

NOAA ESRL GMAC 2013

**Achievements and prospects
of the CMA-NOAA bilateral
cooperation on GHGs**

Ling-Xi Zhou & colleagues

Chinese Academy of Meteorological Sciences (CAMS)
China Meteorological Administration (CMA)

21-22 May 2013, Boulder



Outline

- **CMA's role in the WMO/GAW**
- **CMA-NOAA bilateral**
- **Products & Services**
- **Prospects**

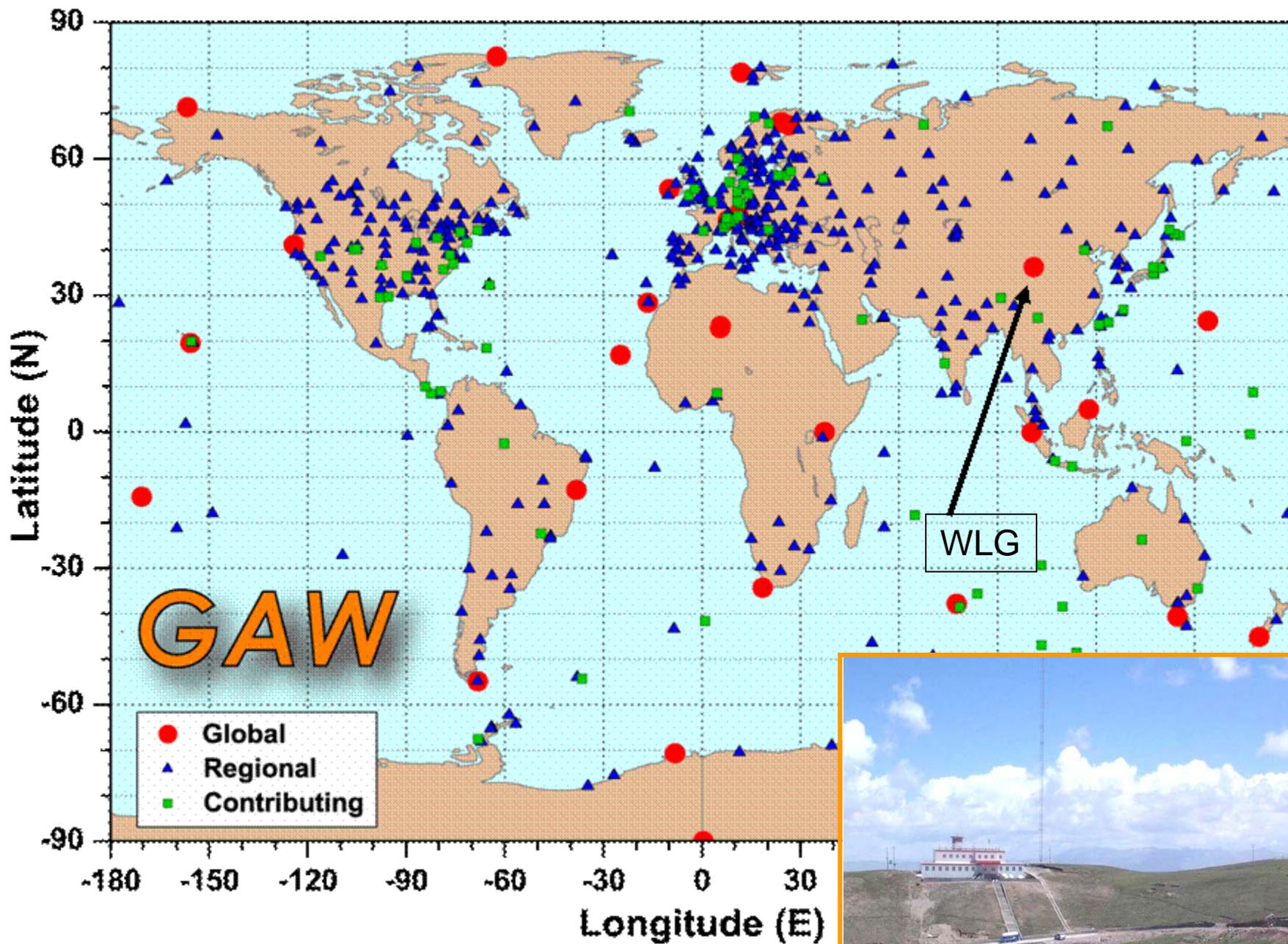
Outline

- **CMA's role in the WMO/GAW**
- CMA-NOAA bilateral
- Products & Services
- Prospects

CMA represents the WMO' Commission for Atmospheric Sciences (CAS) in China and is deeply involved in the WMO's GAW Program.

**WMO EC 65
Geneva, May 2013**







GAW 2013 Symposium

18-20 March 2013
WMO Secretariat, Geneva
Salle Obasi



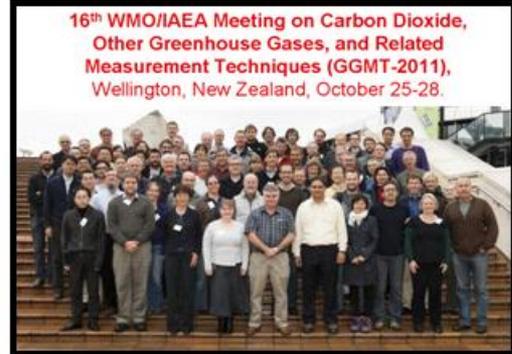
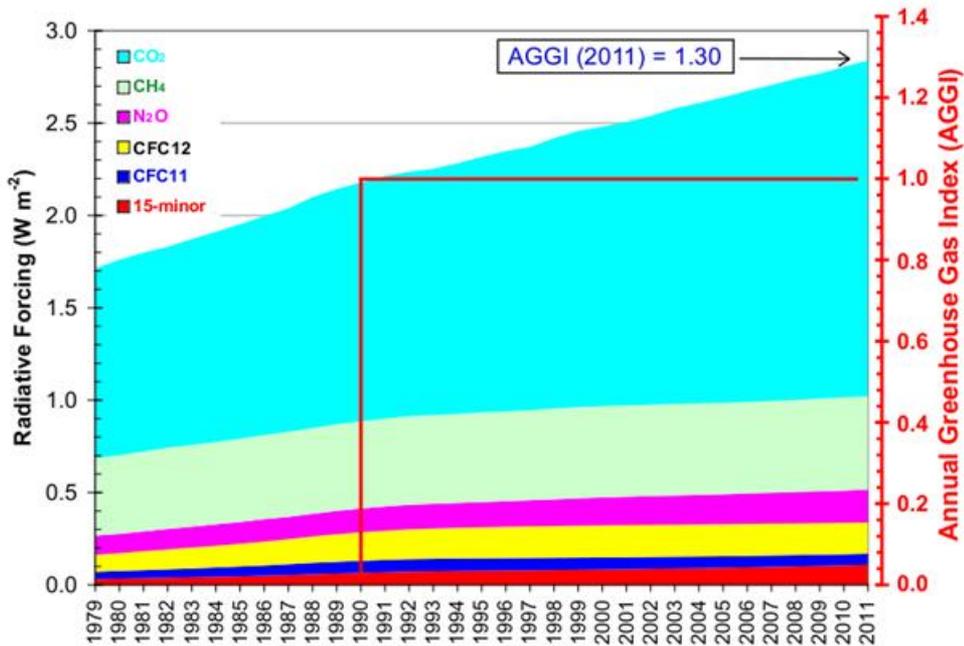
GAW 2005 (Geneva, 14-16 March)



