Scale for greenhouse gas observation and Intercomparison activities in JMA

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Overview of the GAW world central facilities
(as of January 2011)

Variable	Quality Assurance / Science Activity Centre (QA/SAC)	Central Calibration Laboratory (CCL)	World Calibration Centre (WCC)	World Data Centre (WDC)
CO_2	**JMA (A/O)**	ESRL	ESRL (round robin) Empa (audits)	**JMA**
CH_4	Empa (Am, E/A) **JMA (A/O)**	ESRL	Empa (Am, E/A) **JMA (A/O)**	**JMA**
N_2O	UBA	ESRL	IMK-IFU	**JMA**
CFCs, HCFCs, HFCs				**JMA**
CO	Empa	ESRL	Empa	**JMA**
Surface Ozone	Empa	NIST	Empa	**JMA**
Total Ozone	**JMA (A/O)**	ESRL[1], Environment Canada[2]	ESRL[1], Environment Canada[2]	Environment Canada[5], DLR[6]
SO_2				**JMA**
NOx	UBA		IEK-8 (NO)	**JMA**
H_2		MPI-BGC		**JMA**

Am: Americas; **E/A:** Europe and Africa; **A/O**: Asia and the South-West Pacific

[1] Dobson, [2] Brewer, [3] Filter instruments, [4] Precision Filter Radiometers (PFR), [5] ground-based, [6] satellite-based

Structure of Atmospheric Environment Division of JMA

JMA → Global Environment and Marine Department

Atmospheric Environment Division

Director

Senior Coordinator for GAW: Koide

Deputy director

GAW International Centers

- WDCGG (3 members) Data Management
- QA/SAC (1 member) Quality Assurance
- WCC (1 member) :Takizawa Calibration

Monitoring and Analysis

- Senior Scientific Officer
  - Greenhouse Gas monitoring section (7 members)
- Senior Scientific Officer
  - Solar radiation section
  - Aerosol observation section
- Senior Scientific Officer
  - Model developing and analysis section (3 members)

Observational stations

Calibration System and Primary Standard Gases in JMA

NOAA/ESRL
Central Calibration Laboratory (CCL) for CO_2, CH_4, CO and N_2O

Traceability
High precision

Calibration

Send to

precision of JMA's calibration system

CO_2	<= 0.02ppm
CH_4	<= 2ppb
CO	<= 3ppb
N_2O	<= 2ppb

JMA

Primary Standard Gases for CO_2, CH_4, CO and N_2O

calibration system at JMA

CO_2:HORIBA
VIA-510R (NDIR)

CH_4:SHIMADZU
GC-14BPF (GC-FID)

CO:Round Science
Inc. TRD-1 (GC-RGD)

N_2O:SHIMADZU
GC-2014A (GC-ECD)

Hierarchy of CO_2 standard gases in JMA

JMA has three ranks of standard gases.

NOAA/ESRL WMO Standards

JMA Headquarters

JMA primary standards

Measured every 6 months

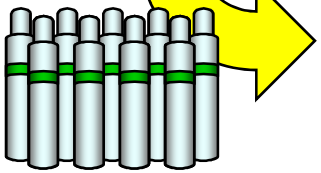
JMA secondary standards

Calibration before use

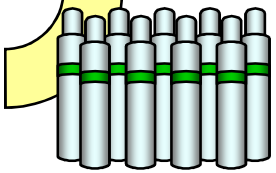
Working standards
(Initial pressure 15MPa)

Calibration after use

Working standards
(Minimum pressure >3MPa)



Stations, Ships and Aircraft



Working standards are sent to stations after calibration.

Working standards are re-calibrated after the use (almost every 6 months)

The standards for Greenhouse gases in JMA

- Carbon Dioxide (CO_2) (14 cylinders : 210～465ppm)
  Calibrated with the WMO standard gases of the NOAA/ESRL (WMO-X2007 scale)
  Now JMA uses the 6th generation primary standard gases.
  The 7th generation primary standard gases have been calibrated by NOAA/ESRL.
  (Zhao and Tans, 2006)

