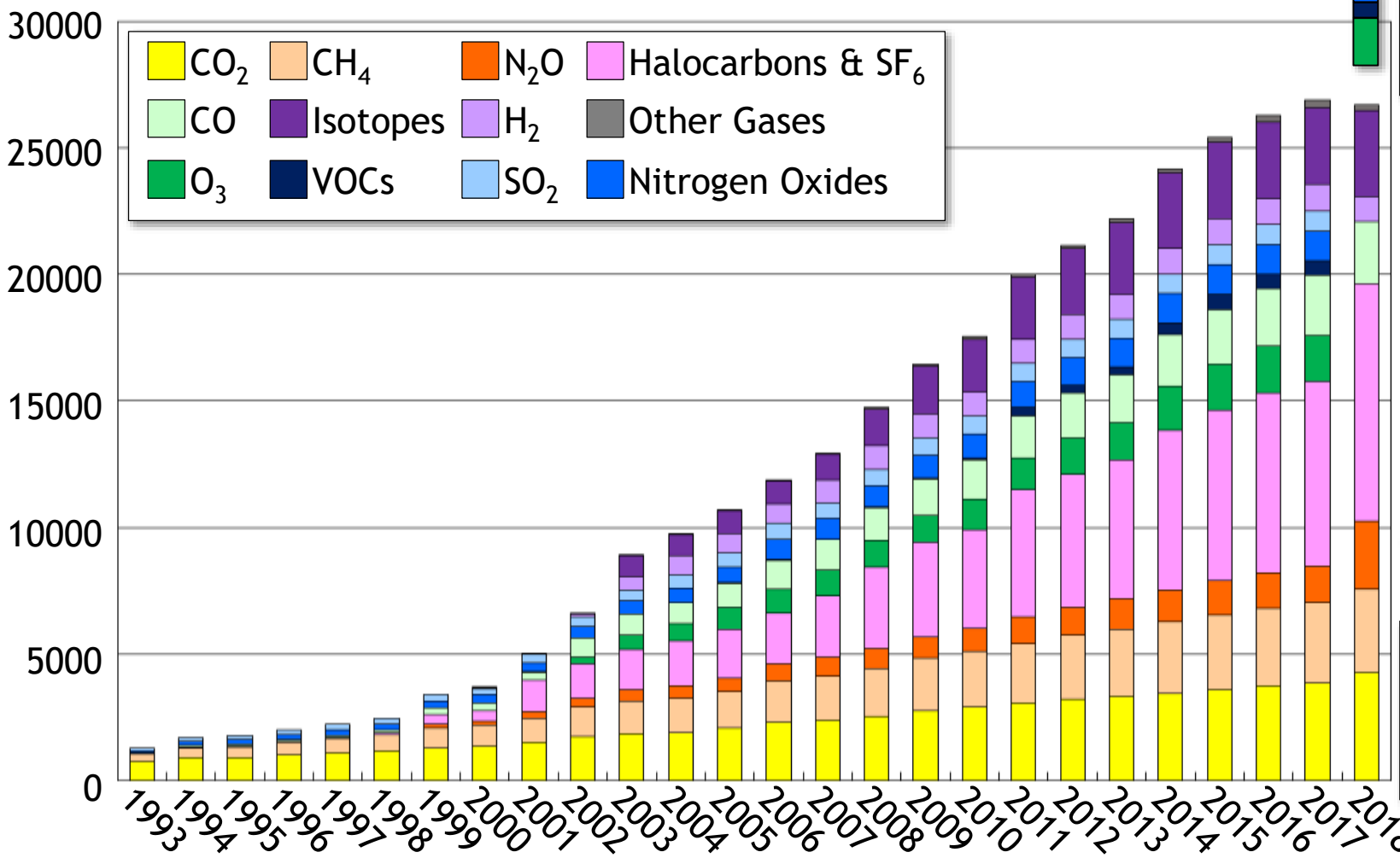
REGION I (Africa)	10
REGION II (Asia)	13
REGION III (South America)	5
REGION IV (North and Central America)	5
REGION V (South-West Pacific)	6
REGION VI (Europe)	25
ANTARCTICA	7
MOBILE	6

Note: There are countries that extend over multiple regions.



As of 17 September 2019

WDCGG Statistics (Gas species)



Transferred to WDCRG from 2018

O_3 VOCs SO_2 Nitrogen Oxides

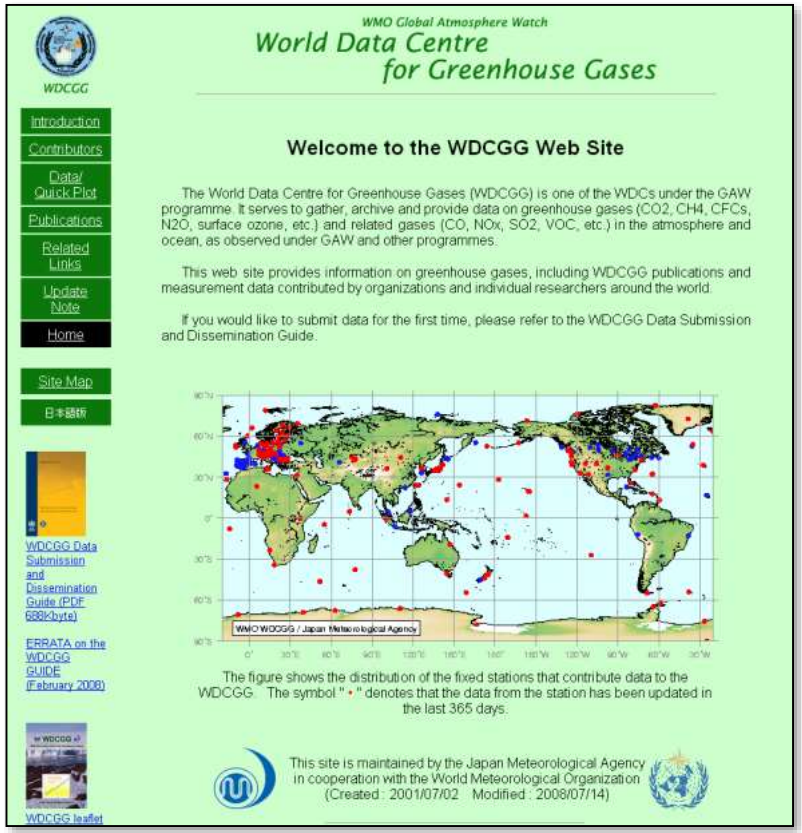
Get it here until the migration is complete.

In 2018, NOAA's N_2O and SF_6 data increased.