GAW 2009 (Geneva, 5-7 May)



World Meteorological Organization - GAW 2009 Workshop - Geneva, 5-7 May 2009



Wellington 2011



Jena 2009



Helsinki 2007



Toronto 2003

Boulder 2005



Tokyo 2001

To serve the needs of expanding GHG measurement and application and better contribute to the global network one of the CMA's efforts is to form a National Central Calibration Lab (CCL) with tight linkage to the WMO CCLs, particularly the one for GHGs, which is operated by NOAA.

In recent years comparisons with CIPM-related institutions (International Committee for Weights and Measures)

April 2010: CIPM Mutual Recognition Arrangement

The World Meteorological Organization (WMO) has become the second intergovernmental organization to join the CIPM MRA.

→ Climate change - WMO signed the CIPM MRA!

The "WMO-BIPM Workshop on Measurement Challenges for Global Observation Systems for Climate Change Monitoring: Traceability, Stability and Uncertainty" was held from 30 March to 1 April 2010, at the WMO headquarters in Geneva, Switzerland, under the chairmanship of Prof. Andrew Wallard (BIPM) and Dr Wenjian Zhang (WMO).

At the occasion of the Workshop, the World Meteorological Organization (WMO) joined the CIPM MRA. This signing ceremony took place on 1 April 2010, when Michel Jarraud, Secretary General of the WMO, signed the Arrangement on behalf of the WMO.

**WMO与CIPM
温室气体观测标准互认协议**

WMO-BIPM Workshop on Measurement Challenges for Global Observation Systems for Climate Change Monitoring: Traceability, Stability and Uncertainty
30 March-1 April 2010



Source of information:
<http://www.bipm.org/en/cipm-mra/>

17th WMO/IAEA Meeting on CO₂, Other GHGs, and Related Measurement Techniques (GGMT-2013), Beijing, China, June 10-14.

19/06/2012 11:28 +41227380849

WMO AREP

PAGE 01/02



World Meteorological Organization
Organisation météorologique mondiale

Secrétariat
7, Bd, avenue de la Paix - Case postale 2300 - CH 1211 Genève 2 - Suisse
Tel.: +41 (0) 22 730 81 11 - Fax: +41 (0) 22 730 81 81
wmo@wmo.int - www.wmo.int

TEMPS • CLIMAT • EAU
WEATHER • CLIMATE • WATER

Facsimile

From: Secretary-General To: Dr Zheng Guoguang
Permanent Representative of China with WMO

Date: 18 June 2011 City: BEIJING

Our ref.: RES/AER/GHG Country: China

No pages: 2 Fax No.: +86-10 62 17 47 97

Subject: 17th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques

Dear Dr Zheng,

I would like to bring to your attention the activities of the WMO Global Atmosphere Watch (GAW) Programme addressed to the understanding of the global carbon cycle and the role of the greenhouse gases in the climate system. Global observations and analysis of the key greenhouse gases coordinated by WMO/GAW help Members in taking informed action to mitigate carbon emissions globally. Harmonized observations and stringent requirement to the quality of measurements are essential for the high quality products and services. As part of Quality Assurance Framework for greenhouse gases, WMO/GAW meets biennially with the International Atomic Energy Agency (IAEA) to review scientific understanding of greenhouse gas sources and sinks, and to examine data quality objectives and measurement techniques. The 16th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques (GGMT-2011) took place, in Wellington, New Zealand, from 25 to 28 October 2011, hosted by the National Institute for Water and Atmospheric Research (NIWA).

This meeting came to a general agreement reflected in the meeting recommendations that it would be desirable to convene the next meeting, the 17th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases and Related Tracers Measurement Techniques (GGMT-2013), in a developing country with a rapidly expanding greenhouse gas measurement programme such as China. China would be particularly suitable in that the systems being developed there under Prof. Lingxi Zhou's guidance are fully aligned with the WMO/GAW network. This meeting could be scheduled the week before or the week after the International Carbon Dioxide Conference taking place in Beijing, China, from 3 to 7 June 2013. Prof. Zhou of the China Meteorological Administration (CMA) stated that she would be interested to be the lead organizer if the CMA would be willing to host the meeting.

The China Meteorological Administration (CMA) contributes to the global activities on greenhouse gases observations and their quality control. The CMA has been represented in the past GGMT meetings (in 2001, 2003, 2005, 2007, 2009 and 2011). At the previous meetings the

17th WMO/IAEA Meeting on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques (GGMT-2013)
10-14 June 2013 Beijing, China

Home Announcement Agenda Registration Abstract submission Oral & Poster Exhibition Venue Fee & Payment

- Advisory Committee
- Steering Committee
- Local Committee
- Local Information
- Hotel Information
- Travel Information
- Lab Tour
- Station Visit
- Sight-seeing
- Co-sponsors
- Contact Us
- Related Links

Important deadlines

- 6 February - 5 March 1st circular, pre-registration
- 15 March - 15 April 2nd circular, abstract submission and registration
- 10 May 3rd circular, notification oral & poster
- 25 May detailed agenda

News

- First circular has been announced on 7 February, 2013.

Traditional session topics:

- Developments of the GHG networks and sites update
- CO₂ observations (measurements techniques and calibration)
- Non-CO₂ observations (measurements techniques and calibration)
- Isotope measurement and calibration
- Emerging techniques
- GHG standards and companion activities
- Integration of observations, data products and policy
- Recommendations discussion

Brief introduction and history

Co-Sponsors

WMO IAEA CMA AMS

- 2 -

on national activities related to the greenhouse gases actively participated in the discussions and preparation of

fact that since 2002 Prof. Zhou, of CMA, serves as a referee comparison campaigns. These campaigns are an efficient compatibility of the greenhouse gas observations made by

ve. at your earliest convenience, your confirmation whether GGMT-2013 Meeting.