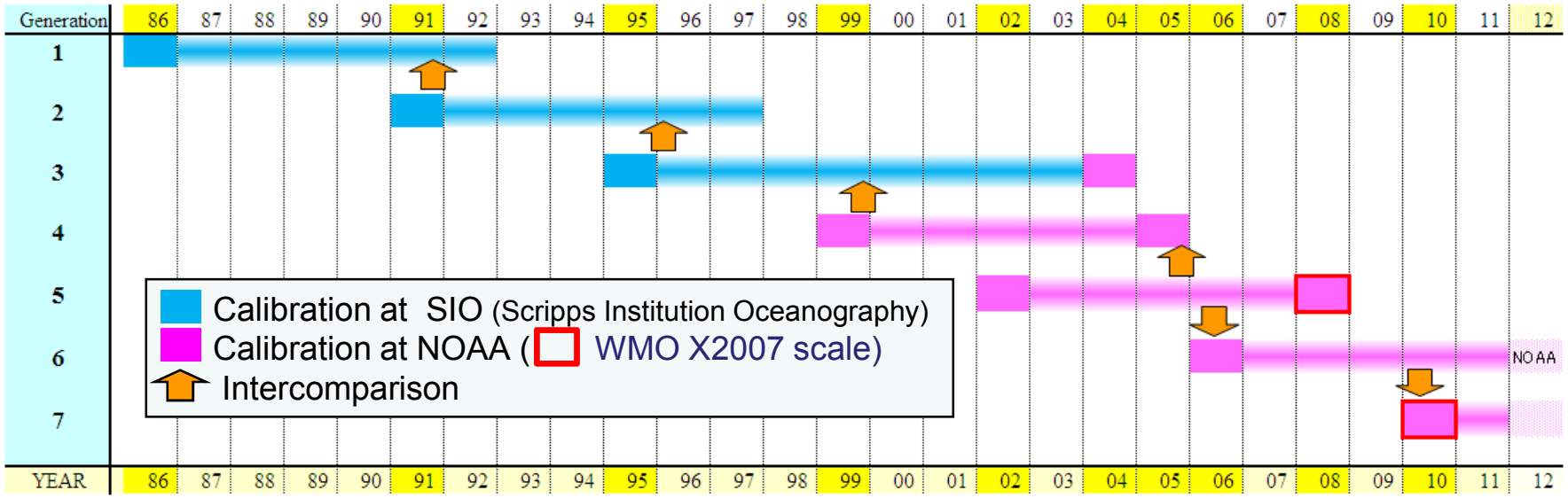
- Methane (CH_4) (5 cylinders : 1620～2110ppb)
  Calibrated with the WMO standard gases of the NOAA/ESRL (NOAA04 scale)
  The 2nd generation primary standard gases are calibrated by NOAA/ESRL in this year.
  (Dlugokencky et al., 2005)

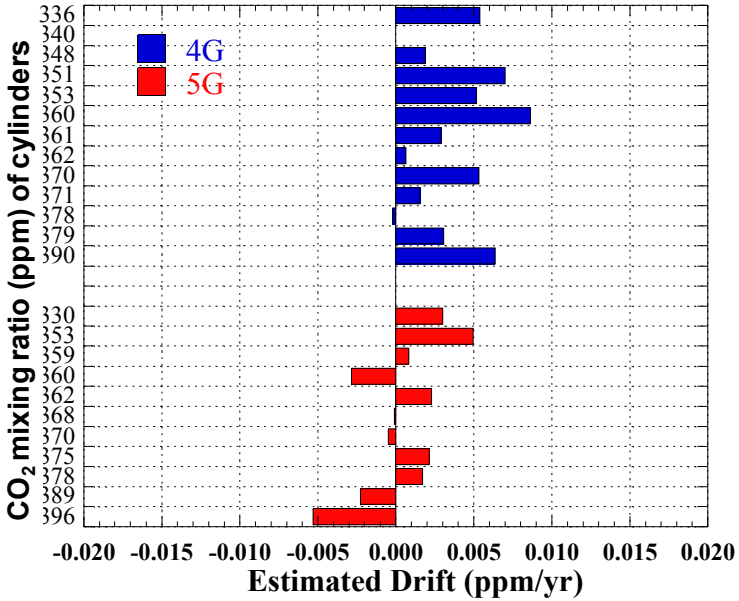
- Carbon Monoxide (CO) (5 cylinders : 50～1000ppb)
  Calibrated with the WMO standard gases of the NOAA/ESRL (WMO-2000 scale)
  (Novelli et al., 1994)