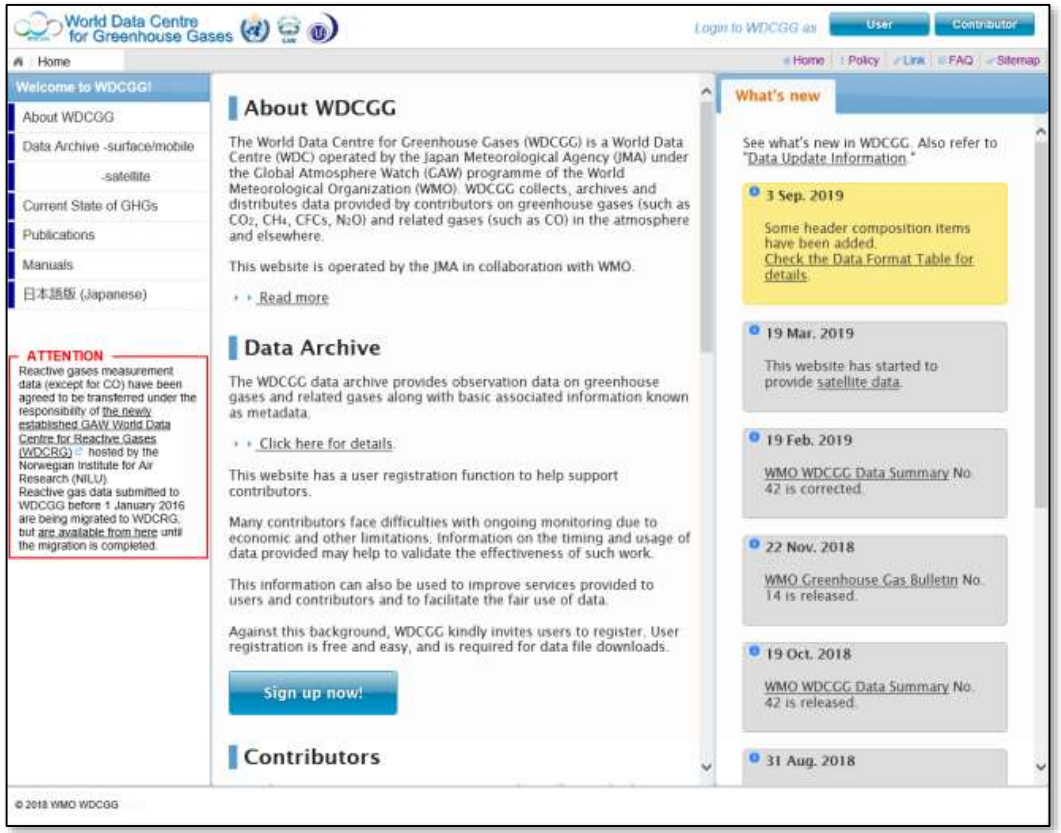
N_2O Halocarbons & SF_6

Website renewal

Website Renewal in August 2018



Closed on 30 November 2018



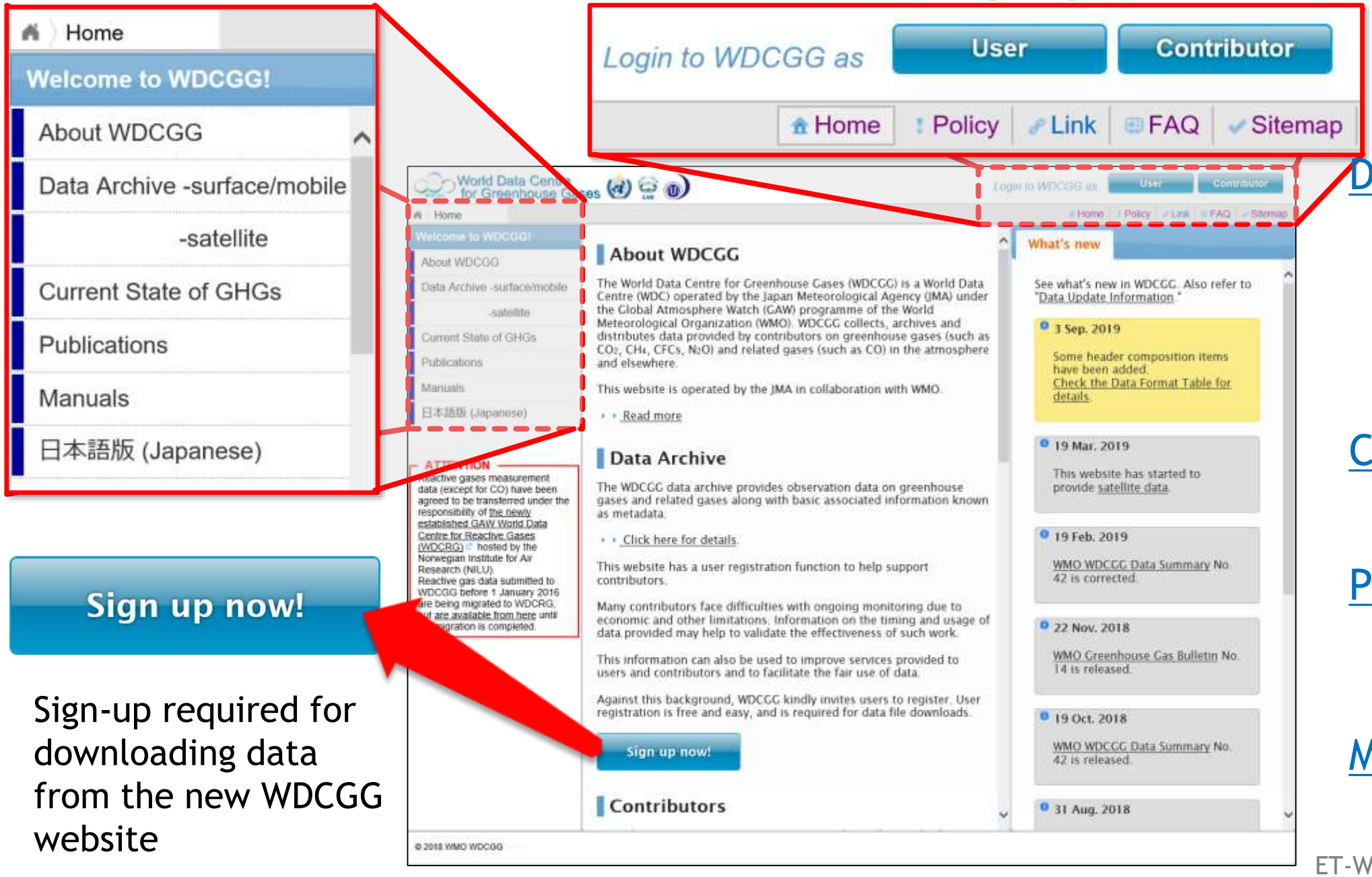
Renewal on 31 August 2018

Current old site

What's New?

- Need registrations to download the data
- Changing metadata information
- Improved user interface/data format

WDCGG Homepage



Sign up now!

Sign-up required for downloading data from the new WDCGG website

About WDCGG
- Activities
- History
- About GAW
- Statistics

Data Archive
-surface/mobile
- Search
- Map
- List

-satellite
- List

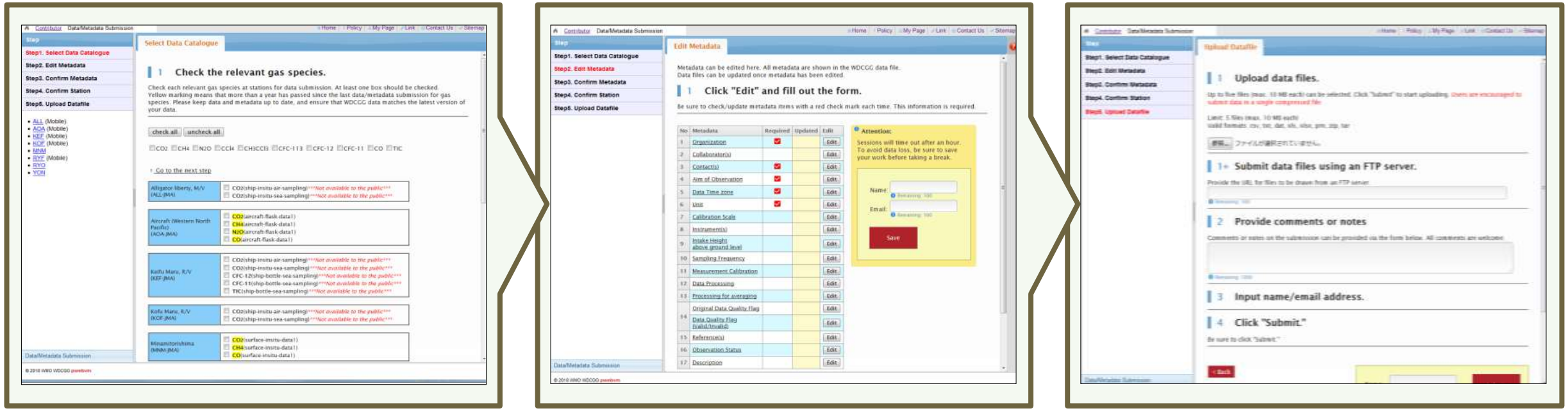
Current State
- Global mean
- etc.

Publications
- Data Summary
- GHG Bulletin
- etc.

Manuals
- for Contributor
- for User

How to register your data (for contributors)

Select data catalogue ➤ Input metadata ➤ Upload data files

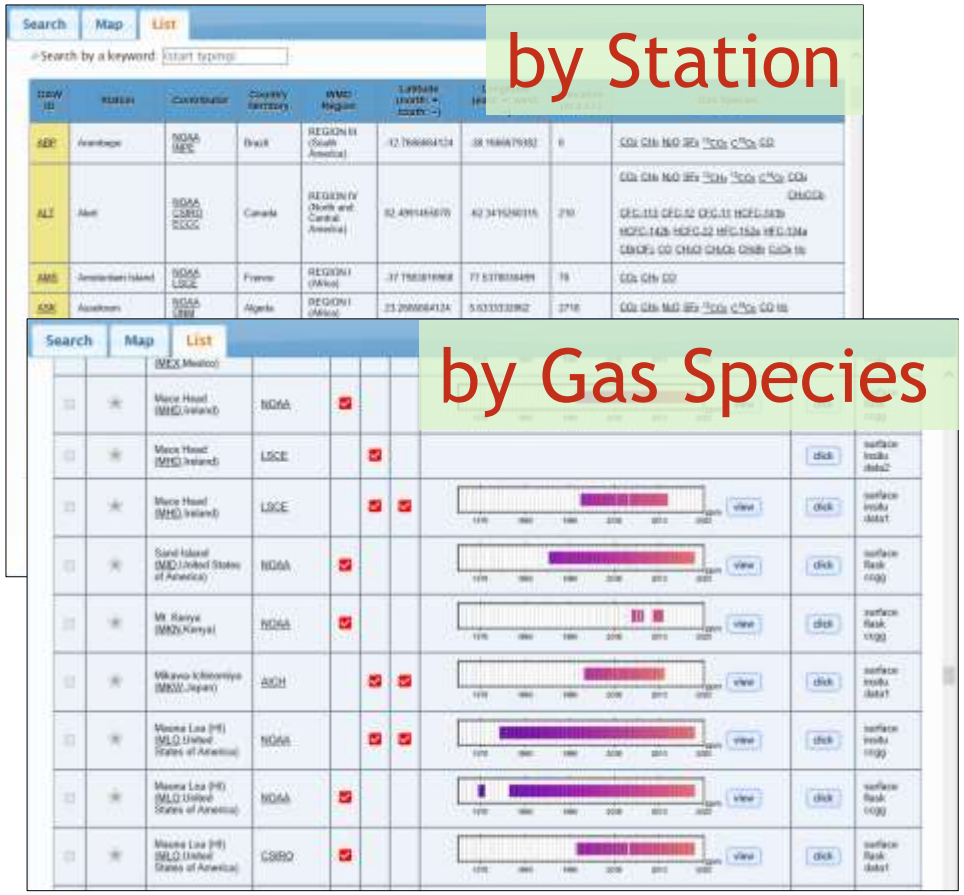


1. Select the relevant gas species of each station to register on the WDCGG.
   (Multiple selections are possible)
2. Input metadata by selection column.
   (e.g. Organization, Contact(s), Aim of Observation, Time zone, Unit...)
3. Upload the data file on the WDCGG after checking metadata and station information.

How to find/use data (for users)

- How to search data -

List



Map

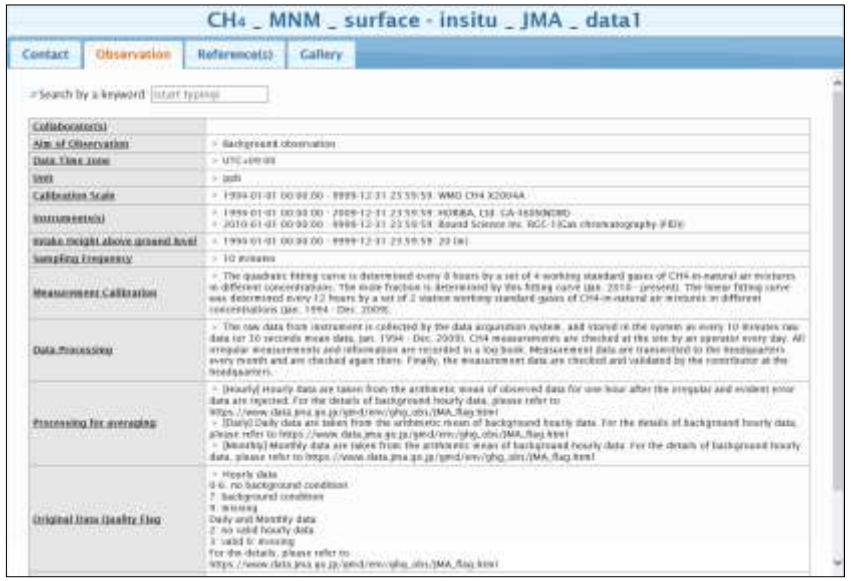
Keyword

- ✓ Many ways to find the data, including choosing from the entire list, picking up on the map, or searching by keywords.
- ✓ Registration is needed to download data files.

How to find/use data (for users)

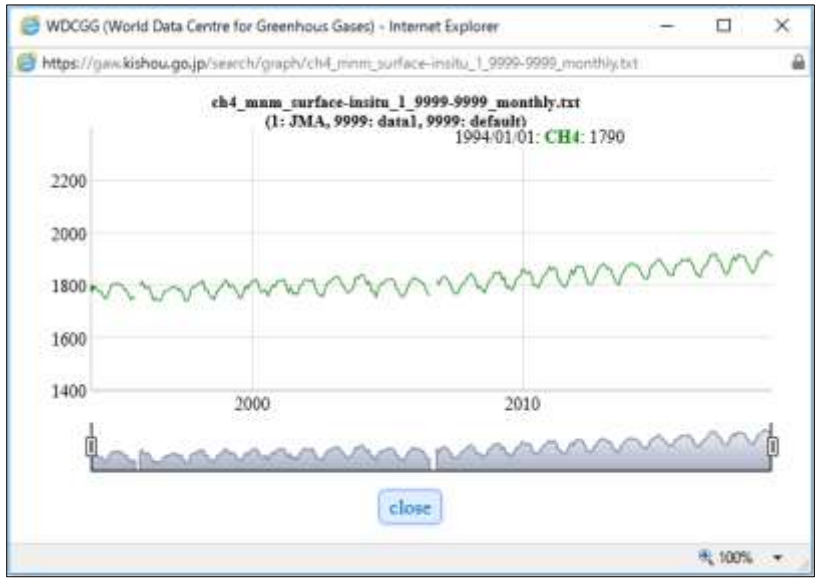
- What kind of data and metadata -

Metadata



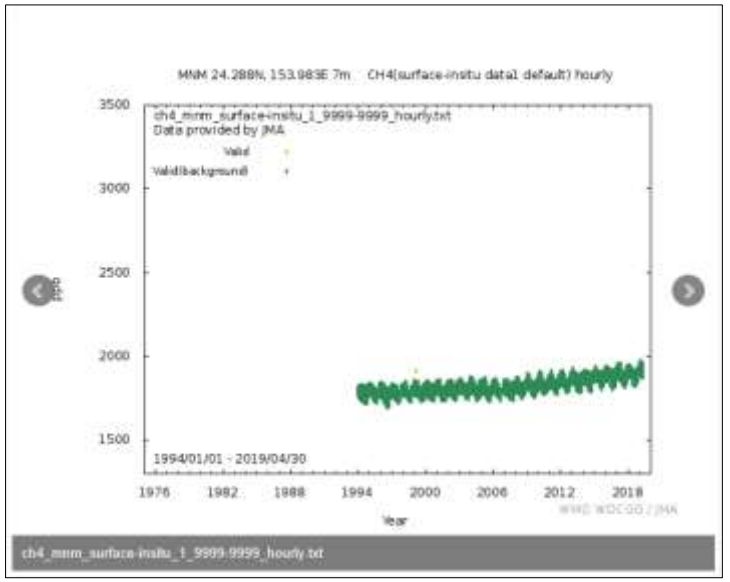
- ✓ Organization
- ✓ Contact(s)
- ✓ Aim of Observation
- ✓ Time zone
- ✓ Unit...