Yours sincerely,

(J. Lengossa)
for the Secretary-General

中国气象局

CHINA METEOROLOGICAL ADMINISTRATION
46 Zhongguancun Nandajie, Beijing 100081, China



Date: September 2012
To: Mr. M. Jarraud, Secretary-General, WMO
Fax No.: 00 41 22 730 8181
From: Dr. ZHENG Guoguang, Permanent Representative of China with WMO
Number of pages including this one: 1

Our Ref.: CMA /F1/WMO/12-098

Subject: 17th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques

Dear Mr. M. Jarraud,

I wish to refer to your fax dated 18 June 2012 (Ref. No: 7822-12/RES/ARE/WWR), inviting CMA to host the 17th WMO/IAEA Meeting of Experts on Carbon Dioxide, Other Greenhouse Gases, and Related Tracer Measurement Techniques in Beijing in June 2013.

In this connection, I would like to confirm with you that CMA agrees to host the above mentioned meeting in Beijing. The suggested period is from 10 to 14 June 2013. Local facilities will be provided for the meeting. I also designate Prof. ZHOU Lingxi (Tel:+86 10 58993464, Fax:+86 10 62176414 E-mail: zhoulx@cma.gov.cn or zhoulx2007@gmail.com) from the Chinese Academy of Meteorological Sciences of CMA as the contact person of this meeting. She will work with your staff in making preparations for the workshop.

With my best personal regards,

Sincerely yours,

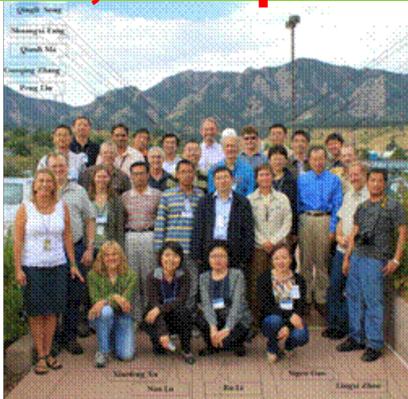
(ZHENG Guoguang)

Permanent Representative of China with WMO

Outline

- CMA's role in the WMO/GAW
- **CMA-NOAA bilateral**
- Products & Services
- Prospects

NOAA and CMA have been working cooperatively in recent years to increase the number of high quality observations of GHGs in China and to coordinate efforts on data management, quality control, and product development.



Workshop on High-Accuracy Greenhouse Gas Measurements:



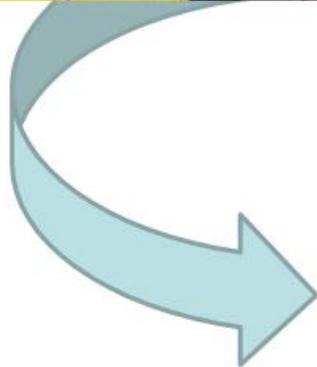
Mary M. Glackin with the CMA GHGs delegation, Sept. 2010



The 17th Joint Working Group Session on Cooperation in the Field of Atmospheric Science and Technology between NOAA and CMA (Sept. 2010)

4th Joint Statement on the U.S.-China Strategic and Economic Dialogue, May 3-4, 2012

No.48 Affirmed our mutual commitment to strengthening joint research between the **NOAA and CMA through the U.S.-China S&T Agreement** to develop accurate and reliable capabilities for observing and understanding the behavior of GHGs in the atmosphere.



3rd

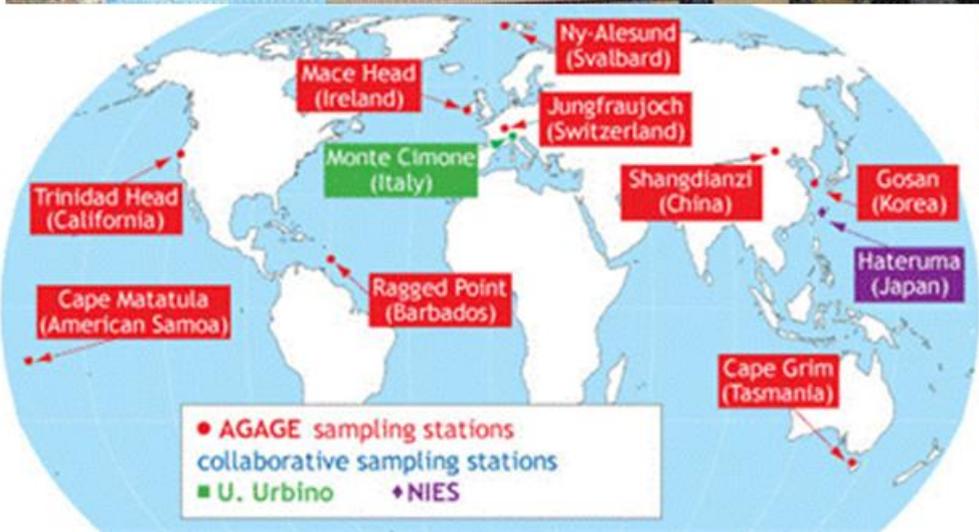
加强中美两国有关气候变化、能源和环境合作（2011.5.10）
加强CMA与NOAA在《中美科技协定》框架下的联合研究，开发双方准确、可靠观测和理解大气温室气体活动的能力。

In further cooperation with AGAGE and other international groups

In-situ and/or discrete high accuracy measurements of ambient GHGs by custom-designed systems have been added at the five background stations (WLG, SDZ, LAN, LFS, XGL)

Moreover, discrete air sampling started in succession at several cooperating sites.