- Nitrous Oxide (N_2O) (5 cylinders : 280～340ppb)
  Calibrated with the WMO standard gases of the NOAA/ESRL (NOAA-2006 scale)
  (Hall et al., 2007)

- Ozone (tropospheric) (Ozone gas generator)
  Calibrated with WMO standard generator in NIST

History of JMA's CO_2 primary standards



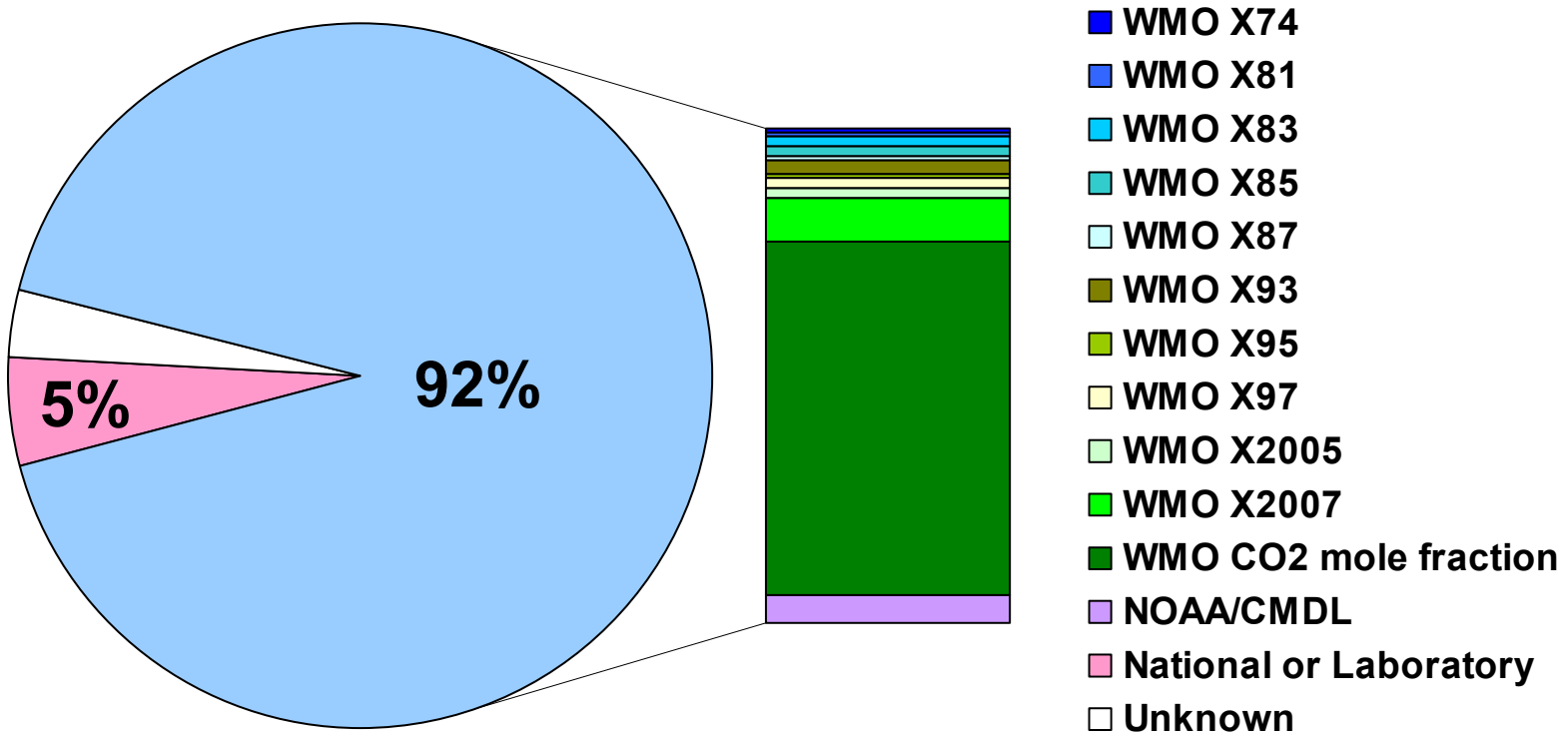


JMA maintains CO_2 primary standard gases calibrated by the WMO standard at the beginning and end of use.