Time-series data



- ✓ Monthly data plot
- ✓ Period can be changed freely
- ✓ Value is displayed by mouse over

All plots data

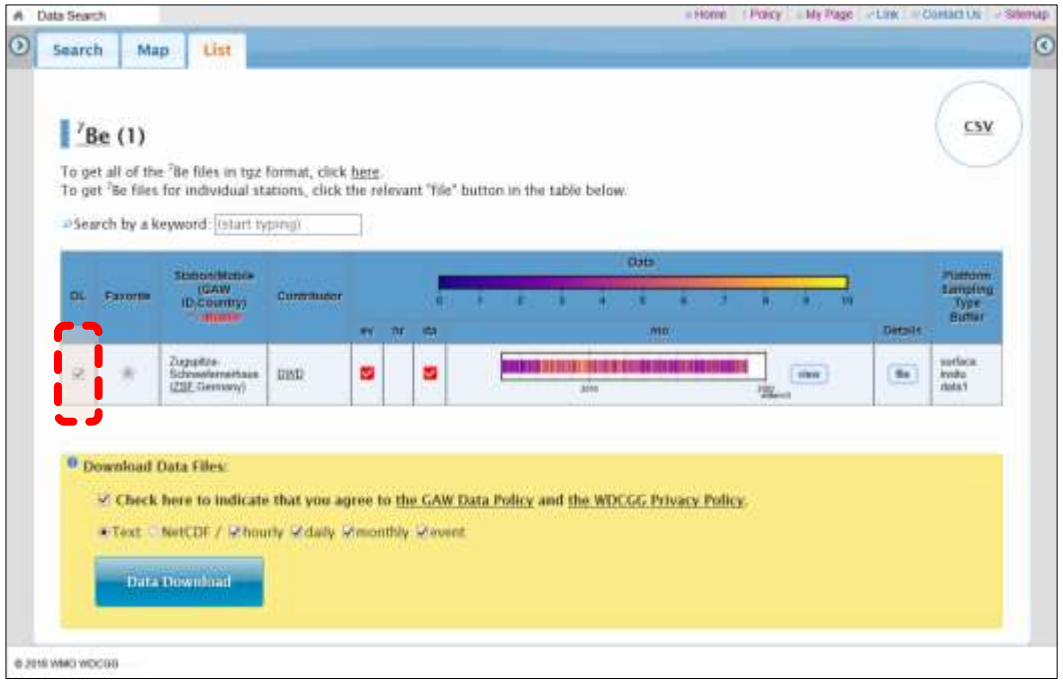


- ✓ All kinds data can be plotted
- ✓ Separate valid data and valid(background) data by flag

How to find/use data (for users)

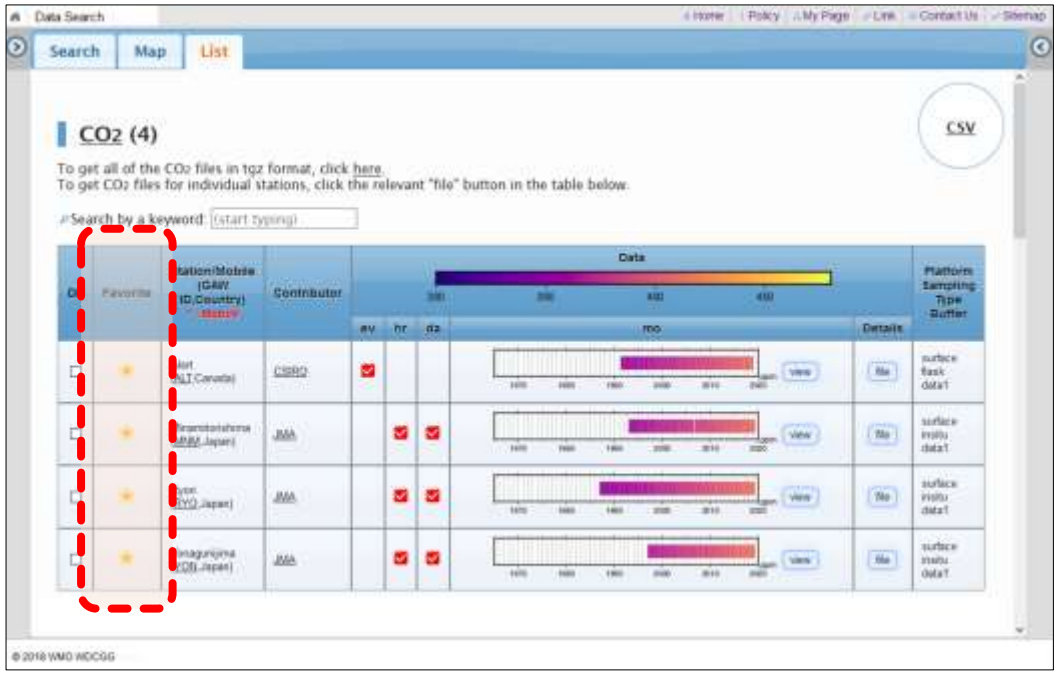
- Download observation data -

Download list



- ✓ Download from multiple observational sites is possible on the new WDCGG website.
- ✓ User ID registration is required to download data.

My Favorite

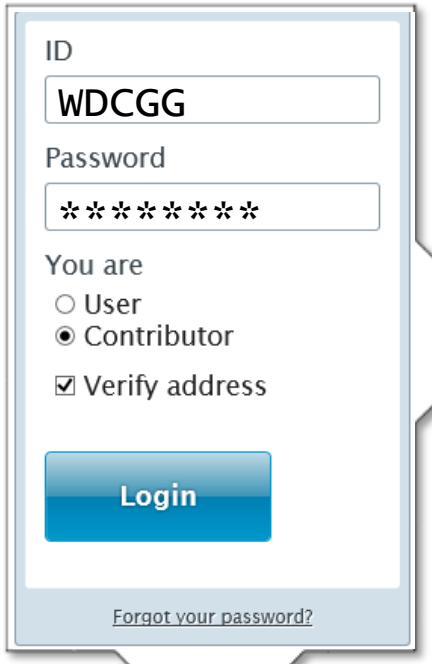


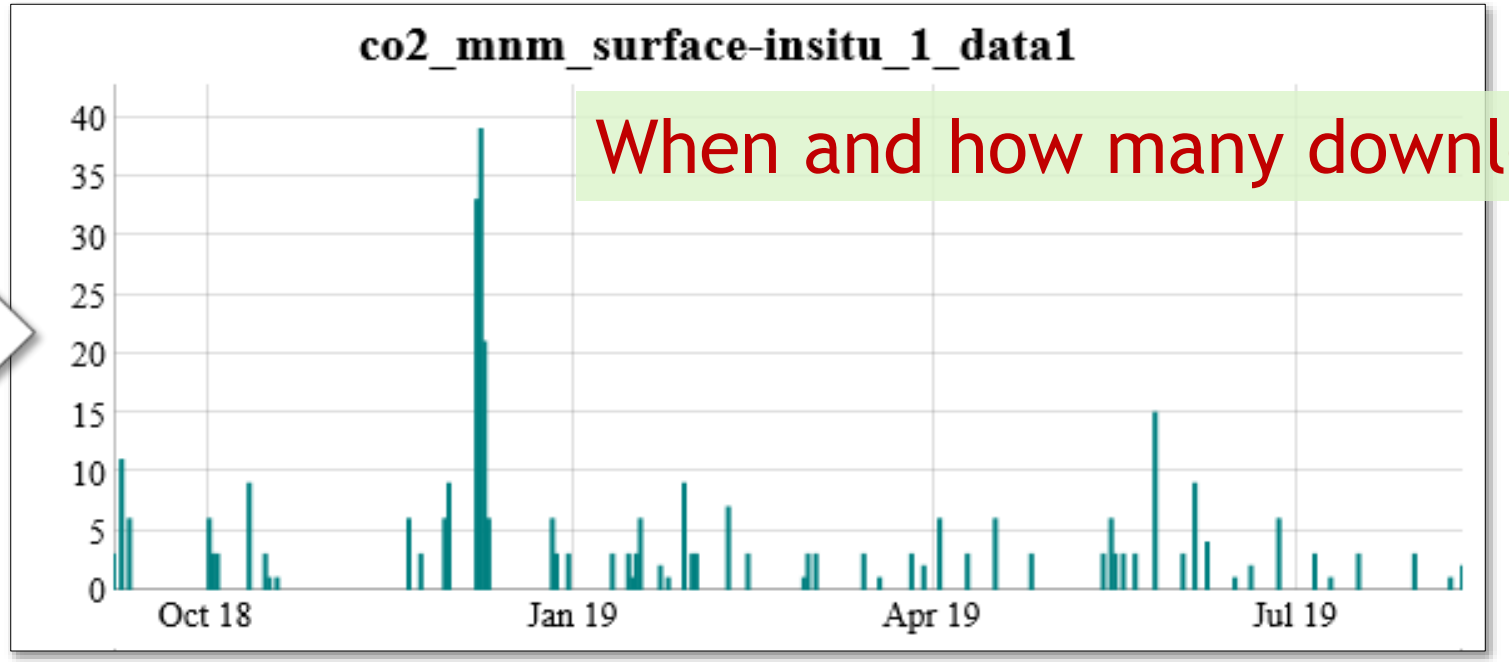
- ✓ If you often look at specific data, please use My Favorite.

When you download, the download information is sent to the data provider(s).

Feedback to data providers

- Why need an contributor/user ID -





When and how many download?