AGAGE41 in Beijing, June 2010



AGAGE33, April 2006



Challenge for Accurate and Compatible Measurement of Atmospheric Greenhouse Gases

Ling-Xi Zhou & Colleagues

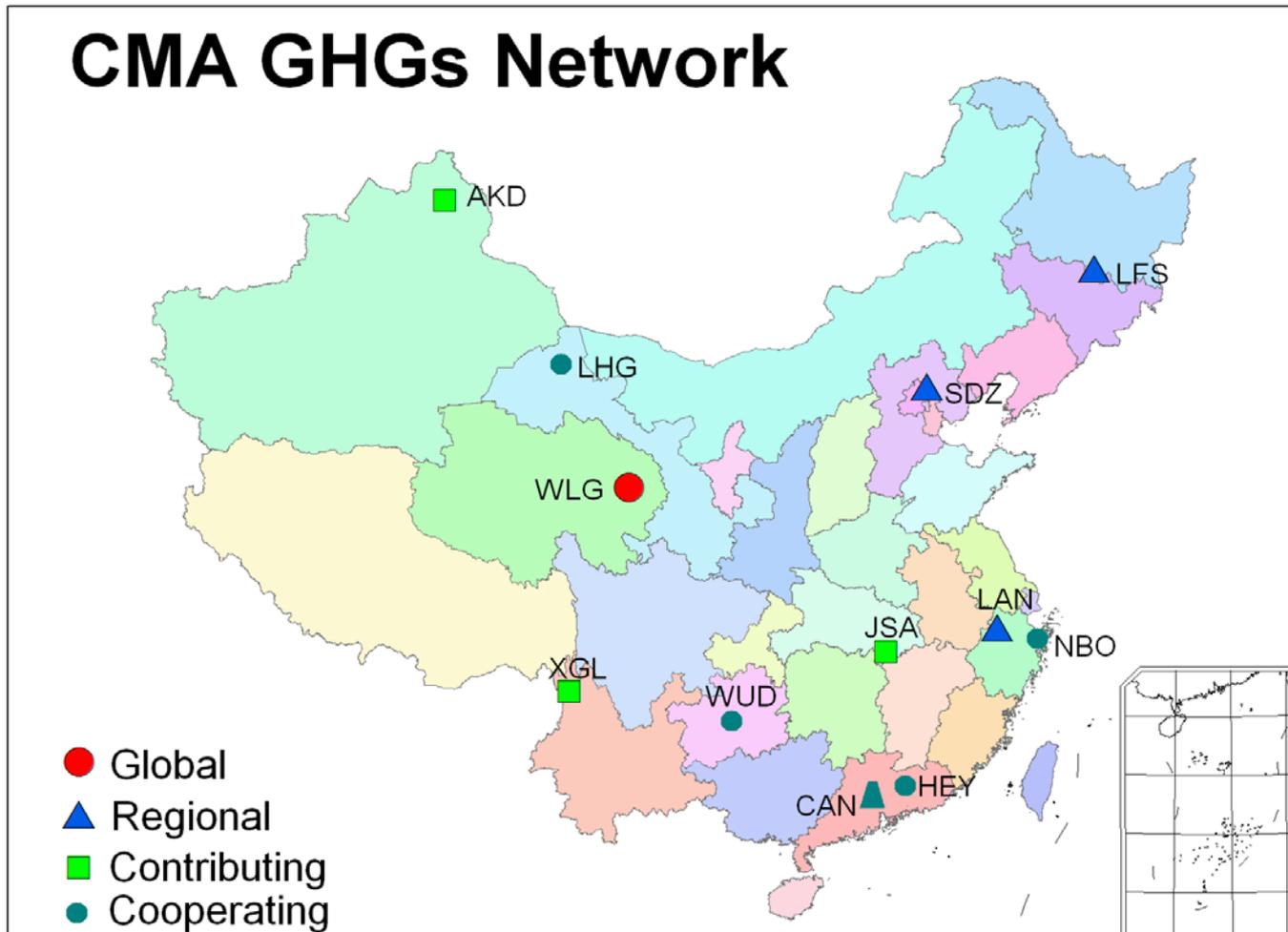
Chinese Academy of Meteorological Sciences (CAMS)
China Meteorological Administration (CMA)

3-4 Sept. 2012, Beijing
Workshop on Measurements and Standards for Climate Change

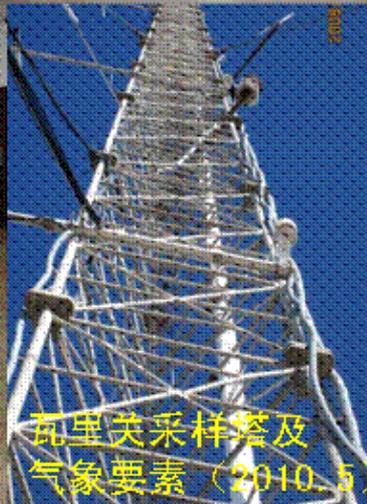
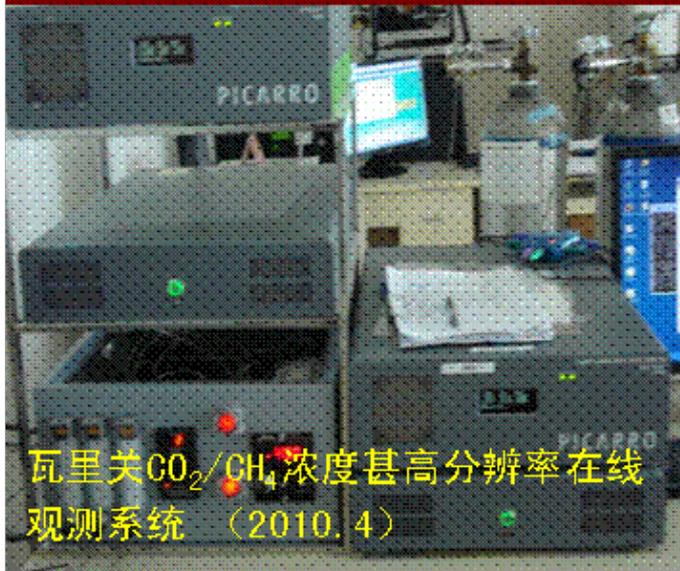
Outline

- CMA's role in the WMO/GAW
- CMA-NOAA bilateral
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- Prospects

A number of background stations were developed in addition to the one at Mt. Waliguan, which is one of the 28 WMO/GAW baseline stations.