No significant drifts (~0.005 ppm/yr) were found in the comparison with the independent standards of MRI.

CO_2 Calibration Scales at the WDCGG

- More than 90% of the CO_2 data sets reported to the WDCGG are on the WMO or NOAA scale, but different scales exist.
- The WDCGG encourages contributors to submit data in latest WMO scales (WMO X2007 scale or whatever the latest scale is).



Calibration scale of reported data
(in the East Asia and the South-West Pacific)

		CO_2	CH_4	N_2O	CO	CFCs
JP	JMA	WMO X2005 (updating to X2007)	NOAA 2004	NOAA 2006	NOAA 2000	gravimetric
	NIES	NIES 95	gravimetric	gravimetric	—	—
KR	KMA	KRISS	KRISS	KRISS	—	KRISS
	NIER	WMO X2007	NOAA04	NOAA 2006	—	unknown
CN	CMA	WMO X2007	NOAA 2004	—	—	—
NZ	NIWA	WMO X95	NOAA04	NOAA06	NOAA04	—
AU	CSIRO	WMO X2007	NOAA04	NOAA2006	CSIRO	—

Based on metadata reported to the WDCGG

WCC Website

日本語版 | Japan Meteorological Agency (JMA) | English

GAW World Calibration Centre (WCC) for Methane in Asia and the South-West Pacific

Regional Dobson Calibration Centre (RDCC) for Asia

- Introduction

WCC for Methane

- Methane Calibration System and Standard Gases
- Policy and Procedures for Calibration
- Methane Reference Gas Intercomparison

RDCC for Asia

- Dobson Spectrophotometer
- WMO/GAW Dobson Calibration System
- Activities of the Regional Dobson Calibration Centre for Asia
- User Registration for Dobson Software (WINDOBSON)

Related Information

- Eleventh WMO/IAEA Meeting of Experts on Carbon Dioxide Concentration and Related Tracer Measurement Techniques (25 - 28 September 2001, Tokyo, Japan)
- Information on CO2 Intercomparison Results
- Links

http://gaw.kishou.go.jp/wcc/

日本語版 | Japan Meteorological Agency (JMA) | WCC home

Annex 2: Results of Intercomparison

Laboratory and Location	Date of Measurement	Cylinder No. CPB13002			Cylinder No. CPB13003			Scale	Measu-rement Info
		Concent-ration (ppb)	SD (ppb)	N	Concent-ration (ppb)	SD (ppb)	N		
1. Intercomparison for Asia **JMA:** Japan Meteorological Agency **CMA:** China Meteorological Administration, **CGAWBO:** China Global Atmosphere Watch Baseline Observatory **KMA:** Korea Meteorological Administration, **KGAWO:** Korea Global Atmosphere Watch Observatory **NOAA:** National Oceanic and Atmospheric Administration, U.S.A. **AES:** Atmospheric Environment Service (presently Meteorological Service of Canada (MSC)) **CMDL:** Climate Monitoring and Diagnostics Laboratory (presently Global Monitoring Division (NOAA/ESRL)), U.S.A.									
JMA Headquarters, Tokyo	Apr. 24-25, 2001	1809.7 *,**	1.1	10	1960.1 *,**	0.9	10	NOAA04	PDF
CMA CGAWBO at Mt. Waliguan	Jul. 21-24, 2001	1822.9	11.7	99	1980.5	9.8	99	AES	PDF
KMA KGAWO at Anmyeon-do	Sep. 3-5, 2001	1786.4	1.1	45	1935.7	1.4	45	CMDL	PDF
JMA Headquarters, Tokyo	Nov. 5-6, 2001	1810.5 *,**	2.2	10	1960.5 *,**	1.0	10	NOAA04	PDF
2. Intercomparison for the South-West Pacific **CSIRO:** Commonwealth Scientific and Industrial Research Organisation **NIWA:** National Institute of Water & Atmospheric Research Ltd. **NIST:** National Institute of Standards and Technology, U.S.A.									
JMA Headquarters, Tokyo	Apr. 15-16, 2002	1810.3 *,**	1.3	10	1959.8 *,**	1.1	10	NOAA04	PDF
CSIRO Aspendale, Australia	Mar. 2003	1787.38	2.0	67	1937.33	2.1	72	CSIRO1994	PDF
NIWA Wellington, New Zealand	Jul. 2003	1817.84	1.79	10	1968.95	2.23	10	NIST	PDF
JMA Headquarters, Tokyo	Dec. 15-16, 2003	1810.6 *,**	0.8	10	1959.3 *,**	1.7	10	NOAA04	PDF
3. Intercomparison for Japan **TU:** Tohoku University **NIES:** National Institute for Environmental Studies									
TU, Sendai	Sep. 28, 2004	1810.5	1.7	11	1961.2	1.6	11	TU Gravimetric Scale	PDF
NIES, Tsukuba	Dec. 20, 2004-Feb. 14, 2005	1812.1	1.4	84	1963.4	1.0	82	NIES94	PDF
JMA Headquarters, Tokyo	Mar. 3-8, 2005	1890.7 **	1.9	10	1960.3 **	1.7	10	NOAA04	PDF