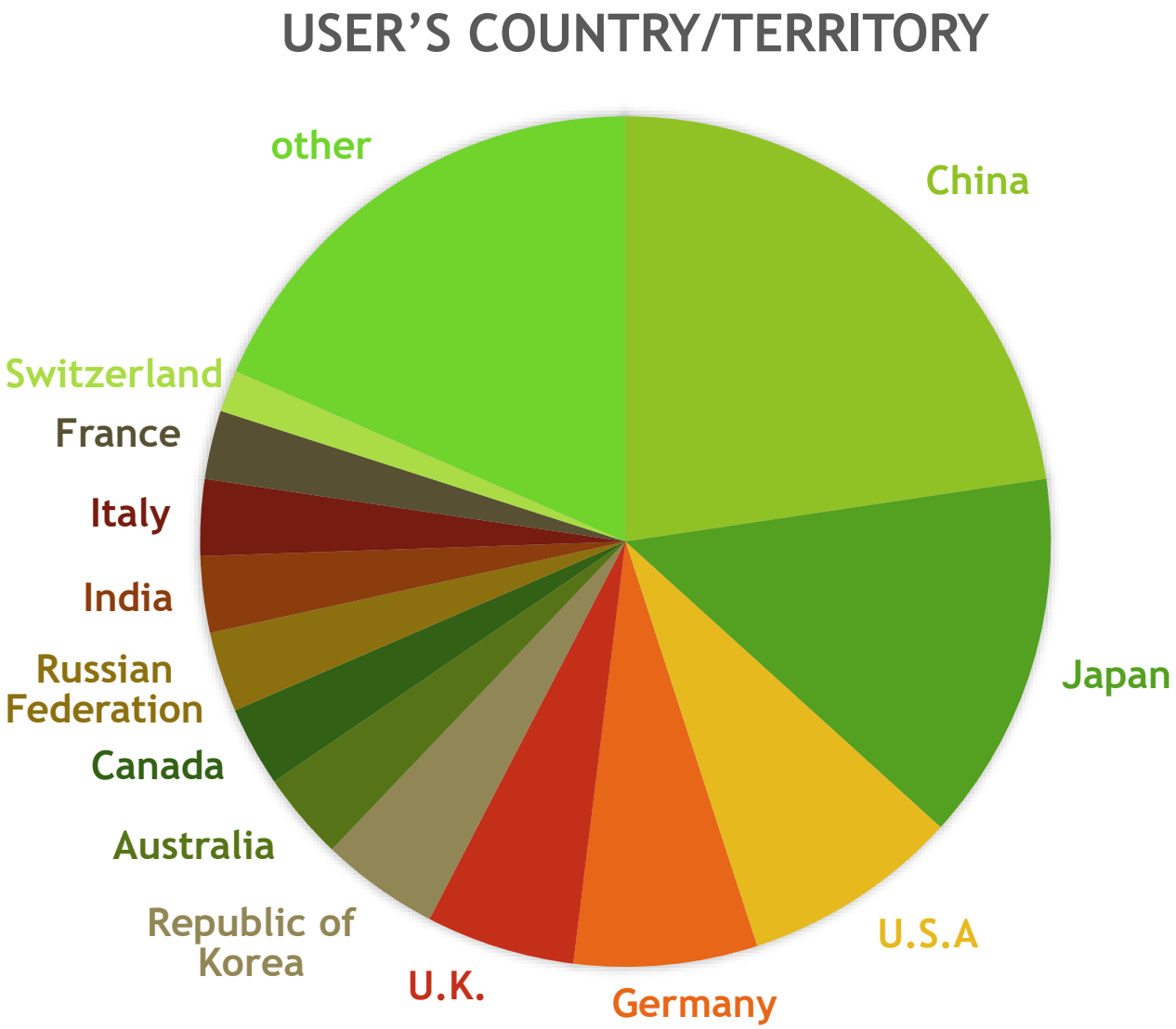
```
2019/5/20 1 #Atsuya Kinoshita::a-kinoshita@met.kishou.go.jp
2019/5/25 2 #Saki Ohkubo::s.ohkubo@met.kishou.go.jp
2019/6/2 3 #Shou Shimamura::shou.shimamura@met.kishou.go.jp
2019/6/5 4 #Yousuke Sawa::yousuke.sawa-a@met.kishou.go.jp
...
```

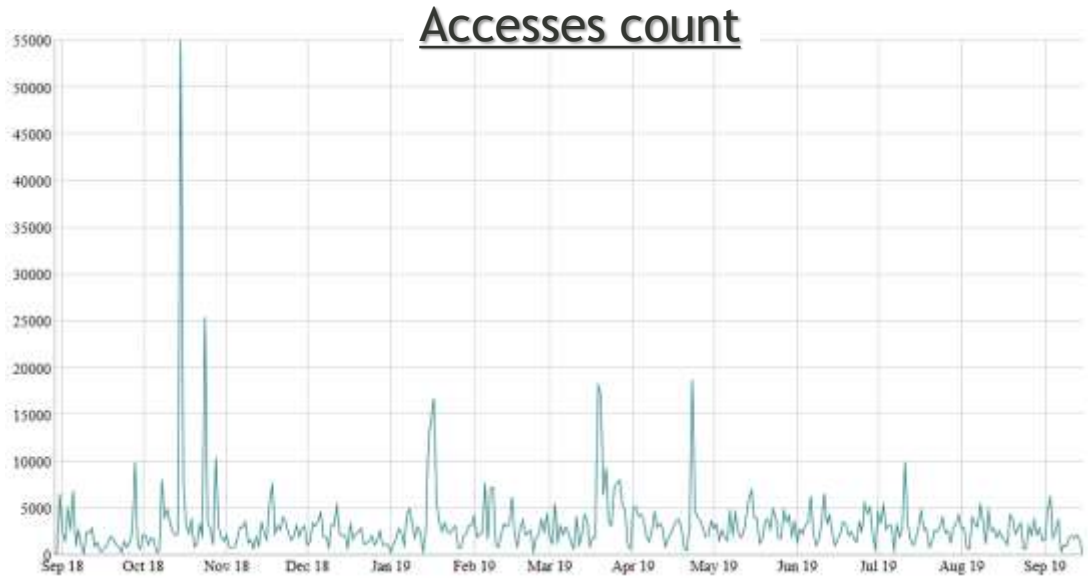
Who download?

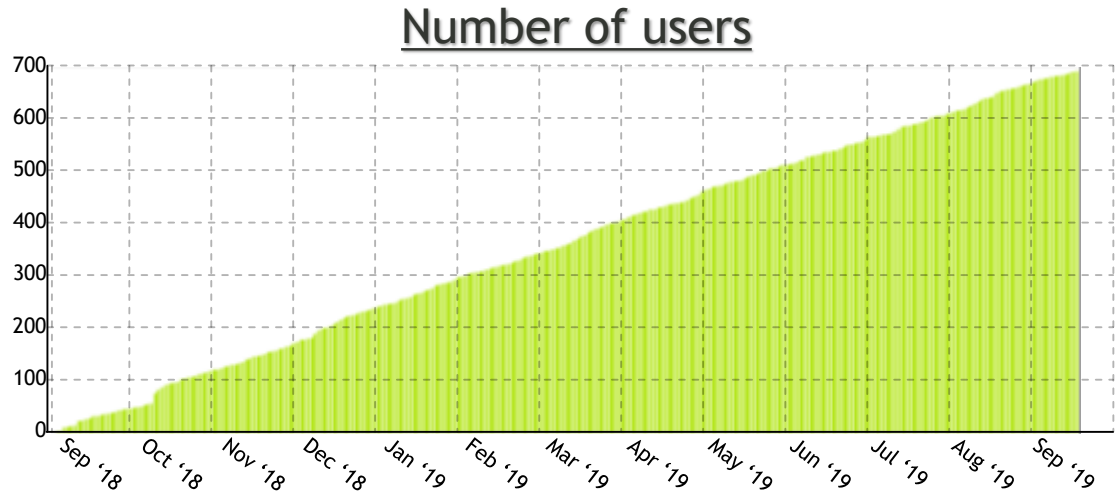
✓ Data provider (Contributor) gets download information about data users.