WLG (GAW global station)



SDZ (GAW regional station)



上甸子大气Picarro系统
(2010.5)



上甸子大气N₂O/SF₆/CO浓度高精度在线观测系统
(2010.12)



上甸子卤代类温室气体高压配气系统
(2010.11)

“我国温室气体监测分析系统建设(一期)”
—北京上甸子站 + 80m tower



GHGs new Lab, Shangdianzi, May 2011



New building



Rix-pump & Tank storage

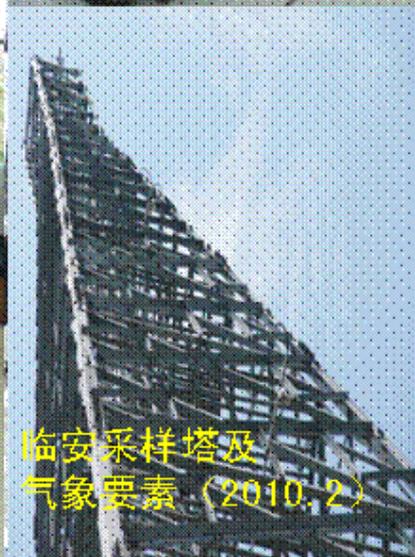


梯度进气系统
(2010.5)

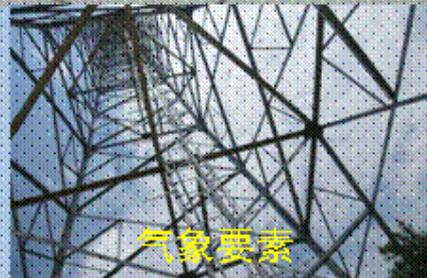
LAN (GAW regional station)



梯度进气系统
(2010.5)



临安采样塔及
气象要素 (2010.2)

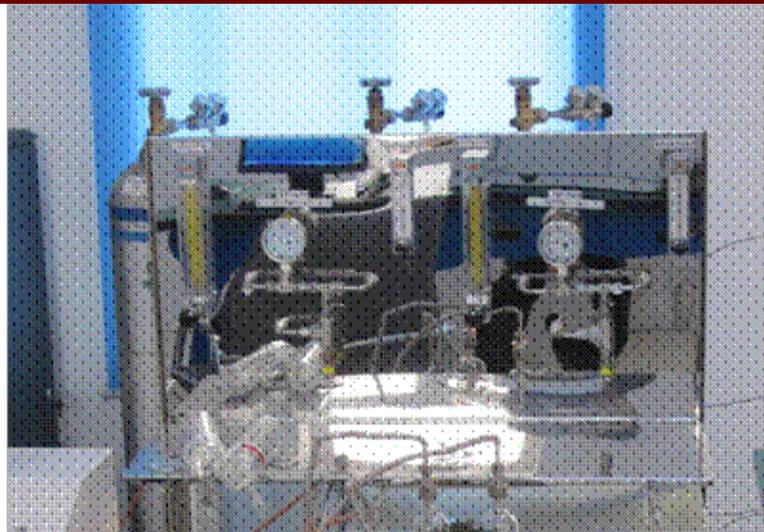


气象要素



高压配气系统
(2010.11)

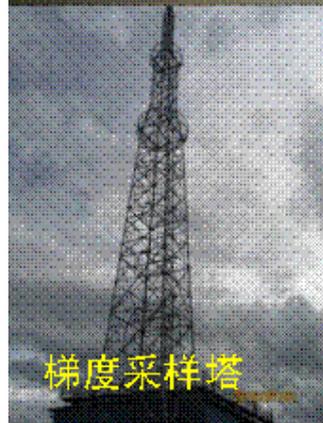
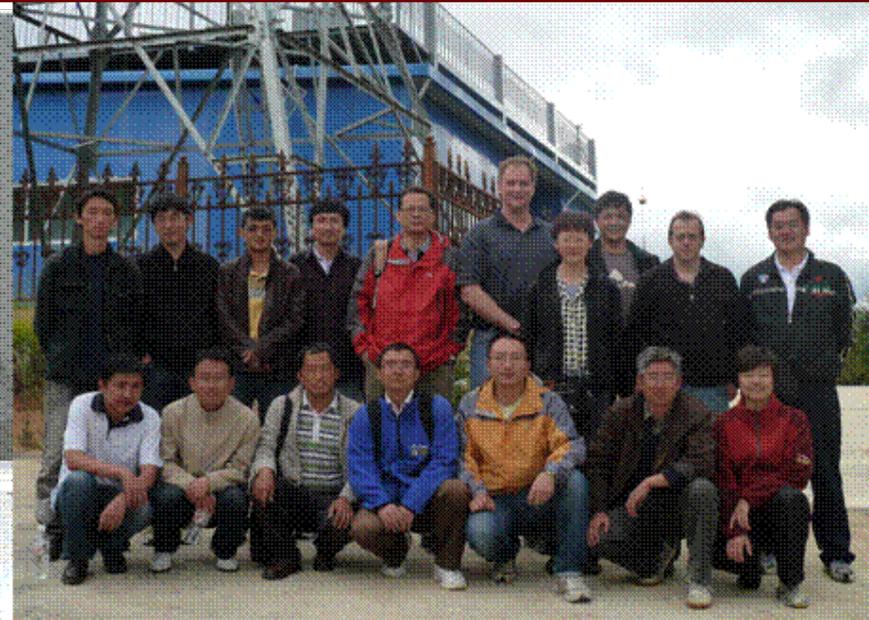
LFS (GAW regional station)



XGL (GAW regional station)



香格里拉CO₂/CH₄浓度甚高分辨率在
(2010.7)

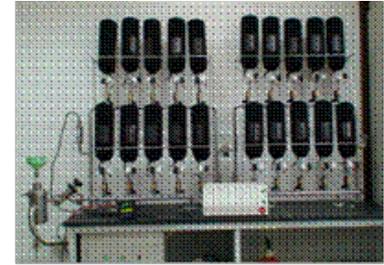


梯度采样塔



梯度进气系统
(2010.5)





CMA/SST/Picarro group in the lab at CMA

2008年11月



CAMS Lab in Beijing (GHGs & tracers)



The 20-year GHGs record contributes to the WDCGG, WMO's GHGs Bulletin, Global-View and Obspack data products, IPCC assessments, and other key products.

Data submit to the WDCGG

WMO Global Atmosphere Watch
World Data Centre
for Greenhouse Gases

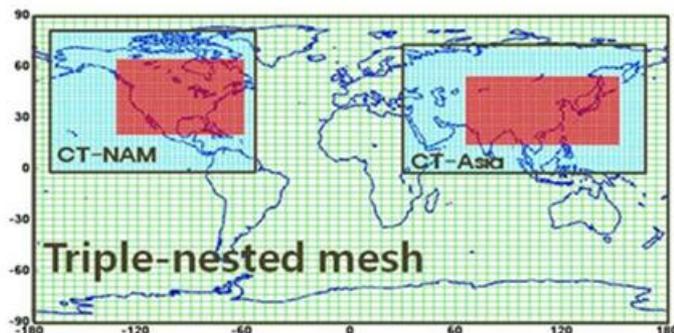
Mt. Waliguan - CMA

Parameter Inventory	Parameter Metadata	Station	Contributor		
Parameter (Data/Quick Plot)	Category	Period	Types of Data	Update	Parameters included