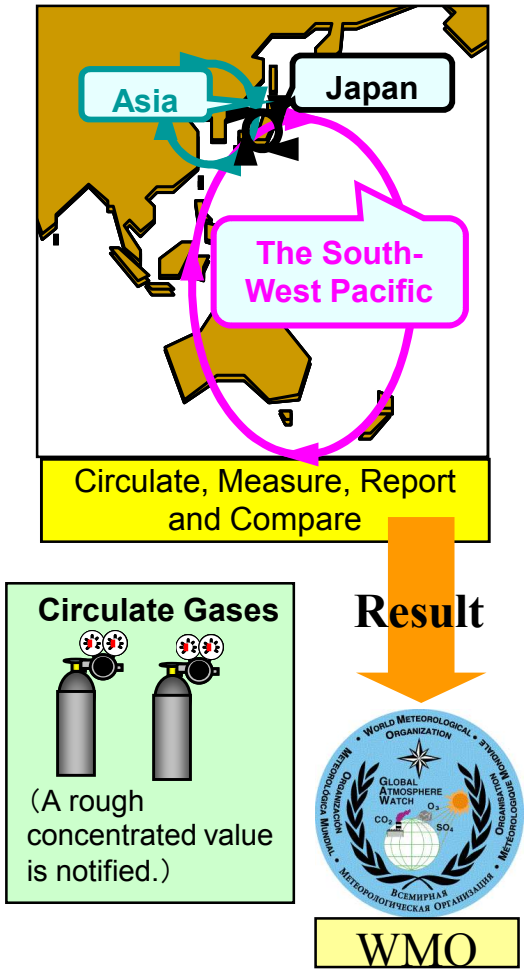
http://gaw.kishou.go.jp/wcc/ch4/com_annex2.html

WCC for Methane in Asia and the South-West Pacific

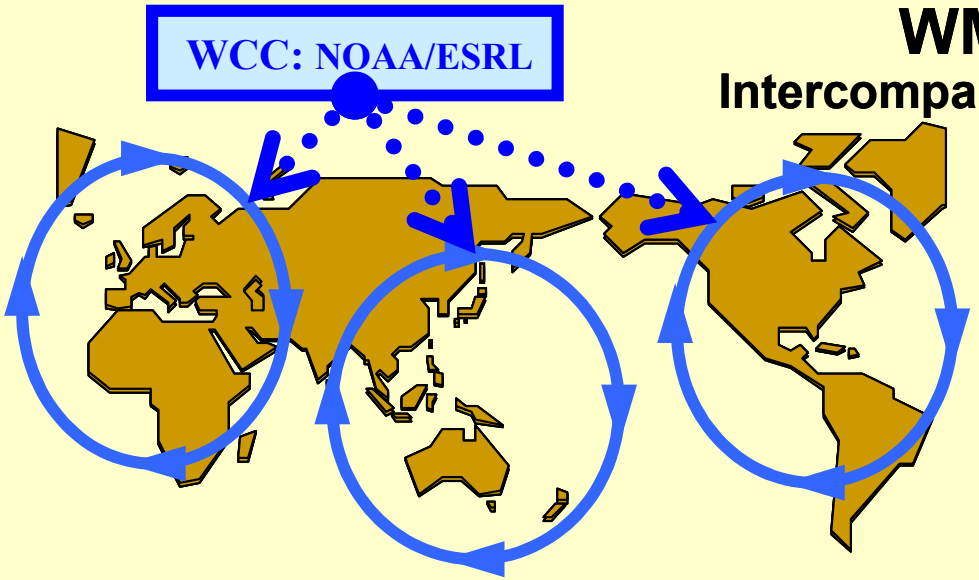
Under the GAW programme, the JMA runs WCC for CH_4, and has conducted intercomparison experiment of CH_4 reference gases since 2001.