Statistics on WDCGG users

- Who and how many access -





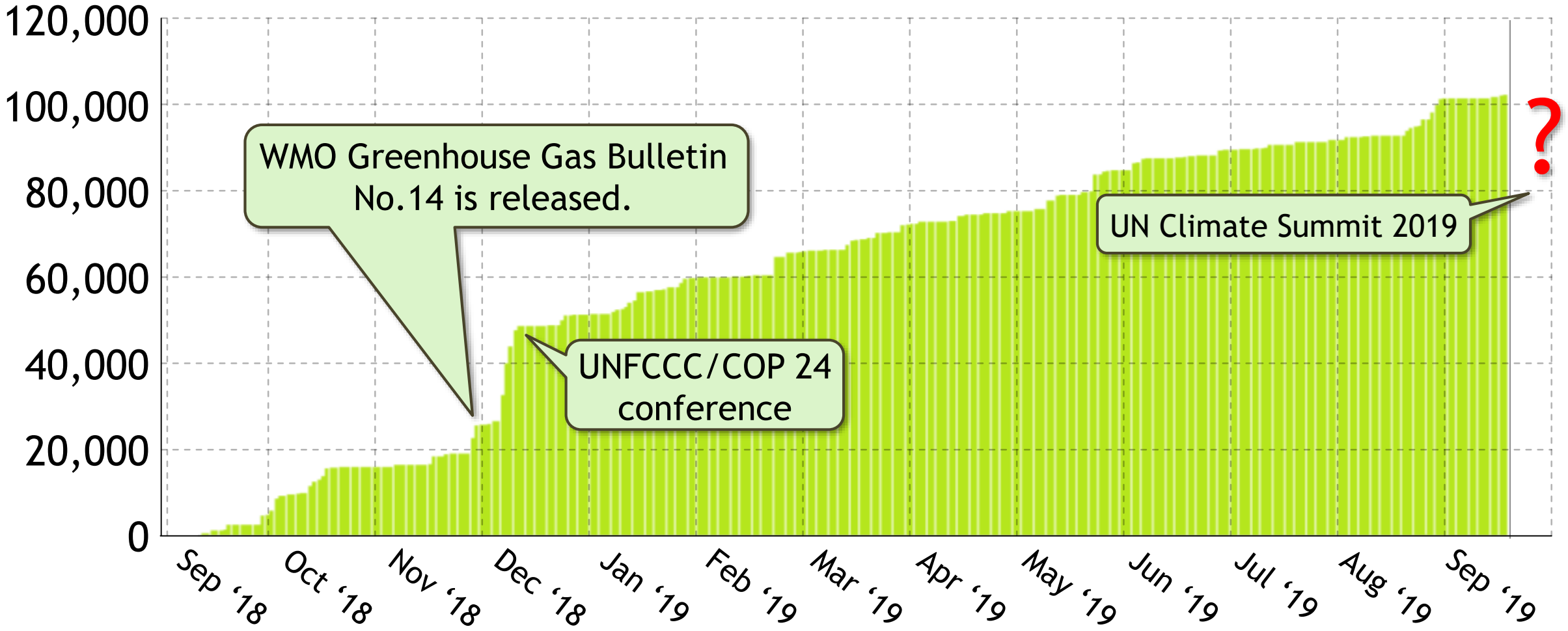


As of 17 September 2019

Statistics on WDCGG users

- When download -

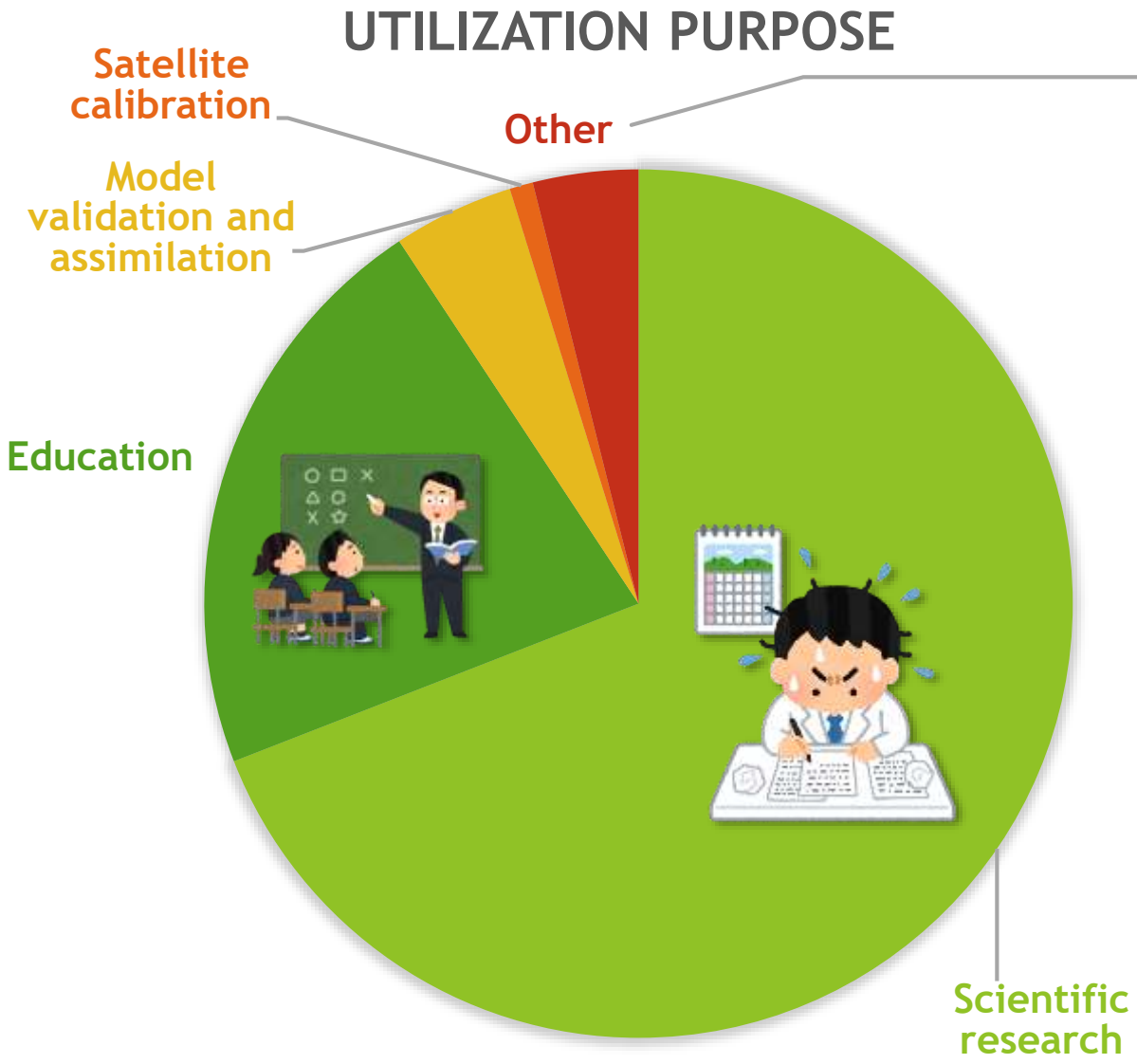
Total download count since opening of the new WDCGG website



As of 17 September 2019

Statistics on WDCGG users

- How used -



Other purpose

- ✓ Internal and public research on climate change and megatrends
- ✓ Data to use within my third year dissertation
- ✓ I have been Interested in Climate Change for the last 10 years.
- ✓ Personal interest in climate change
- ✓ Airborne validation
- ✓ News reporting

..... and so on.

As of 17 September 2019

Changing the data format

```
C01 TITLE: CO2 hourly mean data
C02 FILE NAME: ryo239n00.jma.as.cn.co2.nl.hr2013.dat
C03 DATA FORMAT: Version 1.0
C04 TOTAL LINES: 5120
C05 HEADER LINES: 32
C06 DATA VERSION: 201307
C07 STATION NAME: Ryori
C08 STATION CATEGORY: Regional
C09 OBSERVATION CATEGORY: Air sampling observation at a stationary platform
C10 COUNTRY/TERRITORY: Japan
C11 CONTRIBUTOR: JMA
C12 LATITUDE: 39.03
C13 LONGITUDE: 141.82
C14 ALTITUDE: 260
C15 NUMBER OF SAMPLING HEIGHTS: 1
C16 SAMPLING HEIGHTS: 20
C17 CONTACT POINT: y-fukuyama@met.kishou.go.jp
C18 PARAMETER: CO2
C19 COVERING PERIOD: 2013-01-01 2013-07-31
C20 TIME INTERVAL: hourly
C21 MEASUREMENT UNIT: ppm
C22 MEASUREMENT METHOD: NDIR
C23 SAMPLING TYPE: continuous
C24 TIME ZONE: Local time UTC+9
C25 MEASUREMENT SCALE: WMO X2007 scale
. . .
C30 COMMENT:
C31
C32   DATE  TIME       DATE  TIME        CO2    ND      SD     F CS       REM
2018-01-01 00:00 9999-99-99 99:99     413.65   101   0.132    -7  0 -99999999
2018-01-01 01:00 9999-99-99 99:99     413.56   105   0.088    -7  0 -99999999
. . .
```

```
# header_lines : 189
# Data_Set_Name : co2_ryo_surface-insitu_1_9999-9999_hourly
# Data_Set_Version : 0001-2012-1001-01-01-9999_2018-09-26-1710
# Data_Set_Fair_Use : For Scientific purposes, access to these data .....
#
# GLOBAL ATTRIBUTES
#
# site_gaw_id : RYO
# site_gaw_type : GAW Regional
# site_name : Ryori
# site_country/territory : Japan
# site_wmo_region : REGION II (Asia)
# site_address1 : 1-25,Tahamashimo, Ryori
# site_address2 : Sanriku-cho, Ofunato-shi
# site_address3 : Iwate 022-0211, Japan
# site_latitude : 39.0319
# site_longitude : 141.8222
# site_elevation : 260
# site_elevation_unit : m
# site_lst2utc : UTC+09:00
# site_climate_zone : Cfb
# site_climate_zone:comment : Warm temperate climate, fully humid, warm summer
# dataset_creation_date : 2018-09-27
. . .
# VARIABLE ORDER
#
# site_gaw_id year month day hour minute second year month day hour minute
second value value_unc nvalue latitude longitude altitude elevation
intake_height flask_no ORG_QCflag QCflag instrument measurement_method scale
RYO 2018 01 01 00 00 00 -999 -9 -9 -9 -9 -9 413.65 0.132 101 39.0319 141.8222
280 260 20 -999.999 -7 1 3 9 1
. . .
```

1. Flexible header length

The new data header with flexible length contains more detailed metadata compared to the old header.

2. Improved and expand metadata information

A data file format mainly intended for machine processing while maintaining human visibility.

3. Unity data format

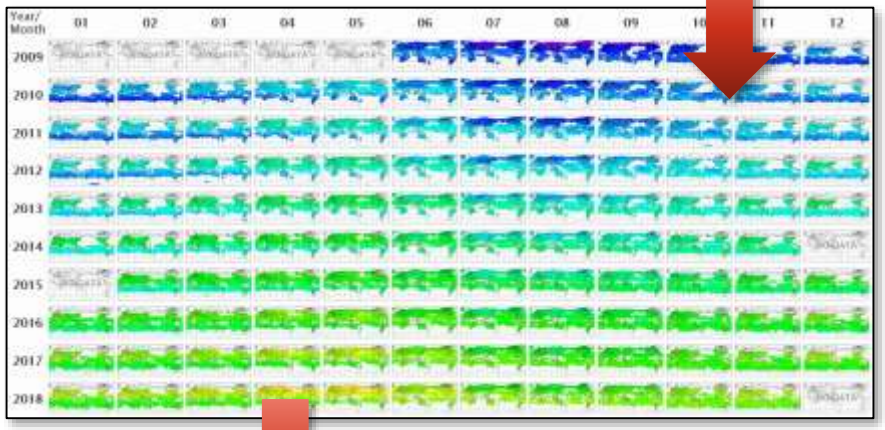
A single format is now applied independent of gas species or platforms.

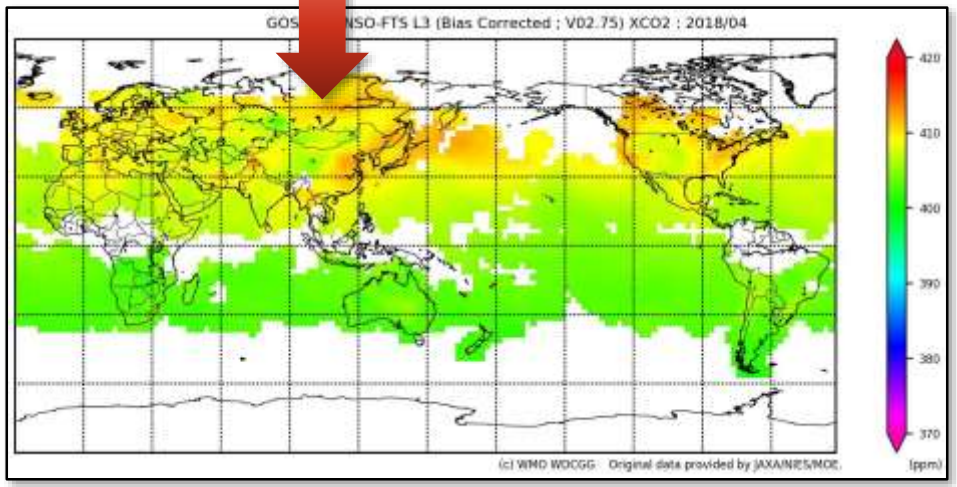
Start provision of satellite data

Provision of satellite data since March 2019

Satellite	Organization	Gas Species	Version * : the latest version	Updated Date	Gallery/Metadata
GOSAT	NIES (National Institute for Environmental Studies)	CO_2	0053-9001-1001-08-08-9999 -2019-03-19-0900*	2019-03-19	view

- ✓ WDCGG began online provision of CO_2 observation data from Japan's Ibuki Greenhouse gases Observing SATellite (GOSAT).
- ✓ Monthly global map of column-averaged CO_2 mole fractions can be seen in the Gallery/Metadata.
- ✓ Downloadable CO_2 data are L2 column volume (SWIR) in daily (combined by month) HDF5 Format.





DL ☑	Gas Species	Organization	Type	Period	Filename	Size
☑	CO_2	NIES	daily	2009-04-23 - 2009-04-30	SWIRL2CO2_200904_V02.75.tar	4.18MB
☑	CO_2	NIES	daily	2009-05-01 - 2009-05-31	SWIRL2CO2_200905_V02.75.tar	5.61MB
☑	CO_2	NIES	daily	2009-06-01 - 2009-06-30	SWIRL2CO2_200906_V02.75.tar	15.66MB
☑	CO_2	NIES	daily	2009-07-01 - 2009-07-31	SWIRL2CO2_200907_V02.75.tar	18.95MB