Introduction
Contributors
Data/Quick Plot
Mt. Waliguan



Global-View => ObsPack



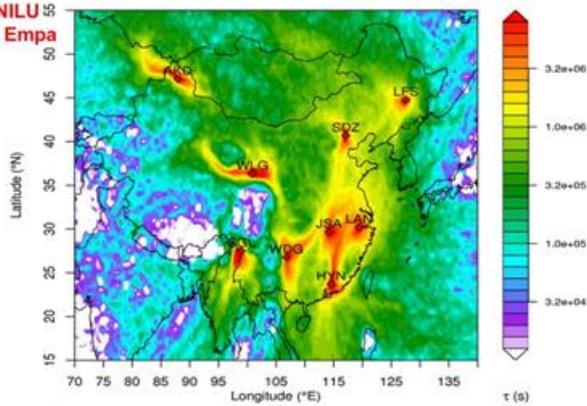
CT-China

From $3 \times 2^\circ$ to $1 \times 1^\circ$

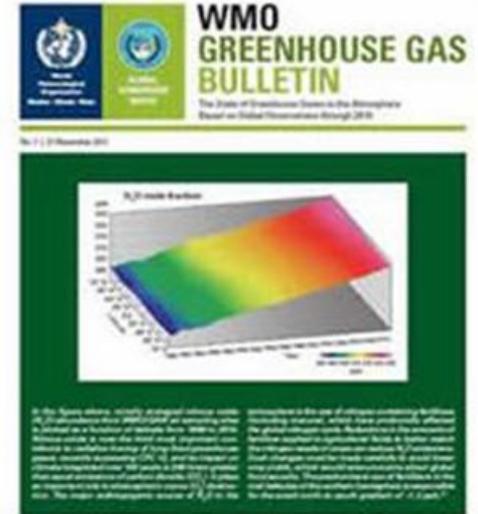
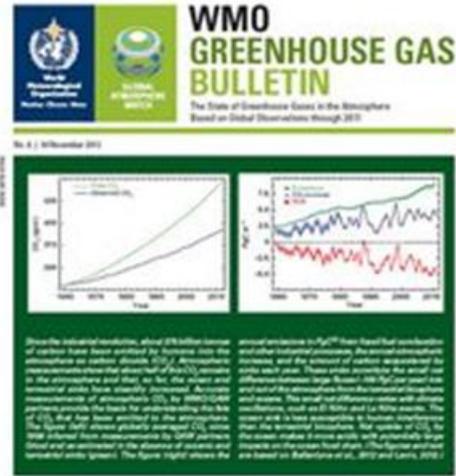


Courtesy of
Andreas Stohl, NILU
Stephan Henne, Empa

瓦里关
上甸子
临安
龙凤山
阿克达拉
香格里拉
金沙
河源
乌当
宁波

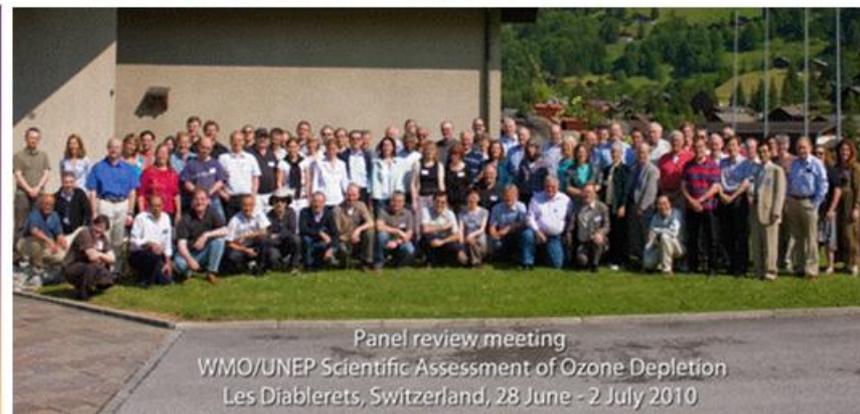
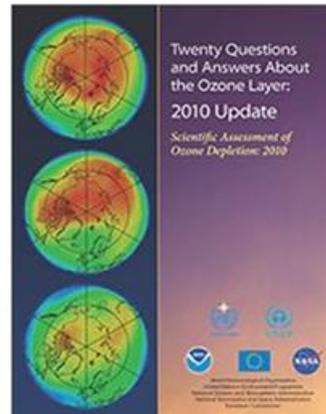
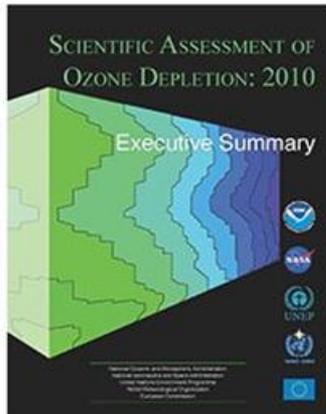
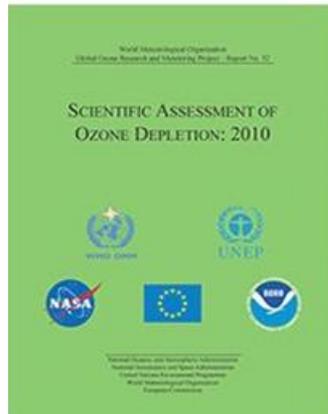


2010年9站足印函数 Annual total PBL residence time for back-trajectories started at CAMS sites at station altitude. Trajectory calculations were performed with FLEXTRA based on ECMWF wind fields with a resolution of $0.2^\circ \times 0.2^\circ$ over China and $1^\circ \times 1^\circ$ for the rest of the globe.



Scientific Assessment of Ozone Depletion: 2010

WMO-UNEP Report



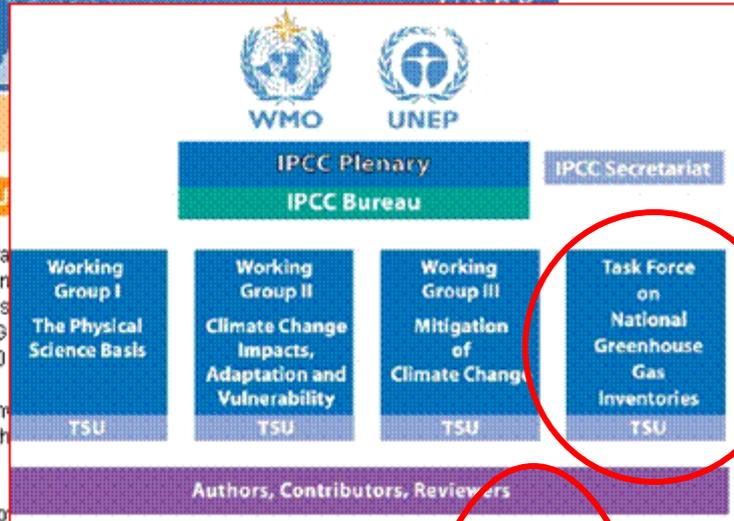
- Home
- About IPCC
- How the IPCC is organized
- IPCC Bureau and TFB
- IPCC Secretariat
- Working Group I
- Working Group II
- Working Group III
- Task Force on National Greenhouse Gas Inventories
- Other IPCC activities

About IPCC

THE IPCC BUREAU AND THE TASK FORCE BUREAU

Members of the IPCC Bureau are normally elected for the duration of 5-6 years. They should be experts in the field of climate change.