Summary of Methane Reference Gas Intercomparison

Regions	Periods of intercomparison	Participating Laboratory and Location
Asia	Jul 2005 – Aug 2006	JMA, CMA, KMA, KRISS, JMA
South-West Pacific	Dec 2006 – Aug 2008	JMA, CSIRO,NIWA, JMA
Asia	May 2008 – Jul 2009	JMA, KRISS, KMA, CMA, JMA
South-West Pacific	Apr 2010 – Feb 2011	JMA, CSIRO,NIWA, JMA
Asia	Jun 2011 –	JMA, CMA, KMA, JMA



Inter-laboratory Comparison Exercises

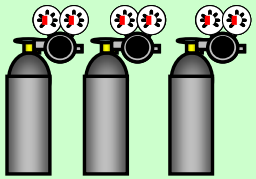


WMO Round Robin

Intercomparison of WMO World Trace Gases

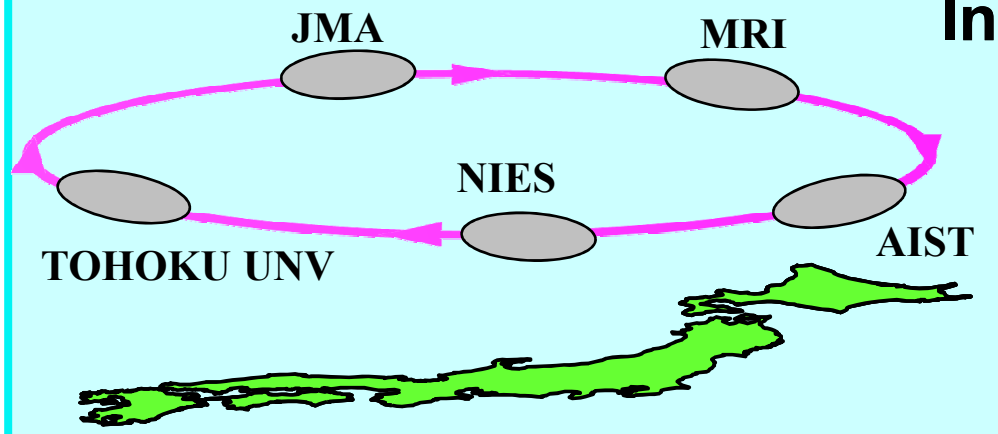
Circulate Gases

(A rough concentrated value is notified.)



Circulate, Measure, Report and Compare

P l u s

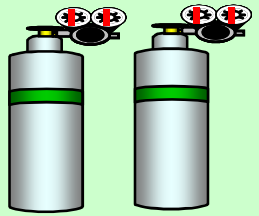


Intercomparison of different Scale in Japan

Circulation among Laboratories

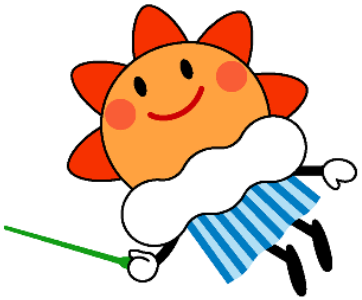
Circulate Gases

(JMA's used Primary standard gases)



Summary

- JMA maintains a relay of primary standards that are calibrated by the WMO/CCL every few years.
- The JMA conduct methane reference gas intercomparison, the difference among participants are gradually smaller.
- Inter-laboratory comparisons enabled the laboratories to compare measurement data of their individual scale.
- In future, we aim to build a systematic intercomparison framework of standard scale among laboratories in Japan and to maintain stability of standard scale over the long term.



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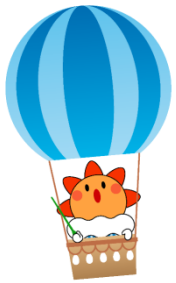

Thank you very much for your attention