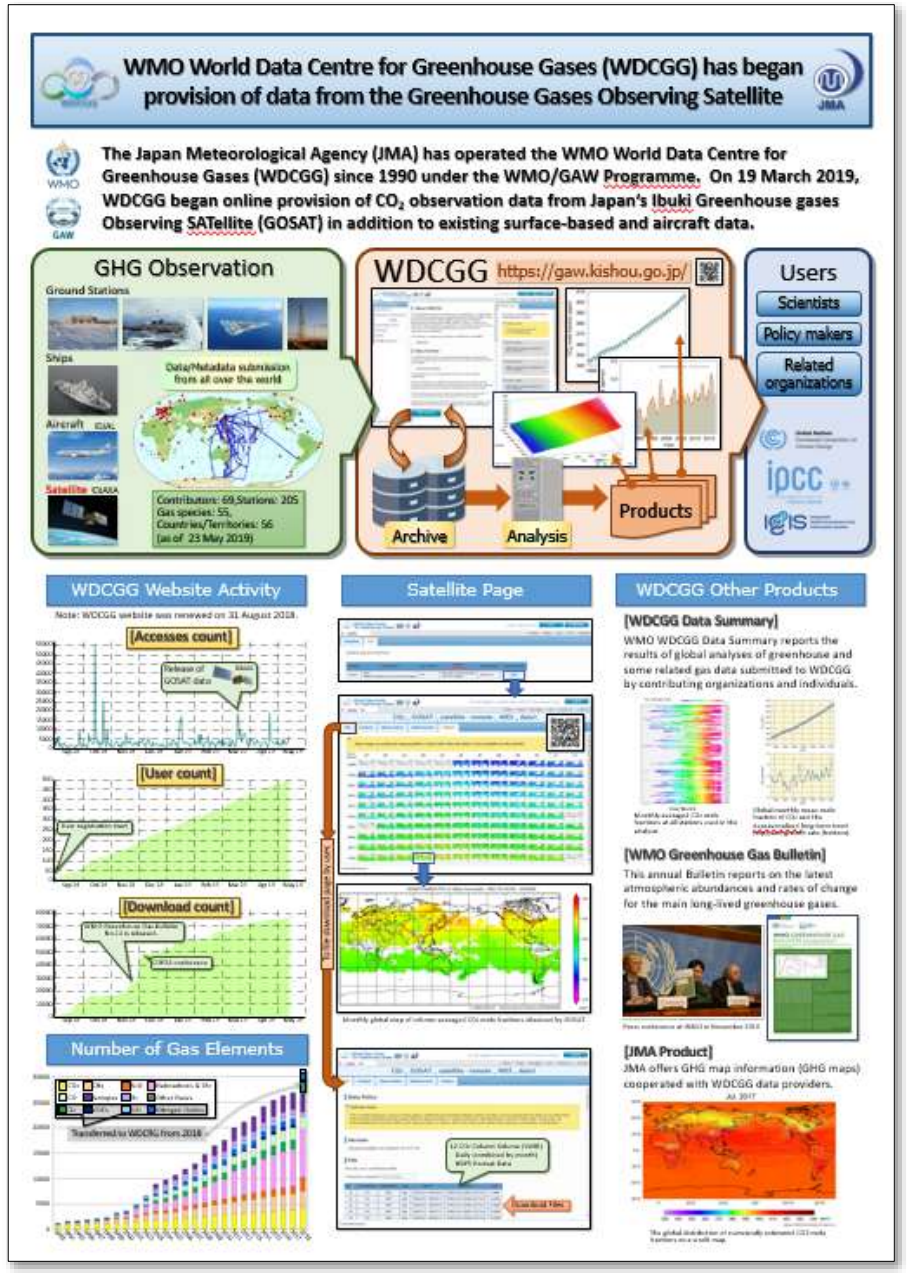
Presentations at scientific meetings

15th IWGGMS

15th International Workshop on Greenhouse Gas Measurements from Space

June 3-5, 2019, Hokkaido, Japan

JMA participants: Atsuya Kinoshita, Saki Ohkubo, Takashi Maki(MRI)



15th IWGGMS

June 3-5, 2019, Hokkaido, Japan

The goal of the workshop is to review the state of the art in remote sensing of carbon dioxide, methane, and other greenhouse gases from space.

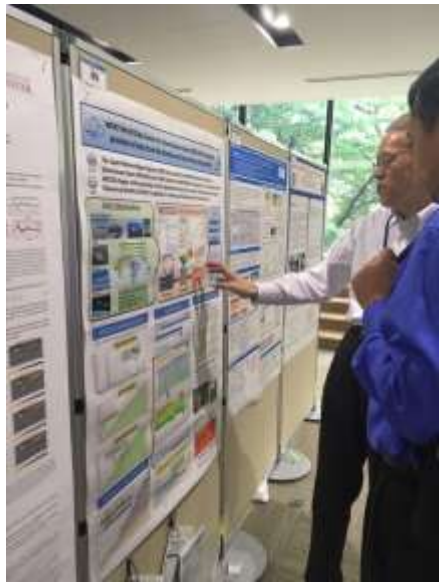
Our Activities

Public relations

- WDCGG began online provision of CO_2 observation data from Japan's Ibuki Greenhouse gases Observing SATellite (GOSAT).

Request

- Agreement was obtained from Dr. Crisp to include OCO-2 data in the WDCGG.



Dr. David Crisp

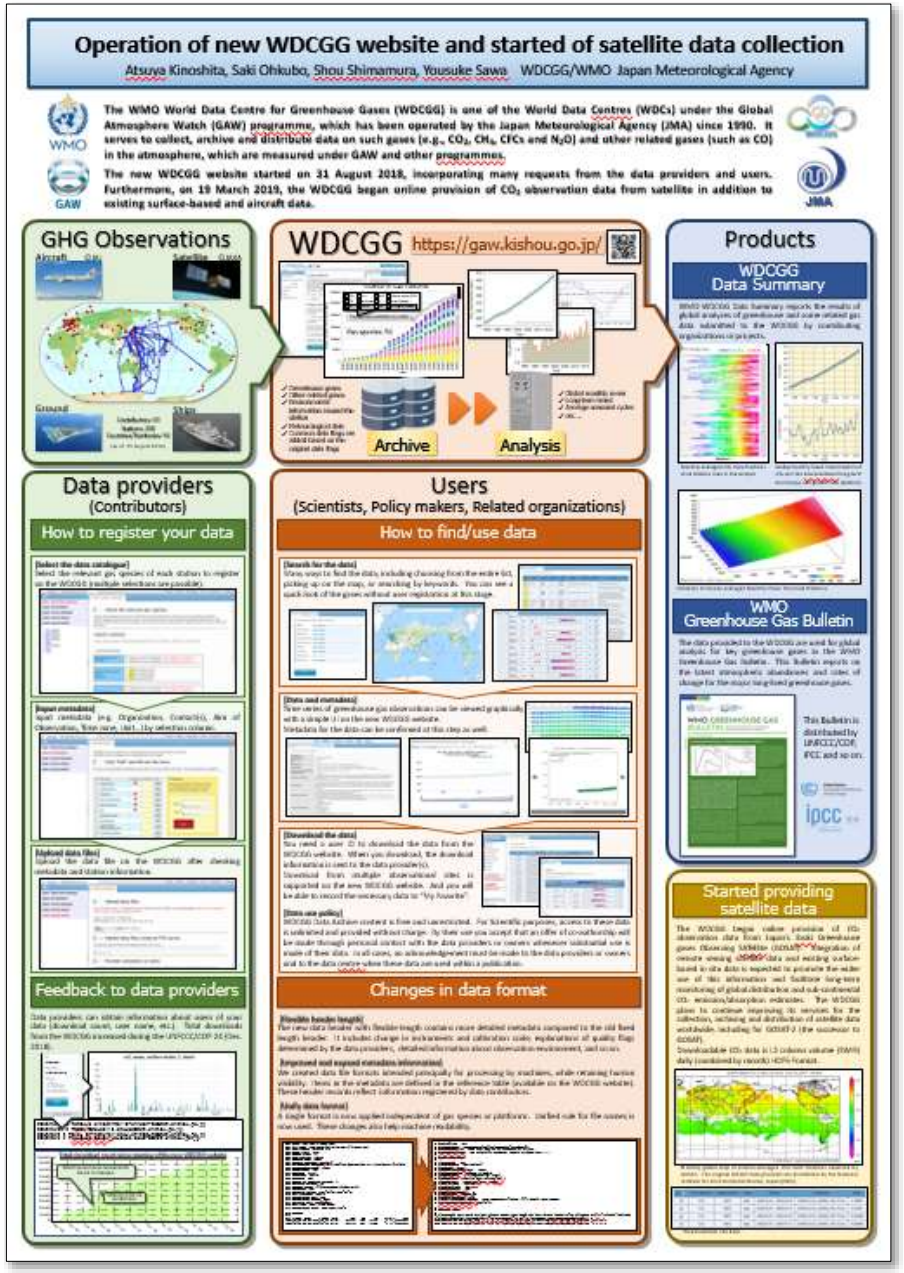
SAG-GHG / GGMT-2019

September 1-5, 2019, Jeju, Republic of Korea

JMA participants: Yousuke Sawa, Atsuya Kinoshita, Teruo Kawasaki

SAG-GHG / GGMT-2019

September 1-5, 2019, Jeju, Republic of Korea



Our Activities

Public relations

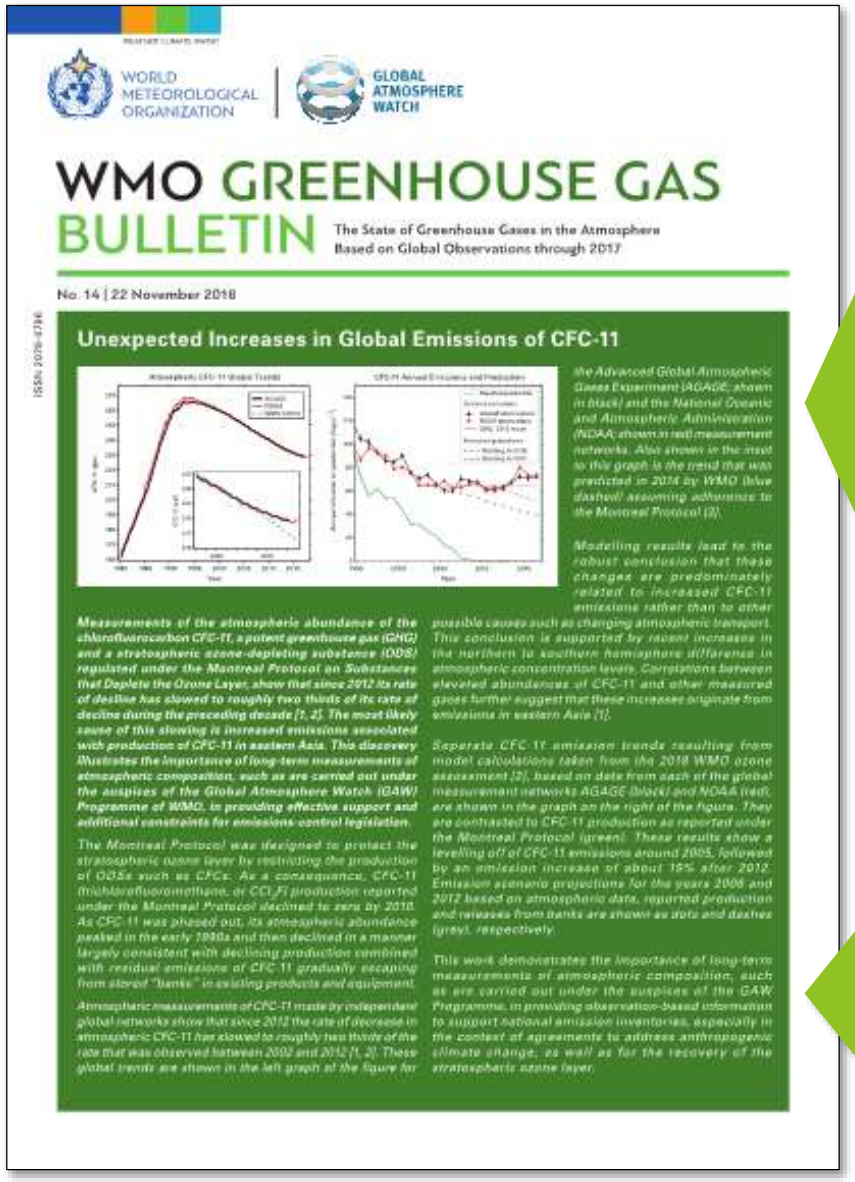
- New WDCGG website description started in August 2018, incorporating many requests from the data providers and users.
  - ✓ Better visibility of the data
  - ✓ Changes in data format
  - ✓ Start of sending relevant information to the data providers
- WDCGG started provision of satellite data in March 2019.

Request

- Request for contributors to provide observation data not yet submitted to WDCGG.