The current composition of the IPCC Bureau and the TFB is shown below.



IPCC AR5

国家气候变化评估报告

THE IPCC BUREAU (SEPT. 2008)

Chairman



Rajendra K. Pachauri

IPCC Vice - Chairs

 Dounlade Davidson (Sierra Leone)	 Jean-Pascal van Ypersele (Belgium)	 Hoesung Lee (Republic of Korea)
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Working Group I The physical science basis	Working Group II Impacts, adaptation, vulnerability	Working Group III Mitigation	Task Force Bureau National Greenhouse Gas Inventories
Co chairs	Co chairs	Co chairs	Co chairs

Working Group I The physical science basis	Working Group II Impacts, adaptation, vulnerability	Working Group III Mitigation	Task Force Bureau National Greenhouse Gas Inventories
Co-chairs	Co-chairs	Co-chairs	Co-chairs
 Thomas Stocker (Switzerland)	 Christopher Field (USA)	 Ottmar Edenhofer (Germany)	 Taka Hiraiishi (Japan)
 Dahe Qin (China)	 Vicente Barros (Argentina)	 Ramon Pichs-Madruga (Cuba)	 Thelma Krug (Brazil)
		 Youba Sokona (Mali)	

Dahe QIN China

Organization

The Task Force on National Greenhouse Gas Inventories (TFI) has a Bureau with 14 members including six (6) Co-Chairs and a Technical Support Unit. The TFI provides guidance to the IPCC/TFI. The present TFI was elected by the IPCC Panel in September 2005. For the IPCC structure, please see the [IPCC website page](#).

Task Force Bureau (TFB)

Co-Chairs



Dr. Heidemarie KROUJ
Brazil



Mr. Takanobu MIYAZAKI
Japan

Members



Mr. Leonidas Guillermo GIMENEZ
Argentina



Ms. Sonia FERGUSON
New Zealand (1)



Mr. Howard DILLIUS
Australia (1)



Mr. Salahuddin KHAYRAN
Syrian Arab Republic (2)



Ms. Delalina PETROVA
Bulgaria (2)



Dr. Somchai MITTA
Thailand



Dr. Dominique BLAIN
Canada



Dr. Simitonship IOWINAYDON
Thailand



Mr. Sergio GONCALVES WARTHIMBAUX
Chile



Dr. Jim POWMAN
United Kingdom



Dr. Sungho CHOI
China



Mr. William DICKING
United States of America



Dr. Haseki SUZUKI
Indonesia



Mr. Wellington ZHAKAIA
Zimbabwe

(1) (2): These two pairs both share one TFB position each.

Technical Support Unit (TSU)

The inauguration of the TSU took place on Saturday 25 September 1999 in Tokyo, Japan. Currently nine staff members are working in the TSU. For more details, please click [here](#).

Task Force on National Greenhouse Gas Inventories

2013 KP Supplement

2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol

The IPCC at its 35th Session in Geneva, 8th – 9th June 2012 decided to produce the "2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol" by the revised target date of October 2013. The panel also agreed to restrict the scope of the work by not including the original section 4.3 of Chapter 4 of the GPG-LULUCF. On 12th June 2012, the IPCC sent out a letter to governments and international organizations for the nomination of experts for consideration as Coordinating Lead Authors, Lead Authors and Review Editors to contribute to this work. The Task Force Bureau (TFB) of the IPCC Task Force on National Greenhouse Gas Inventories (TFI) selected the [authors and Review Editors](#) based on the nominations aiming for a range of views, expertise and geographical representation.

Work on the production of the guidance has since been going on with two Lead Author meetings being convened in 2012. The IPCC Expert Review of the First Order Draft (FOD) will be initiated from 7th January 2013, in accordance with the "Procedures for the preparation, review, acceptance, adoption, approval and publication of IPCC Reports". [See below for the First Expert Review section.] Review is an essential part of the IPCC process to ensure objective and complete assessment of the current information. In the course of the multi-stage review process - first by experts and then by governments and experts - both expert reviewers and governments are invited to comment on the accuracy and completeness of the scientific/technical/socio-economic content and the overall balance of the drafts.

Documents

- [Terms of Reference, Chapter Outline & Work Plan as approved by IPCC 35](#)
- [List of CLA, LA and RE](#)
- [Procedures for the preparation, review, acceptance, adoption, approval and publication of IPCC Reports](#)

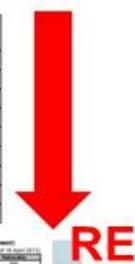
Timeline

Timeline for the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol	
Panel Approval	6 - 9 Jun 2012
Lead Author Meeting 1	24 - 28 Sep 2012
Lead Author Meeting 2	12 - 15 Nov 2012
Expert Review	7 Jan - 3 Feb 2013
Lead Author Meeting 3	5 - 8 Mar 2013
Government/Expert Review	22 Apr - 2 Jun 2013
Lead Author Meeting 4	15 - 18 Jul 2013
Government Consideration	Sep 2013
IPCC Panel Adoption/Acceptance	Mid-Oct 2013

First Expert Review

List of Authors of the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (KP Supplement)

Role	Name	Country	Organization	
Coordinating Lead Authors	Dr. Heidemarie Krouj	Brazil	IPCC	
	Mr. Takanobu Miyazaki	Japan	IPCC	
	Mr. Leonidas Guillermo Gimenez	Argentina	IPCC	
	Ms. Sonia Ferguson	New Zealand	IPCC	
	Mr. Howard Dillius	Australia	IPCC	
	Mr. Salahuddin Khayran	Syrian Arab Republic	IPCC	
	Ms. Delalina Petrova	Bulgaria	IPCC	
	Dr. Somchai Mittra	Thailand	IPCC	
	Dr. Dominique Blain	Canada	IPCC	
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	Dr. Sungho Choi	China	IPCC	
	Mr. William Dicking	United States of America	IPCC	
	Dr. Haseki Suzuki	Indonesia	IPCC	
	Mr. Wellington Zhakaia	Zimbabwe	IPCC	
	Dr.
	Dr.
	Dr.
	Dr.
Review Editors	Dr. ...	...	...
	Dr. ...	...	...
	Dr. ...	...	...
	Dr. ...	...	...
	Dr. ...	...	...
	Dr. ...	...	...
	Dr. ...	...	...
	Dr. ...	...	...
	Dr. ...	...	...
	Dr. ...	...	...