Regular Publications

Regular Publications / WMO GHG Bulletin



WORLD METEOROLOGICAL ORGANIZATION | GLOBAL ATMOSPHERE WATCH

WMO GREENHOUSE GAS BULLETIN

The State of Greenhouse Gases in the Atmosphere Based on Global Observations through 2017

No. 14 | 22 November 2018

ISSN: 2078-0796

Unexpected Increases in Global Emissions of CFC-11

Measurements of the atmospheric abundance of the chlorofluorocarbon CFC-11, a potent greenhouse gas (GHG) and a stratospheric ozone-depleting substance (ODS) regulated under the Montreal Protocol on Substances that Deplete the Ozone Layer, show that since 2012 its rate of decline has slowed to roughly two thirds of its rate of decline during the preceding decade [1, 2]. The most likely cause of this slowing is increased emissions associated with production of CFC-11 in eastern Asia. This discovery illustrates the importance of long-term measurements of atmospheric composition, such as are carried out under the auspices of the Global Atmosphere Watch (GAW) Programme of WMO, in providing effective support and additional constraints for emissions control legislation.

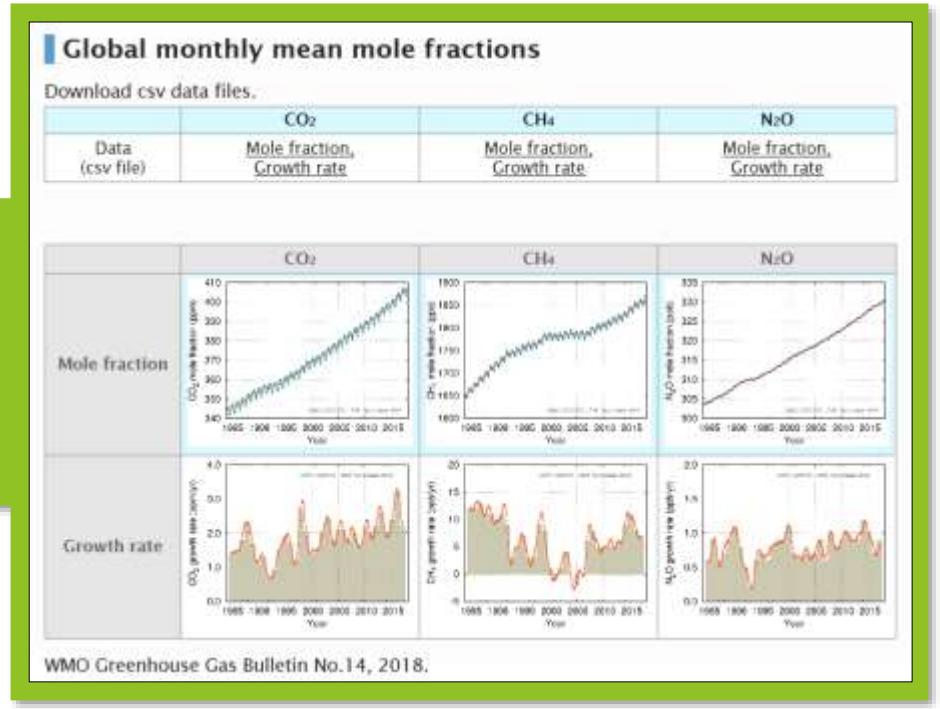
The Montreal Protocol was designed to protect the stratospheric ozone layer by restricting the production of ODSs such as CFCs. As a consequence, CFC-11 (trichlorofluoromethane, or CCl_3F) production reported under the Montreal Protocol declined to zero by 2010. As CFC-11 was phased out, its atmospheric abundance peaked in the early 1990s and then declined in a manner largely consistent with declining production combined with residual emissions of CFC-11 gradually escaping from stored "banks" in existing products and equipment.

Atmospheric measurements of CFC-11 made by independent global networks show that since 2012 the rate of decrease in atmospheric CFC-11 has slowed to roughly two thirds of the rate that was observed between 2002 and 2012 [1, 2]. These global trends are shown in the left graph of the figure for the Advanced Global Atmospheric Gases Experiment (AGAGE; shown in black) and the National Oceanic and Atmospheric Administration (NOAA; shown in red) measurement networks. Also shown in the inset to this graph is the trend that was predicted in 2014 by WMO (blue dashed) assuming adherence to the Montreal Protocol [2].

Modelling results lead to the robust conclusion that these changes are predominately related to increased CFC-11 emissions rather than to other possible causes such as changing atmospheric transport. This conclusion is supported by recent increases in the northern to southern hemisphere difference in atmospheric concentration levels. Correlations between elevated abundances of CFC-11 and other measured gases further suggest that these increases originate from emissions in eastern Asia [1].

Separate CFC-11 emission trends resulting from model calculations taken from the 2018 WMO ozone assessment [2], based on data from each of the global measurement networks AGAGE (black) and NOAA (red), are shown in the graph on the right of the figure. They are contrasted to CFC-11 production as reported under the Montreal Protocol (green). These results show a levelling off of CFC-11 emissions around 2005, followed by an emission increase of about 15% after 2012. Emission scenario projections for the years 2008 and 2012 based on atmospheric data, reported production and releases from banks are shown as dots and dashes (grey), respectively.

This work demonstrates the importance of long-term measurements of atmospheric composition, such as are carried out under the auspices of the GAW Programme, in providing observation-based information to support national emission inventories, especially in the context of agreements to address anthropogenic climate change, as well as for the recovery of the stratospheric ozone layer.



Global monthly mean mole fractions

Download csv data files.

	CO_2	CH_4	N_2O
Data (csv file)	Mole fraction, Growth rate	Mole fraction, Growth rate	Mole fraction, Growth rate

WMO Greenhouse Gas Bulletin No.14, 2018.

Globally averaged mole fractions (CO_2, CH_4, N_2O) (annual, monthly)

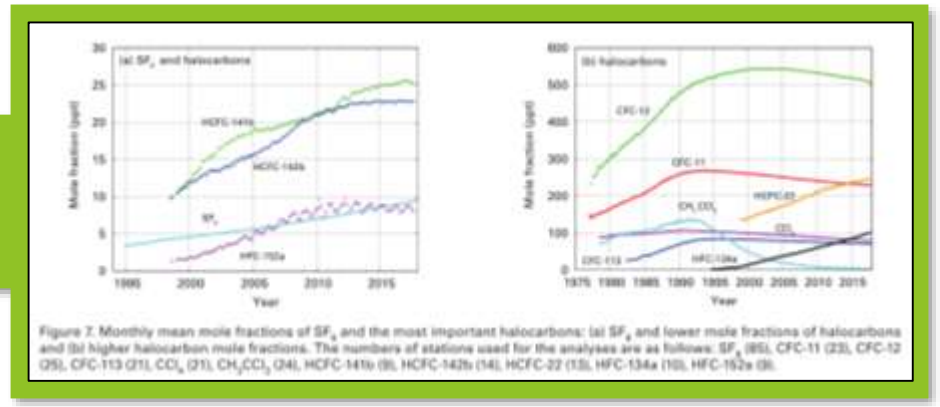
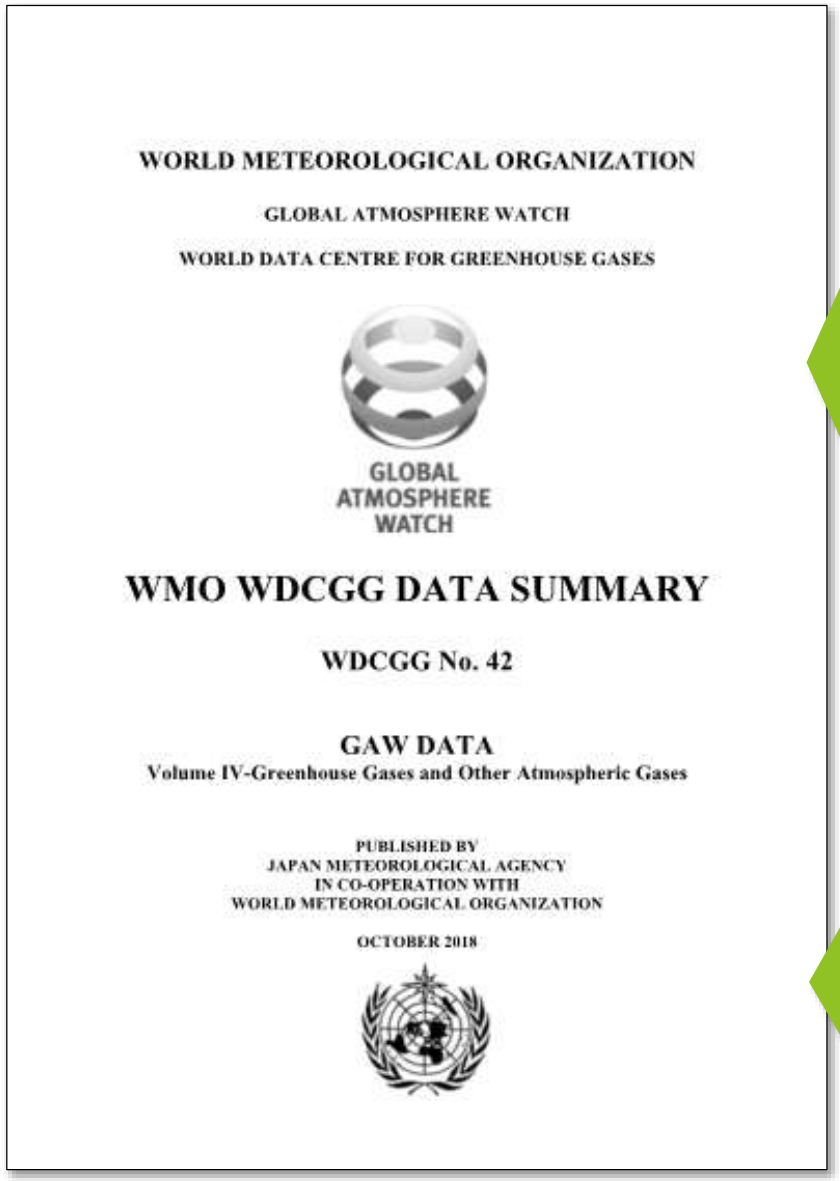


Figure 7. Monthly mean mole fractions of SF_6 and the most important halocarbons: (a) SF_6 and lower mole fractions of halocarbons and (b) higher halocarbon mole fractions. The numbers of stations used for the analyses are as follows: SF_6 (85), CFC-11 (23), CFC-12 (25), CFC-113 (21), CCl_4 (21), CH_3CCl_3 (24), HCFC-141b (9), HCFC-142b (14), HCFC-22 (13), HFC-134a (10), HFC-152a (9).

Monthly mean mole fractions (SF_6, CFCs, HFCs, HCFCs,CCl_4)

- Contents are prepared by SAG-GHG

Regular Publications / WDCGG Data Summary



WORLD METEOROLOGICAL ORGANIZATION

GLOBAL ATMOSPHERE WATCH

WORLD DATA CENTRE FOR GREENHOUSE GASES

GLOBAL ATMOSPHERE WATCH

WMO WDCGG DATA SUMMARY

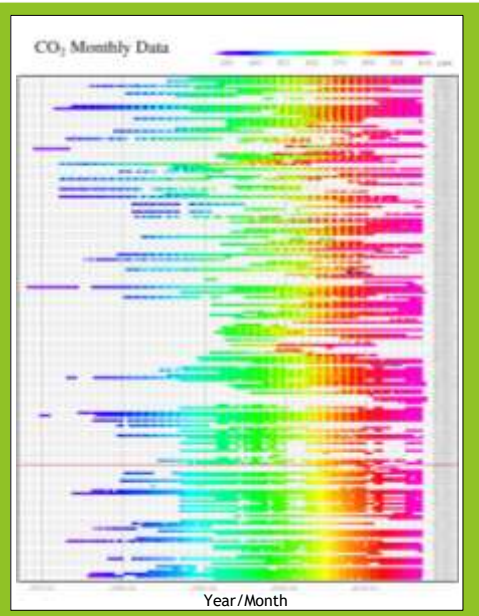
WDCGG No. 42

GAW DATA

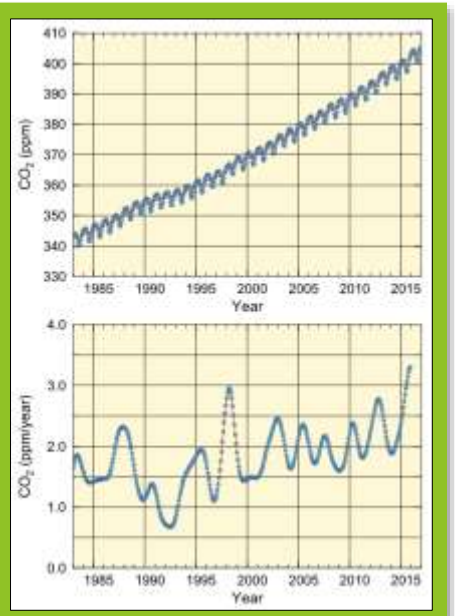
Volume IV-Greenhouse Gases and Other Atmospheric Gases

PUBLISHED BY
JAPAN METEOROLOGICAL AGENCY
IN CO-OPERATION WITH
WORLD METEOROLOGICAL ORGANIZATION

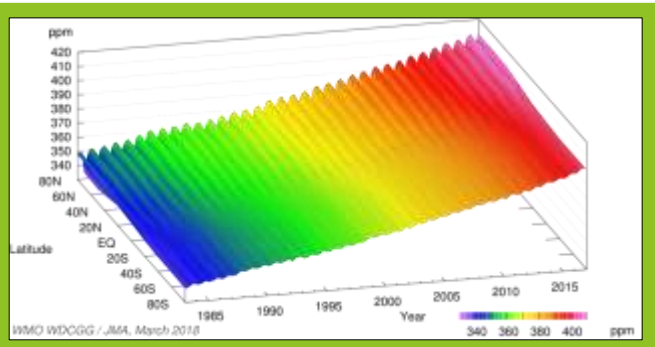
OCTOBER 2018



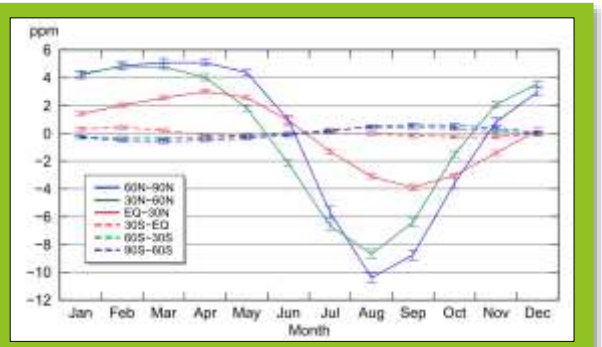
Monthly mean at all stations



Global monthly mean & growth rate



Variation of zonally averaged Monthly mean



Averaged seasonal cycle for each 30 degree

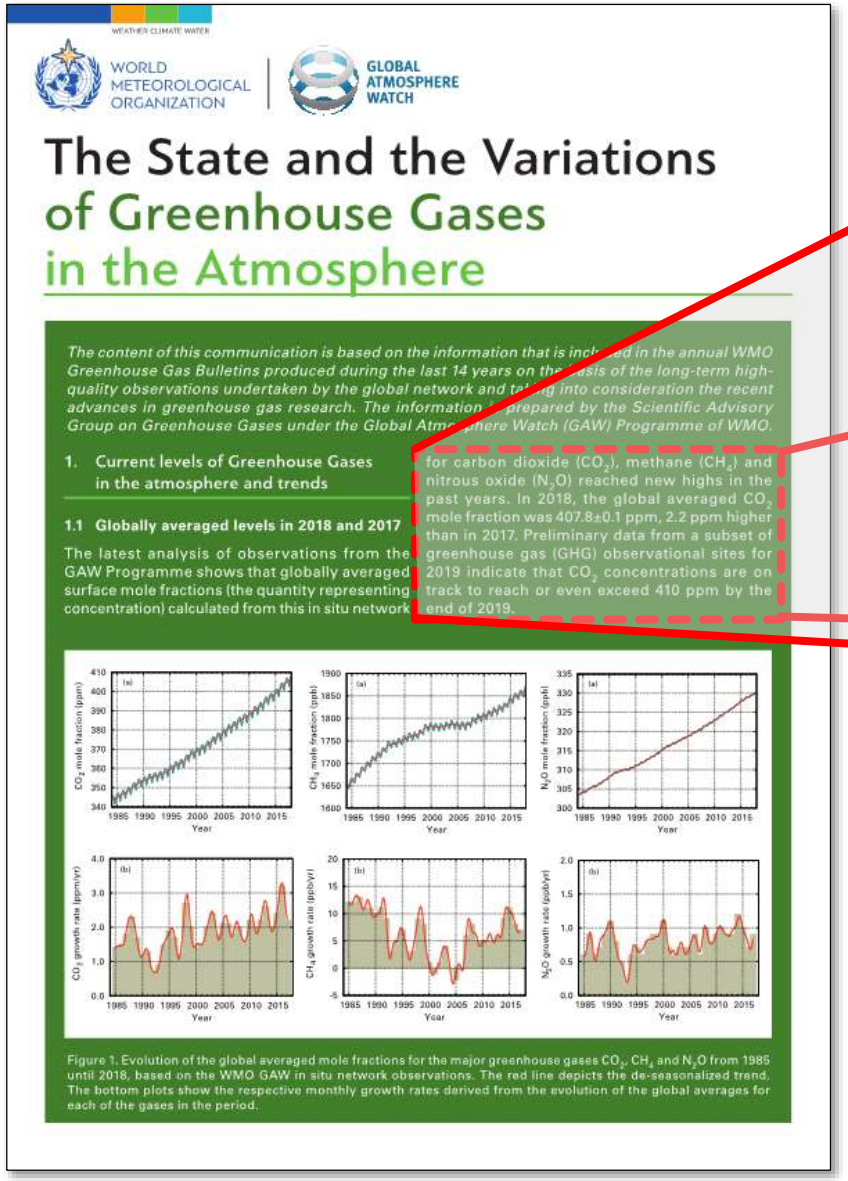
In addition

- ✓ Trend for each 30 degree
- ✓ Monthly mean for each 30 degree
- ✓ Calibration and standard scales
- ✓ Observational station list

..... and so on.

➢ All contents are prepared by our staff

Report of WMO/GAW to the 2019 UN Climate Summit



WORLD METEOROLOGICAL ORGANIZATION | GLOBAL ATMOSPHERE WATCH

The State and the Variations of Greenhouse Gases in the Atmosphere

The content of this communication is based on the information that is included in the annual WMO Greenhouse Gas Bulletins produced during the last 14 years on the basis of the long-term high-quality observations undertaken by the global network and taking into consideration the recent advances in greenhouse gas research. The information is prepared by the Scientific Advisory Group on Greenhouse Gases under the Global Atmosphere Watch (GAW) Programme of WMO.

1. Current levels of Greenhouse Gases in the atmosphere and trends

1.1 Globally averaged levels in 2018 and 2017

The latest analysis of observations from the GAW Programme shows that globally averaged surface mole fractions (the quantity representing concentration) calculated from this in situ network

for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) reached new highs in the past years. In 2018, the global averaged CO_2 mole fraction was 407.8±0.1 ppm, 2.2 ppm higher than in 2017. Preliminary data from a subset of greenhouse gas (GHG) observational sites for 2019 indicate that CO_2 concentrations are on track to reach or even exceed 410 ppm by the end of 2019.

Figure 1. Evolution of the global averaged mole fractions for the major greenhouse gases CO_2, CH_4 and N_2O from 1985 until 2018, based on the WMO GAW in situ network observations. The red line depicts the de-seasonalized trend. The bottom plots show the respective monthly growth rates derived from the evolution of the global averages for each of the gases in the period.

for carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) reached new highs in the past years. In 2018, the global averaged CO_2 mole fraction was 407.8±0.1 ppm, 2.2 ppm higher than in 2017. Preliminary data from a subset of greenhouse gas (GHG) observational sites for 2019 indicate that CO_2 concentrations are on track to reach or even exceed 410 ppm by the end of 2019.

- ✓ We asked contributors to send the latest data as possible to WDCGG one month earlier than usual for the Climate Summit.

CLIMATE ACTION SUMMIT 2019

in New York on 23 September 2019.

- ➢ Contents are prepared by WMO/GAW

Current and future plans

Currently working plans

Publication of meteorological data

- ✓ WDCGG started collecting meteorological data records as environmental information for each observation station from this year again.
- ✓ Publication method is undecided yet.

Expansion of satellite data

- ✓ WDCGG plans to continue improving its services for the collection, archiving and distribution of satellite data worldwide, including for GOSAT-2 (the successor to GOSAT).
- ✓ In addition, OCO-2 data will be included.

Item name	Number of digits	"No Data" expression	Content	Explanation of the item
Site_gaw_id	3	-	Site code	3-letter site identification codeas defined by GAWSISfor stationary platforms
Year	4	-999	Year	Calendar year of observation
Month	2	-9	Month	Calendar month of observation
Day	2	-9	Day	Day of observation
Hour	2	-9	Hour	Hour of observation
Minute	2	-9	Minute	Minute of observation
Second	2	-9	Second	Second of observation
Wind_direction	Variable	-99.9	Wind direction (degree)	The angle in degrees between true north and the wind direction, and increases in a clockwise direction.
Wind_speed	Variable	-99.9	Average wind speed (m/s)	Speed of the wind averaged over the previous 10 minutes. If not, please note *
Relative_humidity	Variable	-99.9	Relative humidity (%)	
Precipitation_amount	Variable	-99.9	Precipitation amount (mm)	
Air_pressure	Variable	-999.9	Air pressure (hPa)	
Air_temperature	Variable	-99.9	Air temperature (degree Celsius)	
Dew_point_temperature	Variable	-99.9	Dew point temperature (degree Celsius)	
Sea_water_temperature	Variable	-99.9	Sea water temperature (degree Celsius)	Temperature at the observation point
Sea_surface_water_temperature	Variable	-99.9	Sea surface water temperature (degree Celsius)	
Sea_water_salinity	Variable	-9999.9	Sea water salinity (permil)	Sea water salinity at the observation point calculated using Practical Salinity Scale of 1978: PSS-78 and expressed in permil
Sea_surface_water_salinity	Variable	-9999.9	Sea surface water salinity (permil)	Sea surface water salinity calculated using Practical Salinity Scale of 1978: PSS-78 and expressed in permil
Latitude	Variable	-999.999999999	Latitude	Latitude of sampling location in decimal degrees (north: +; south: -)
Longitude	Variable	-999.999999999	Longitude	Longitude of sampling location in decimal degrees (east:+; west: -)
Elevation	Variable	-999.999	Station height	Station height (m) above sea level

Future plans

- **netCDF**
  Provision of netCDF format data in addition to text data
- **DOI**
  Add DOI to each observation data
- **Uncertainty column**
  WDCGG is requested to add the necessary uncertainty columns to data format (in GGMT-2019)
- **GAWSIS**
  Exchange metadata with GAWSIS by automatic reading using API

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Thank you for your attention!