TFB
2008 - 2015

Task Force on National Greenhouse Gas Inventories

Products & Services



2011年

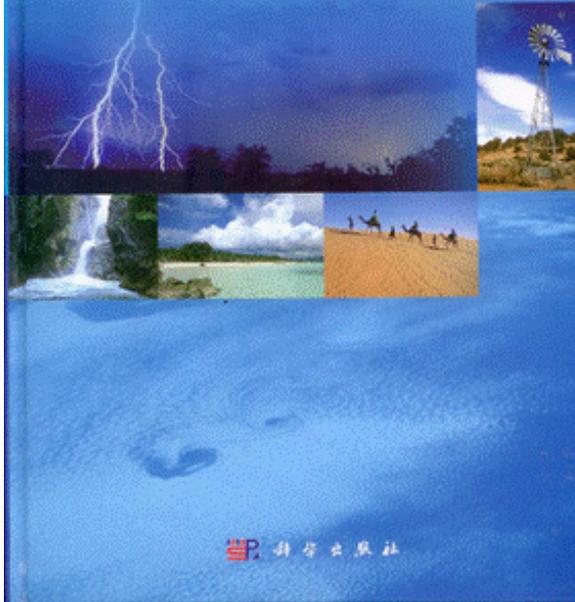
中国气候变化监测公报 CHINA CLIMATE CHANGE BULLETIN



中国气象局气候变化中心

第二次 气候变化国家评估报告

《第二次气候变化国家评估报告》编写委员会 编著



科学出版社

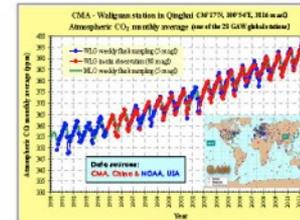


CHINA GREENHOUSE GAS BULLETIN

The State of Greenhouse Gases in the Atmosphere
Based on Chinese and Global Observations through 2011

No. 1 December 2012

Climate Change Centre
China Meteorological Administration



CMA GHGs Network



Since 1980s, China Meteorological Administration (CMA) has put in place seven atmospheric background stations - Waliguan in Qinghai (WLG), Shangdianzi in Beijing (SDZ), Lan'an in Zhejiang (LAN), Longfengshan in Heilongjiang (LFS), Shangri-La in Yunnan (XGL), Jinsha in Hubei (JSA) and Akedaisi in Xinjiang (AKD), which represent a number of typical climatic, ecological and economic zones in China. Greenhouse gases and related tracers have been observed by network stations in a standard and consistent routine in response to the Kyoto Protocol and the Montreal Protocols. In particular, the Waliguan Global Atmosphere Watch Baseline Observatory has engaged in flask air sampling analysis since 1990 and in-situ observation since 1994. The 20-year history in observation records the longest time series in atmospheric CO₂ records in China. The flask air sampling analysis and the in-situ observations were launched in other background stations beginning from 2006.

Executive summary

The World Meteorological Organization (WMO) Greenhouse Gas Bulletin (2011) No. 8 released by WMO on 19 November 2012 shows that globally averaged mole fractions in atmospheric carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) continued to hit new highs in 2011, with CO₂ at 390.9 ± 0.1 ppm^[1], CH₄ at 1813 ± 2 ppb^[2] and N₂O at 324.2 ± 0.1ppb. These values constitute 140%, 259% and 120% of pre-industrial (before 1750) levels.

As analyzed from observational data at the seven China Meteorological Administration (CMA) background stations through 2011, averaged mole fractions in atmospheric CO₂, CH₄ and N₂O also hit new highs in 2011, with the Waliguan station in Qinghai registering 392.2 ppm for CO₂, 1861 ppb for CH₄ and 324.7 ppb for N₂O. As a record high since the observation was started in 1990, they are roughly equivalent to the averaged mole fractions in the northern mid-latitudes, but are slightly higher than the global averages in all these components (390.9 ppm, 1813 ppb and 324.2 ppb) over the same period. Global mole fractions in atmospheric CO₂, CH₄ and N₂O increased by 2.0 ppm, 5 ppb and 1.0 ppb in absolute terms, from 2010 to

2011, while those at Waliguan by 2.2 ppm, 9 ppb and 1.1 ppb. Global annual averages in atmospheric CO₂, CH₄ and N₂O over the past 10 years increased by 2.0 ppm, 3.2 ppb and 0.78 ppb in absolute terms, while those at Waliguan 2.1 ppm, 3.5 ppb and 0.80 ppb.

As observed by the three regional stations of Longfengshan in Heilongjiang, Shangdianzi in Beijing and Lan'an in Zhejiang in 2011, the annually averaged mole fractions in atmospheric CO₂ were 395.8 ppm, 393.3 ppm and 400.8 ppm, those in CH₄ 1942 ppb, 1887 ppb and 1942 ppb, and those in N₂O 325.5 ppb, 324.8 ppb and 326.0 ppb, all being higher than the observations made at Waliguan (392.2 ppm, 1861 ppb and 324.7 ppb) over the same period. This is somewhat a reflection of the anthropogenic impacts more active in and around the three regional background stations.

The atmospheric SF₆ mole fractions observed at Waliguan and Shangdianzi reached 7.54 ppt^[3] and 7.52 ppt in 2011, - the highest ever records since the observation was launched at the two sites.

Outline

- CMA's role in the WMO/GAW
- CMA-NOAA bilateral
- Products & Services
- **Prospects**

December 2009, CMA



March 2013

CMA GHGs Lab



18th CMA-NOAA JWG proposal

Integrated Approaches of GHGs Monitoring and Verification

- Cooperative surface flask sampling extension
- Cooperative high accuracy vertical profiles
- PFP and AirCore analysis techniques
- Extensive ICP and Interactive Data Visualization
- Data assimilation, higher resolution CT and Validation
- CCL-China for GHGs tight link to WMO/CCLs

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- **NIES & JMA, Japan**
- **MPI-BGC & GAWTEC, Germany**
- **FMI, Finland**
- **GAW SAG, QA/SAC, CCL, WCC, WDC,**

**and many
others**

